CREATION OF BIM MODELS FOR SOCIAL HOUSING PROJECTS, IN VIEW PROJECT COSTS

Sarah Barbosa Martins Silva

Prof. Dr. Marcelo Eduardo Giacaglia

Faculty of Architecture and Urbanism of the University of São Paulo

sarahbarbosa@usp.br

Objectives

This research aims to study the modeling process, in BIM authoring software, of a Social Housing Project, oriented to project costs. It seeks to understand the modeling aspects necessary for the correct extraction of building economy and quantitative indicators, associated with spaces and construction elements, at different stages of design.

Besides that, a digital model of a building was developed to contribute to the improvement of the course AUT0518 – Project Costs of the Faculty of Architecture and Urbanism of the University of São Paulo.

Materials and Methods

The methodology starts with a literature review on Building Information Modeling – BIM (GSA, 2007; SUCCAR, 2009; ANDERY ET AL. 2010; EASTMAN ET AL. 2011; GIACAGLIA and MOURA, 2015) and the bibliography of the course AUT0518 (CERON, 2011).

The BIM modeling techniques applied in the current study were based on the experience accumulated in previous projects (VIANNA, 2018, SALMAZO, 2020 e CORREIA, 2021). Thus, it was possible to model the Tower 3 of Conjunto Habitacional Jardim Edite, designed by the offices MMBB Arquitetos and H+F Arquitetos. However, these previous works focused on BIM authoring software behavior, while this project focuses on modeling for project cost analysis and estimation, and the quantification of material and products, labor and services, use of equipment and tools, etc, oriented to project costs. Therefore, this research aims to obtain BIM models from which these cost analysis and estimations can be obtained throughout the design process.

Quantity takeoffs were done with the use of a software, PQTO, under development by the advisor of this project. PQTO extracts space and building element quantities from models saved in IFC (Industry Foundation Classes), a vendor independent format. The software was essential for testing the models produced in this research, since it also helps identify modeling errors that could compromise future reading of the files when shared.

Results

In the current research, three main results were produced: a model of a floor type of the Building Jardim Edite, the corresponding worksheets of building spaces and element quantities and the resolution of proposed course exercises based on these elements.

The modeling process since its beginning, was oriented to the extraction of quantities for the realization of the project cost analyses. In this way, the modeling of the Jardim Edite floor type is composed of the basic elements and spaces of a construction. Also, a mass model was produced to better understand one of the exercises proposed in the course AUT0518.

Another result of the research was the elaboration of two tables with the elements and spaces of construction, extracted by the software PQTO. Through them, it is possible analyze data referring to the objects to be studied. The creation of these worksheets was essential for the realization of the proposed exercises in AUT0518.

This research results will serve as a basis for repeating such exercises in subsequent course

semesters, in substitution of the previous that were carried in conventional manner.

Conclusions

After all the studies carried out, it was possible to achieve the main objective proposed in this research, despite some difficulties encountered during its course. The modeling processes, sometimes, required greater attention and caution, mainly due to the problem of communication between the BIM authoring software and PQTO.

Furthermore, it is worth emphasizing the importance of interoperability in the design process since it is necessary to exchange information among different disciplines as well as the team itself. In this way, the model can be used by several users without any loss of information, made possible with the use of neutral models, such as IFC. For the accomplishment of the exercises this type of file was indispensable. Otherwise, students would be forced to use the particular BIM authoring software chosen by this researcher, to analyze the model and do the extractions. In this way, any IFC model viewer can be used as well as the worksheets produced by PQTO or the extraction software itself, which is simple to run.

It was noticed during the work that the IFC class (as in IfcColumn or IfcSpace) was not enough to define more specific functions and purpose of an element or space of the construction. Thus, the adoption of the classification system NBR 15965 was of great importance to complement the information present in the neutral file, being essential for the filtering of data during the execution of the exercises.

Based on all the above, it was possible observe the impact of this novel approach in the quantity extraction process, moreover in terms of time and error reduction. Furthermore, it narrows the gap between education and the state of the art in professional practice. [

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