

Constructability Assessment Model for Buildings Design

Abdelaziz Fadoul, Walid Tizani, Christian Koch
Centre for Structural Engineering and Informatics, University of Nottingham, UK
Abdelaziz.Fadoul@Nottingham.ac.uk

Abstract. Implementation of constructability principles in the construction industry has a potential return on investment concerning time and money. Prior research shows that reviewing the design constructability at the early design stages provides benefits to owners, contractors and designers. Considering the complexity of current building design process, there is a need to provide a decision support tool that can help designers in reviewing the design constructability based on embedded information within the design model. Such a tool would be most beneficial at the conceptual design stage so that constructability is factored into the design solution starting from its inception. Therefore, this research reviews how contemporary process- and object-oriented models can be used to assess the design constructability to inform the structural engineer's building design decisions at an early stage thus enabling design optimization.

1. Introduction

The Construction Industry Institute (CII) defines the term constructability as “The optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives” (CII, 1986). Similarly, the Construction Industry Research and Information Association (CIRIA) defines term buildability as, “The extent to which the design of a building facilitates ease of construction, subject to overall requirements for the completed building” (Johnson and Jardine, 1995)

The design phase is a critical part of any project in the architectural, engineering, and construction (AEC) industry. Although the design process itself constitutes just 5% of the costs associated with a typical construction project, its success affects the build cost and the quality of the remaining 95% of the project (Egan and Williams, 1998, Latham, 1994). This includes the consideration of design constructability, which are often ignored by designers and building clients until the commencement of the construction phase, when they are confronted by the reality (CIRIA, 1983).

In recognition of the importance of designing for constructability, many studies were conducted to investigate the implementation of the concept. Various approaches were employed to benchmark the constructability of design solution and enable an objective evaluation of the abstract concept. One of the key approaches to improve and enhance constructability is through quantified assessment of designs (Wong et al., 2007).

This paper attempts to evaluate the practice in assessing the design constructability and associated challenges within such process, by reviewing current adopted approaches and methods to appraise the design constructability. The evaluation covers recent developed assessment tools that are presented to benchmark the design constructability, and hence designers could use obtained feedbacks to improve their designs solutions. It then identifies a set of requirements that should characterize any decision-support tool for assessing design constructability, given the advanced technologies available nowadays. It goes further to propose a model-based approach that can be utilized to employ current information technologies to assess design constructability. Such model can contribute significantly to address the identified gaps from the evaluation process. A proposed framework and its components will be described as well as the direction for future work.