ICAI 2023
12th International Conference on Applied Informatics
Eger, Hungary, 2023

Designing structured cabling systems documentation and model by using Building Information Modeling

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Abstract

Any organization requires a local area network that combines computers, telephones, and peripheral equipment. A basis of this computer network is a structured cabling system with the main elements as follows:

- telecommunication cabinets and racks in cross rooms or data centers of buildings;
- copper and optical panels inside telecommunication cabinets;
- information sockets installed in the offices;
- copper and optical cable lines connecting panels in the cabinet and information sockets;
- cable trays and boxes for laying cable lines in them.

The design of structured cabling systems as parts of complex building engineering systems—similarly to many engineering systems—is usually carried out by computer-aided design programs. This approach has a number of disadvantages. For example, there is duplication of work between the engineers designing a system and engineers creating a model of the same system in Building Information Modeling. Furthermore, if a system is designed in computer-aided design programs, but

not modeled and linked to other systems, then, during the construction process, there may be intersections of systems or overlapping of equipment from one system to another. Therefore, more and more attention has recently been paid to the use of Building Information Modeling concept not only for the design of buildings and their engineering systems but also for the operation of them ([1],[3],[4],[5]). In a recent work, we touched upon the issue of designing telecommunication cabinets and the equipment inside them in the Building Information Modeling environment. We developed a novel 3D model of cabinets, which has a number of distinctive features: (1) the ability to select the equipment installed in a particular unit in the properties; (2) the ability to change and add equipment inside the cabinet; (3) automated creation of schemes for facades of cabinets and equipment inside; (4) automated creation of equipment specifications in cabinets [2]. Also, we analyzed the use of cable trays for modeling cable lines and found an optimal way to build tray routes and their elements. The goal of this study is to build up the entire design cycle process using all the necessary elements in Building Information Modeling and then use the model during the operation. Since now there is only a small part of the research covers topics related to Building Information Modeling and Engineering systems. The authors aim to fill this gap with a qualitative analysis of the existing literature and the application of Building Information Modeling in information technology. The methodology includes several steps: Traditional literature review on the use of Building Information Modeling in the design and management of facilities in the field of Engineering systems and then qualitative analysis of researchers content related to the design of Engineering Systems. The qualitative investigation of the literature has identified five main areas of Information and Communications Technology where Building Information Modeling tools and methodologies are used, namely (1) analysis of cabling systems; (2) production of working drawings; (3) optimized data center design; (4) preparation of documentation and models for further facility management; (5) monitoring system parameters. Literary sources have different degrees of correlation with the main research questions: weak, medium, and strong. In our study, we used medium and strong correlated topics of the study. The ultimate goal is to find an optimal solution to designing structured cabling systems documentation and model by using Building Information Modeling with the improvement of techniques available in the relevant literature.

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