Keywords: BIM, IFC, information resources, construction firms, object-oriented

Nowadays most construction firms are using information systems as management tools and more and more information is being accumulated in the systems with time, relating to such productive elements as labor, machine and material etc., and covering such managerial subjects as schedule, cost, quality, etc. The information that can be reused is called information resources in the context of this paper. It is obvious that by making full use of the information resources, the decision-making in the management could be improved, which thus enhances the competitiveness of construction firms.

A conceptual framework for the application of information resources in construction firms has been established by the authors (Ma and Lu, 2009a). It includes four steps, i.e. extracting information resources, standardizing them, managing them and analyzing them. Among these steps, standardizing information resources is aimed to standardize the information resources by using related standards.

The related information standards could be divided into two categories, i.e. information coding standards and information exchange standards. The well-known examples of the former include MasterFormat, Uniformat II, OmniClass, CI/SfB and Uniclass. The latter can be further divided into document information exchange standard (e.g. aecXML), CAD information exchange standard (e.g. STEP-CDS, SCADEC and KOSDIC) and product data exchange standard (e.g. IFC). In addition, a number of file format adopted by software vendors such as DOC, PDF, DWG, DXF, JPEG and BMP have been accepted as fact standard in the industry. In recent years, BIM (Building Information Modelling) technology has been developed rapidly, and its main data standard IFC (Industry Foundation Classes) tends to mature and has been widely used in such areas as building design, construction process simulation etc.

Zhang et al. used IFC to represent construction product information to simulate construction processes (Zhang et al., 2008). Fu et al. presented the nD model using IFC to describe information related to planning, cost etc. (Fu et al., 2006). Froese et al. analyzed the information for project planning and cost estimation and claimed that IFC can be used to represent the information (Froese et al., 1999a, 1999b). Lou analyzed the information needs for cost estimation and described the related information by using and extending IFC to adapt to the practice in China (Lou, 2009). However, the application of IFC for representing the wide-spreading information resources has not been reported.

Due to IFC’s object-oriented nature, it is obvious that representing information resources by using IFC will facilitate not only the standardized storage but also the efficient storage of information resources. This study aims to establish an approach to representing information resources by using IFC.
In this paper, the feasibility of representing information resources by using IFC 2x3 (the latest formal version) is analyzed at first. The analysis shows that IFC 2x3 (IFC for short hereafter) has provided some entities to represent information resources but the entities in IFC could not meet the needs of representing all information resources. So the method of defining and adding new entities directly to IFC’s structure is introduced in this paper.

Then the extension of IFC is discussed based on the analysis of information resources. To represent the information resources by using IFC, an analysis process based on object-oriented method is figured out and shown in this paper. Each item of information resource is analyzed by using the process, while IFC2x model implementation guide are referred (Liebich, 2009) to define extended entities and identify the relationship between entities. Totally 10 objects, 12 relationships and 12 extended property sets are concluded in the process and the match between them and the entities in IFC are shown in this paper.

Based on the above-mentioned analysis, the information resources summarized in previous study (Ma and Lu, 2009b) were represented by using the entities in IFC and extended entities, and the extended entities were defined by using EXPRESS language. As an example, the corresponding object entities to the information resources whose reusable value was A (24 items of information resources) in a previous study are shown in this paper. A case study is given to show the way of verifying the completeness of the entities for an information resource and tests are still under way to verify the completeness for other information resources.

This study established an approach to representing information resources by using IFC. Major objects, relationships and properties in information resources are analyzed and information resources in previous study are represented by using the entities in IFC and the extended entities. The result is of value for facilitating the utilization of information resources.

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References