ARCHITECTURAL INFORMATION MODELLING TO ADDRESS LIMITATIONS OF BIM IN THE DESIGN PRACTICE

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1. INTRODUCTION

During the past few years, information and communication technology (ICT) has shown an increasing impact on architectural design processes [1]. A technology that gained great interest is building information modelling (BIM) [2]. BIM enables the three-dimensional description of every ‘measurable’ component of a building, with all extra information attached (e.g. cost, planning, etc.) for further automation.

Whereas this technology has proven its advantages in the construction design phase, it shows lesser impact on the more preliminary phases of a design project [3]. Therefore, an architectural information modelling (AIM) research project is briefly presented, which aims at investigating how methods in the first architectural design stage and the seemingly shortcoming digital interaction with related AEC domains can be improved.

2. OBJECTIVES

Using BIM applications, one is able to model a central three-dimensional building model containing all necessary information about the project being built. This information describes for instance material characteristics, building component dimensions, information about cost and planning, etc. The information is passed over to other applications through an interoperable format, such as the Industry Foundation Classes (IFC), which is developed by the BuildingSmart Alliance (http://www.buildingsmartalliance.org/), the former International Alliance for Interoperability (IAI). This interoperability is expected to enable the direct calculation of derived building information, such as the building cost or material takeoffs [2].

Unlike the technological impact of BIM in construction industry, a lot of the early design work of an architect is still done in terms of paper-based sketching, either way in a paper-based sketchbook or in a digital sketch application. A lot of advantages could be emerging however, when the extensive ICT techniques for information modelling would be deployed in this early design stage as well. This appears hardly possible by the exclusive usage of BIM software, mainly because of the gap between the concrete and components-based nature of the information deployed in BIM and the more conceptual and abstract terms (e.g. taxonomy, typology, theory, etc.) typically deployed in design environments [3].

The proposed framework for Architectural Information Modelling (AIM) addresses this gap by enabling designers to deploy conceptual and more abstract terms.

3. THE CONCEPTUAL FRAMEWORK

In the proposed AIM framework, the designer will be able to model a central AIM model, similar to BIM but containing more abstract, intangible and implicit design information. This model will then be connected to three separate components that evaluate the AIM model at hand. These components have evolved through previous research [4] in which an extensive
overview is given of several ICT applications developed for design, compared to applicable
design principles and practices (e.g. [1], [5], [6]).

Since its original conception the AIM research has focused on the required structure to
describe this abstract, intangible and implicit information [8]. Current research concentrates
on the further conception and implementation of the three ICT components in combination
with this AIM structure, which will enable us to define more precisely the advantages of using
this information type within these ICT components.

ARCHITECTURAL MEMORY - AM
The first ICT component linked to the information in the central AIM model is an
architectural memory (AM). This architectural memory should be understood as a repository
of knowledge about architecture and building [9]. Maintaining explicit references to this
knowledge source effectuates an introduction of extra, related information into the design
environment, thereby directly providing the designer with the required knowledge.

VIRTUAL SIMULATION AND CALCULATION - VSC
Secondly, the central AIM model is connected to an ICT component for virtual simulation
and calculation (VSC). This AIM research aims at simulations and calculations based on less
tangible information, such as the evaluation of a kitchen design against a designer his own
‘rules of thumb’.

VIRTUAL REALITY VISUAL SIMULATION – VRVS
The medium through which the designer interacts with the AIM Framework is of capital
importance, as is recognised throughout international research projects on design [10]. An
interactive tool is necessary for the work processes and methods of the designer. In order to
answer these demands of interaction and multiplicity in visualisation, research will focus on
the application of virtual reality techniques for the development of the AIM interface.

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