



Assessment of conformance and interoperability testing methods used for construction industry product models[☆]

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ABSTRACT

This paper presents a review and assessment of conformance and interoperability testing methods for product data models used in the construction industry. Conformance testing methodologies, with varying degrees of rigor, have been developed and applied to ensure interoperability across product modeling software applications in other engineering and industry domains, such as, engineering and manufacturing of automotive and aerospace products. Current conformance testing and evaluation of interoperability for construction industry product modeling software do not necessarily apply those same principles and are usually done on an ad-hoc basis. Key principles are identified for improved methods and metrics for developing conformance and interoperability testing capabilities for the construction industry.

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1. Introduction

Over the past 30 years, most sectors of the construction industry have adopted the use of computer-aided design (CAD) and computer-aided engineering (CAE) applications. This started with industrial plant design and structural engineering and moved to additional disciplines, work processes and building types. As each sector has expanded its portfolio of software applications and the use of digital information to drive work processes, effective information management and reliable product data exchange has become critical. With the recent adoption by the architecture, engineering and construction industry of the benefits and challenges of using building information modeling (BIM), the general building industry has also recognized the importance of interoperability among the various software applications used over the life cycle of a construction project, from preliminary design through construction, commissioning, and handover for operations and maintenance.

Industry sectors which have been leaders in the successful use and integration of CAD/CAE across complex enterprises, for example the aerospace and automotive industries, invested in:

- developing product data exchange (PDE) specifications for their important information flows;

- validating these draft PDE specifications, and
- defining conformance and interoperability testing for ensuring that software implementations comply with the PDE specification and that interoperability among software applications can be achieved.

However, this overall strategy has not yet gained traction in the construction industry. The construction industry has efforts developing PDE specifications such as the Industry Foundation Classes (IFC) [1] and the CIMsteel Integration Standards (CIS/2) [2,3], but these efforts have not included robust validation as part of developing these PDE specifications and have not developed test suites or tools to enable rigorous conformance testing for software applications. The extra costs to develop the conformance test suites, to establish the neutral testing environment and to perform the testing across multiple software implementations have been impediments to achieving the needed level of conformance testing capabilities. Additionally, there is also a lack of industry consensus on methods and metrics for conformance, interoperability, and validation testing and how these should be included in the development and public review of draft PDE specifications such as the proposed National Building Information Modeling Standard [4].

Fortunately, industry leaders and government agencies now recognize the importance of addressing this situation. There are numerous reports which have documented the imperative to solve this problem. Industry assessments continually report disappointment in the lack of progress in achieving interoperability among software tools [5,6]. The recent National Research Council report

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