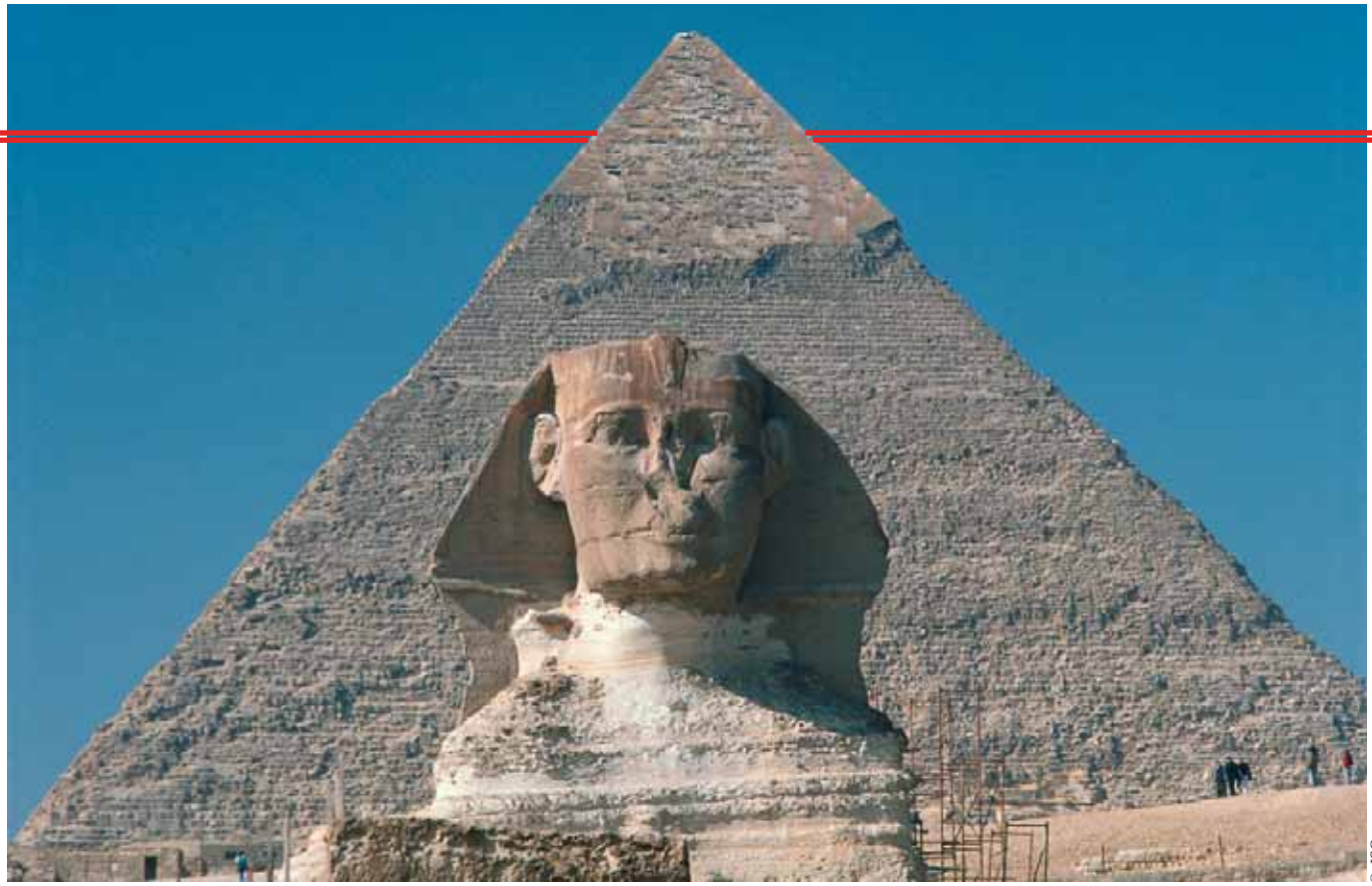

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Built to last
Service life planning

by Prof. Christer Sjöström, Chair of ISO/TC 59/SC 14, and Dr. Hywel Davies, Vice-Chair of ISO/TC 59/SC 14

Buildings and civil engineering works consume considerable resources in all economies, to build, operate and use. Buildings account for 46% of the energy use in Europe, of which 22% could be saved cost effectively by improved energy efficiency, and the built environment is the largest consumer of material resources. For example, in the United Kingdom, 70 million tonnes of building materials go to waste each year. The environmental impact of constructing, running and demolishing our built environment is enormous.

