



Visual-based Value Assessment Application in the Construction Industry

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Abstract

Target value design and value engineering are key value-related assessment tools in the construction industry that have proven to be successful in driving design compliance with stakeholder requirements such as those related to cost and energy consumption. The successful application of these methods requires clear understanding of the interactions among the different values and building components, allowing the assessment team to focus on items with greater impact. However, the absence of visual representation of the influence of project components on project values increases the difficulty associated with matching the design outcomes with stakeholders' values; as such, the time needed for the evaluation increases significantly. This research utilizes BIM to create a supportive tool for design assessment that visualizes the values defined by stakeholders to measure the compliance of designs with desired values.

Keywords: visualization, value, construction, building information modelling (BIM), building information models (BIMs).

1 Introduction

During the Second World War, companies were forced to reconsider their practices due to labour and material shortages [1]. This led to the development of various systematic methods to maximize the value that is delivered to the end user and to the company, such as value analysis (VA) developed by General Electric in 1947 [2], and the Toyota Production system in 1945 [3]. These value-adding methods, which began in the controlled environment of the manufacturing industry, were slowly adopted into the construction industry: VA, also known as value engineering (VE) [4], was adopted in the early 1960s [5]; and the Toyota Production system, widely recognized as Lean [6], began to find its stride in construction in 1992 with Koskela's publications [7]. However, what is *value*? Value can be defined as "the regard that something is held to deserve; the importance, worth, or

usefulness of something" [8]. This richness in meaning has led researchers to propose various technical definitions, and there is ongoing effort to formalize a value theory [9]. Ancient Greek philosophers, chiefly Aristotle, had established eight categories of value, of which Mudge argues that only the economic value must be considered in value-adding methods, as it is the only one objective in nature [10]. In fact, a considerable number of researchers share this sole-economic perspective of value with Mudge such as Dell'Isola [11], Mocomber et al. [12], Ballard et al. [13], and Zemina et al. [14]. However, with the increase in environmental awareness and the environmental impact of the construction industry (note that as per Statistic Canada, in 2008 the construction industry was responsible for about 12% of the total Greenhouse Gases emissions [15]), stakeholders are becoming concerned about how their projects rank in relation to environmental measures.