

# EDITORIAL: IFC - PRODUCT MODELS FOR THE AEC ARENA

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*"When we mean to build, We first survey the plot, then draw the model; And when we see the figure of the house,  
Then must we rate the cost of the erection; Which if we find outweighs ability, What do we then but draw anew  
the model!"*

*Shakespeare  
King Henry IV  
Approx. 1597*

Models have existed for a long time and have been used in many different ways. The purpose of a model is to depict something – existing or planned – in a simplified way.

The need for exchange of more and more complex information has successively grown. During the 1980-ties the interest for standardized exchange of 3D geometries and product structures increased. Mainly standard products and their break down into parts were in focus, as the manufacturing industry is very dependent of versioning and configuration over the product life cycle.

In the construction sector there has not been the same interest in managing standard components. The interest has been more in the area of describing and showing project specific solutions, from early design to production specifications. First in these later phases, some elements of standard components have emerged, as e.g. windows, doors and fans have been type and product defined.

Bill of quantities, spaces, time and costs are some examples of what the construction sector wishes to exchange in addition to drawings and 3D models of the building itself. This means that exchanges are needed, not only between applications of the same type, e.g. CAD to CAD, but also between heterogeneous applications like CAD and cost estimation. Some examples of needed exchanges are:

- building elements between two different CAD systems in one project,
- building elements from a CAD system to an analysis tool – e.g. for structural analysis,
- bill of quantities from a CAD system to a cost estimation application,
- products / articles from catalogues / data bases into CAD systems.

These examples illustrate that it is object related information that needs to be managed, i.e. information related to a wall, a room, a fan etc. To be able to manage this kind of information, the ISO STEP standard based on an object-oriented approach was developed with the goal to have a common platform for data exchange for products over the whole life cycle. The first parts of STEP were released 1994 and were mainly intended for the manufacturing industry.

In the middle of the 1990-ties a new initiative within the construction sector was taken, resulting in an international proposal for a new standard – IFC, Industry Foundation Classes, for product models within the AEC domain. The IFCs has now been available for the construction industry for 6 years. After the initial founding of the International Alliance of Interoperability (IAI) in 1995, the first generations of IFCs have appeared starting with IFC 1.0 in 1997 and with successive improvements up to the current IFC 2X Edition 2, which was released in May 2003.

IFC is the leading standard within the domain of product models for construction. There are of course other organizations and groups working with standardization of information exchange between the actors in the construction sector, but they are mainly considering smaller and more limited parts of the construction process. Examples are bill of quantities, tenders and specifications, which can be defined by more simple formats, often based on XML.

A product model based design presumes that the actors work and think in 3D during the whole process. One is building the virtual building, implying the need for construction knowledge also among the designers making the modelled building, not only possible to accomplish, but also described to such an extent that it can serve as bases for the down stream processes towards the completed building.

With co-operation built on common shared information in e.g. a product model server, one can achieve better precision in product definition through:

- documented and traceable user requirements from space program via space planning to the individual spaces in design, production and maintenance,
- co-ordination between the design results from various disciplines,
- simplified evaluation of requirements using more frequent simulations of alternative solutions.

A more effective project management based on:

- current and complete information – better planning and control.
- current documents related to the different parts of the building.
- visualization in 3D and 4D for design, construction and customers.

Savings in the form of:

- automatic compilation of bills of material in digital form as indata to cost estimations and time scheduling. The quantities can then be used for production preparation and on call deliveries from the manufacturers. (savings – shorter time and fewer errors)
- automatically generated foundation for climate and energy simulation of all the spaces. (savings – shorter time, better solutions and energy savings during the lifetime)
- fewer co-ordination errors (savings – reduced re-design and re-construction)

According to the IAI the mission of the organisation is: ‘To provide a universal basis for process improvement and information sharing in the construction and facilities management industries, using Industry Foundation Classes (IFCs).’

The first Chapter of the International Alliance for Interoperability was set up in North America in June 1995, the UK Chapter in January 1996. Other Chapters cover German-speaking, French-speaking and Nordic countries, Iberia, Japan, Singapore, Korea and Australasia.

This special issue of Itcon is dedicated to the IFC initiative. The papers describe the current implementations, research and development issues and finally thoughts about the future directions of IFC-based interoperability. Important developments for the future are to some extent discussed in the papers and are in the areas of:

- classification – define the relations between building elements, work results and products according to ISO 12006-2 Classification Framework,
- product model servers – SABLE is a newly started initiative to standardize the access to them,
- incremental updates and versioning
- multiple models and views to support design and analysis,
- information ownership and the legal aspects.