Lack of interoperability, or simply ineffective communication in the building value chain, creates poor quality, increases costs, and requires unsustainable resource and energy consumption.[1),2)] Construction has a great potential for cost reduction and productivity increases particularly in relation to process improvement, re-engineering and better use of ICT[1),3)].

Service life planning aims at enabling designers and other decision makers to optimize resource use by ensuring that the building will last for the lifetime that the building user wants, without incurring large unexpected expenditures. The fundamental aim of service life planning is to ensure that any design is capable of lasting for the specified period.

How many years should a building last?

Service life data is important in all aspects of sustainable construction. Building users specify the number of years they want the building to last. This is entitled the "design life". The designer will then aim to design a building that will last for the specified length of time, and continue to be functional to the end of its life cycle. The proposed design response should satisfy the performance requirements, including environmental impacts, functionality and cost of the proposed design, over the specified design life. **Figure 1** *(overleaf)* describes service life planning as part of the building construction process.

Design solutions and life predictions

ISO has been active in the development of standards for service life planning for over a decade through the work of ISO technical committee ISO/TC 59, *Building construction*, subcommittee SC 14, *Design life*. Originally formed in Atlanta, the USA, in 1993 as a working group on design life of buildings, it became subcommittee SC 14 in Gävle, Sweden, in 1998. The standardization was initiated to meet a significant European initiative based on the need of supporting standards when implementing the European Construction Products Directive, CPD[4)]. The establishment was based on the Vienna Agreement on cooperation between the European Committee for Standardization (CEN) and ISO, as well as the fact that motives and needs were similar internationally to those in Europe. The work is closely coordinated with that of ISO/TC 59/SC 17, *Sustainability in building*

1) EU, Competitiveness working group on e-Construction, phase II, Final Report, 2004

2) NIST, (GCR04-867), Cost Analysis of Inadequate Interoperability in the US Capital Facilities Industries, 2004

3) ECTP, E-Core strategy, June 2005

4) CEC, Council Directive of 21 December 1988, 89/106/EEC, Brussels

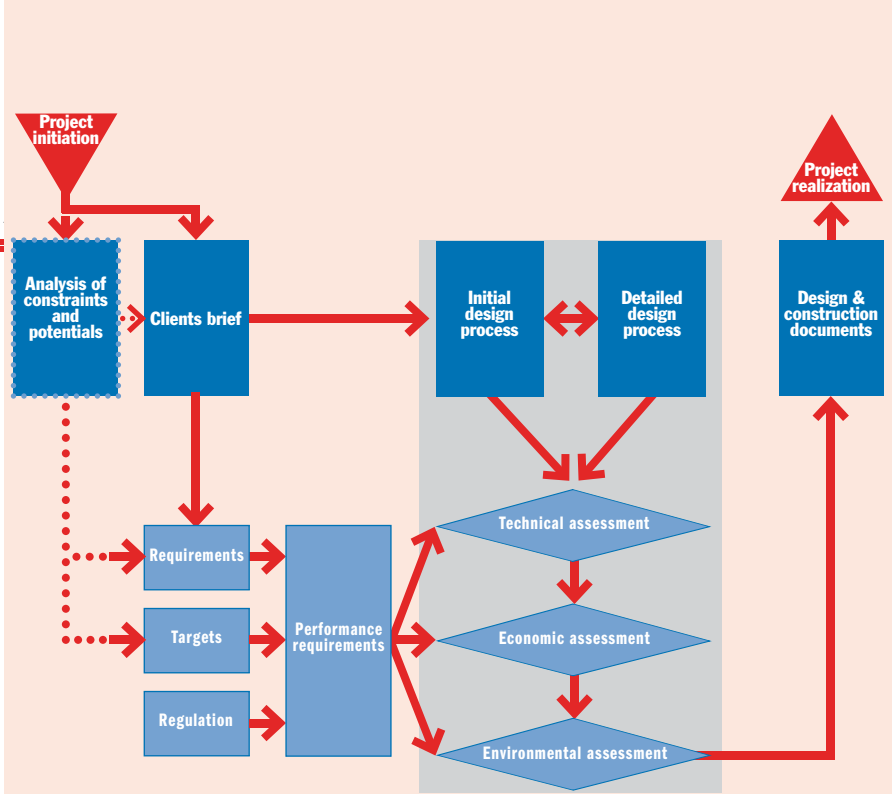

Figure 1: *The service life planning process.*

construction, which was established in 2002. Subcommittee 14 has developed and is now close to concluding the work on the ISO 15686 standards on service life planning.

