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Perspective

Smart Energy Audits of Buildings Based on Building Information Modelling

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DESCRIPTION

Energy audits are a crucial component of the total energy savings plan for the construction industry. The European Energy Savings Directive's adoption of energy audits as well as the development and publication of numerous European standards pertaining to the energy audit of buildings and building systems serve as evidence of the importance of energy audits. However, because present methods for conducting energy audits in buildings do not take into account the most recent advancements in the field of Industry 4.0 practices, there is a widespread consensus among building physics engineers that energy auditing can be further updated and enhanced. Using the adaption of building information, this work intends to propose a fresh strategy for the advancement of current building energy audit techniques. The possibility of a constituent energy audit technique that evaluates building energy use in relation to building envelope using building information models. It is discussed if there is opportunity for increased use of digitization techniques in conducting energy audits as well as the potential for the creation of new tools in this field. The overview and analysis of the Industry Foundation Classes schema building information model data structure and its relationships are the next major findings of this study, and they are intended to be used to digitize energy audit methods. The research methodology includes digital assessment of building energy consumption as it relates to building envelope characteristics, as well as analysis of economic and energy factors for potential building shell optimization scenarios. Also, the evaluation findings employing the developed tool's building envelope modification feature for various environmental and financial factors are shown. The design and the justification for the produced tool's backing are also discussed. This tool is used to retrieve the data required to carry out building energy audits.

Buildings are a significant energy user in all industrialized nations; as a result, cutting-edge energy sciences research is focused on how to make buildings more energy efficient. A major issue, given the age of the building stock in the European Union, is the efficient use of energy. It is intended to drastically cut energy consumption and emissions with the European Commission's renovation wave effort. When it comes to renovations, energy audits are crucial in the early stages of the building retrofitting process with the goal of identifying insufficient energy utilization and proposing building changes to lower primary energy consumption. It is vital to emphasize the significance of complex solutions after building envelope improvement in light of various refurbishment procedures. In order to maximize the efficiency of renovated buildings, heating, ventilation, and air conditioning systems must be upgraded, or at the least, adjusted. Determining the building's envelope is the first step in the energy audit process, and this study also provides a quick evaluation of the impact of energy sources on the payback period for building optimization. The next phase of this endeavor will involve a thorough examination of building systems using Building Information Modelling (BIM) documentation.

Data from BIM models, which provide trustworthy and enough information on the building materials currently in use and their qualities, can be used to calculate energy use in detail. A digital asset model made up of various architectural elements with assigned parameters is created using BIM-based design processes. The building model's components, which include the envelope geometry and the thermal resistance or thermal conductivity characteristics of each material layer, each provide enough data to be used for the energy assessment of the building envelope. Depending on the goal of the assessment, the qualities assigned to an entity are machine-readable data that may be evaluated by different algorithms and employed in creating assessment procedures. It is anticipated that BIM technology will become more widely used in the near future due to rising knowledge of its use and legal obligations for the construction industry to implement BIM for new projects related investments. In this regard, it is intended that the BIM model can serve as a database for building-related data for energy audits. Moreover, building asset data can be enhanced with dynamic input and connected to virtual and actual assets through an API. BIM is mentioned in relation to conducting energy audits. In order to enable BIM to be utilized as a crucial information database for procedures of

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building energy assessment, existing software needs to be adjusted or even new tools need to be developed because there are now no solutions on the market for this business. Eventually, incorporating BIM data in the process of performing an energy audit could increase precision and efficiency while taking up less time.