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Comparative Study of Manual and BIM Quantity Take-Off to Analyze Quantity Variations and Methods to Improve Estimation Accuracy of Various Building Elements

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ABSTRACT

Quantity take-off is a vital process in construction estimation, and affects the construction schedule and the accuracy of estimates. For decades, it has been performed manually from two-dimensional drawings and specifications, using standard rules and conventions. It is labor intensive and dependent on the estimator's experience and their interpretation of specifications and codes. As the use of Building Information Modelling evolves, the quantities may be automatically extracted directly from the BIM model. However, there are often important discrepancies between manual and BIM model extracted quantities due to the different modelling approaches adopted, different geometric interpretations and assumptions that are included as part of the measurement process. It is therefore important to establish the reason for these variations. The objective of this research is to compare manual process and BIM-based quantity extraction in terms of quantity take-off, while identifying their differences and discovering the reasons for those differences. A typical residential unit is selected from the row housing scheme, Tamarind Farming Collective, Tamil Nadu. The quantities are estimated manually using AutoCAD drawings and excel sheets as per the IS measurement guidelines. The same unit is modelled in Autodesk Revit and schedules are extracted. A comparison is

made for the quantities of major building elements such as, walls, slabs, beams, lintels, door, window, floor finish, skirting, plaster, between the two estimation methods to find differences in quantities and percentage variation. The two methods are also compared in terms of time efficiency and how the method responds to design changes.The findings indicate that most building elements show minimal variation, while certain elements such as walls and plaster show noticeable differences due to deduction rules and modelling accuracy. The study concludes that these variations arise from methodological differences rather than calculation errors. The study also proves that Revit workflow is more time efficient. Revit quantity take off is easier when there are design changes in the given project. The research highlights those manual methods build fundamental measurement understanding, while BIM improves efficiency, consistency and saves time.

Keywords

Building Information Modelling (BIM), Construction Management, Cost Estimation, Quantity Take-Off, Quantity Variation.