ISO 15686 provides the tools to develop a design solution with a design life, which will deliver the specified service life. That design solution will also have environmental impacts, and this is the subject of the standards under development in SC 17.

The various standards by ISO/TC 59/SC 14, ISO 15686, *Buildings and constructed assets – Service life planning*, are summarized below:

- ISO 15686-1:2000, *General principles*, gives the general principles and procedures that apply to design, when planning the service life of buildings and constructed assets;
- ISO 15686-2:2001, *Service life prediction procedures*, describes a procedure that facilitates service life predictions of building components. The general framework, principles, and requirements for conducting and reporting such studies are also given;
- ISO 15686-3:2002, *Performance audits and reviews*, is concerned with ensuring the effective implementation of service life planning. It describes the approach and procedures to be applied to pre-briefing, briefing, design, construction and, where required, the life care management and disposal of buildings and constructed assets;
- ISO/AWI 15686-4[5], *Data requirements/data formats*: This technical specification will describe the data requirements needed to carry out service life planning considering various service environments and other in-use conditions. In cooperation with the International Alliance for Interoperability (IAI) the aim is also to describe IFC compliance for the ISO 15686 series;
- ISO/DIS 15686-5, *Whole life cycle costing*, provides guidance on developing a model of the capital and running costs of the project, so that the overall costs can be assessed, and how this data can be used for financial appraisal;
- ISO 15686-6:2004, *Procedure for considering environmental impacts*, provides guidance on assessing the relative environmental impacts of alternate service life designs, and to identify the interface between environmental LCA and service life planning;
- ISO/FDIS 15686-7, *Performance evaluation for feedback of service life data from practice*: Provides a generic basis for performance evaluation and feedback of service life data from existing buildings and constructed works;
- ISO/DIS 15686-8, *Reference service life and service life estimation*, describes how to provide, format and extract reference service lives of components, and to establish the service life of the same in a particular usage. It also provides a factor method to carry out such estimations;
- ISO/AWI 15686-9, *Service life declarations*, aims at giving guidance to construction products manufacturers and standard writers on addressing durability and service life declarations in product standards. The work is performed in close cooperation with the CEN TG on durability, which is to support European product standard committees;
- A new work item proposal, performance standards in buildings – levels of functional requirements and levels of serviceability – principles, is currently being prepared for ballot.

5) ISO approved work item ISO/AWI 15686-4.

About the authors

Chair of ISO/TC 59/SC 14, **Dr. Christer Sjöström** is Professor in Building Materials Technology, Centre for Built Environment, University of Gävle, Sweden, with a research focus on life performance of materials, products, systems and buildings and sustainable construction issues. The R&D group at the Centre conducts both commissioned and academic research in the field.

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The European dimension

The European Committee for Standardization (CEN) is about to begin work to develop standards for the Integrated Environmental Performance of Buildings, through CEN/TC 350. The business plan for this committee indicates that a number of standards from subcommittees 14 and 17 of ISO/TC 59 will form the basis for the new European standards. Both subcommittees are working closely with the new TC to ensure that there is collaboration and joint working as far as possible, so that what has been developed within ISO can be incorporated into the CEN work without the need to reinvent the wheel.

Service life planning and the digital design world

Service life planning produces a significant body of data, as does life cycle assessment, environmental assessment, and life cycle costing analysis. Much of this is of value not only during the initial construction phase, but also through the operating phase. The suite of open Industry Foundation Classes (IFC) standards for shared information exchange, developed within the framework of the International Alliance for Interoperability (IAI) in cooperation with TC 59/SC 13, Organization of information about construction works, forms the basis of effective e-collaboration practices. SC 14 is exploring with IAI and ISO/TC 59/SC 13 the opportunities offered by the development of digital object oriented models of building products and the IFC based standards.

Greater resource efficiency and productivity require the use of service life planning to ensure that buildings are able to meet the client's requirements for the proposed life of the structure. The products of ISO/TC 59/SC 14 offer important tools and a framework in which to use them to improve the quality, performance and sustainability of new buildings in the 21st century.