IOT Based Quantity Survey

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Abstract—**The construction industry is going through a major transformation, thanks to the rise of modern technologies like Building Information Modelling (BIM), the Internet of Things (IoT), Big Data, Machine Learning, and Blockchain. For quantity surveyors—key players in any construction project—this shift means adapting to a new, tech-driven landscape. This research set out to explore how quantity surveyors perceive these emerging technologies and how these changes are impacting their roles. To get a well-rounded view, the study used a mixed-method approach, gathering insights through both semi-structured interviews and questionnaires. The data was then analysed using manual content analysis and the Relative Importance Index (RII). The results were clear: every smart construction concept identified in the study is already making a noticeable impact on the quantity surveying profession. Among them, BIM stood out as having the most significant influence. The findings also highlight an urgent need for professionals in this field to upskill and keep pace with these rapid technological developments. To support this, the research recommends that industry players—including companies, professionals, and academic institutions—actively promote learning and development. This can be achieved through Continuous Professional Development (CPD) initiatives like workshops, webinars, training programs, and formal education focused on modern technologies. Ultimately, this study aims to serve as a practical guide for stakeholders, encouraging them to embrace innovation and take proactive steps toward integrating technology into the traditionally grounded world of quantity surveying.**

I. INTRODUCTION

Quantity surveying is a vital profession within the construction industry, encompassing a wide range of responsibilities such as cost planning, procurement, feasibility studies, asset management, and contract administration. Quantity surveyors play a central role in ensuring that construction projects are financially viable and efficiently managed. The Canadian Institute of Quantity Surveyors (CIQS) defines a quantity surveyor as a professional with extensive knowledge of construction methods, legal aspects, and financial principles, enabling them to provide accurate cost advice. Ashworth emphasizes their role in ensuring optimal resource use, offering financial management and cost consultancy services throughout a project's lifecycle. According to Badu and Amoah, a quantity surveyor's tasks include preparing Bills of Quantities (BOQs), analysing tenders, value engineering, pricing, and contract negotiation. On the contractor's side, they support scheduling and subcontract BOQ preparation. Additionally, traditional quantity surveyors are proficient in procurement procedures, financial reporting, dispute resolution, and project management—highlighting their indispensable role in successful construction delivery.

II. OBJECTIVES

1. To determine the relative position of any objects or points on the earth.
2. To determine the distance and angles between various objects.
3. To prepare a map or plan to represent an area on a horizontal plane.
4. The goal behind the Internet of things is to have devices that self-report in real-time, improving efficiency and bringing important information to the surface more quickly than a system depending on human intervention.

III. LITERATURE

Industries that are driven by digital technologies tend to experience accelerated growth and development, with a higher potential for effectively addressing their operational challenges (Chiedu, 2010). In today's digital age, sectors such as banking, automotive, retail, and manufacturing have embraced digitalisation to streamline and enhance their daily operations

(Osusanmi et al., 2018). While these industries have successfully harnessed the benefits of digital transformation, the construction industry has been comparatively slow in adopting digital trends and smart construction technologies (Castagnino et al., 2016). Nevertheless, Ibem and Laryea (2014) note that since the early 2000s, digital technologies have gradually gained traction in the construction sector. This shift has been largely driven by the emergence and increasing recognition of smart construction concepts such as Building Information Modelling (BIM), cloud computing, and web-enabled project management tools, which offer promising solutions for improving project efficiency and collaboration.

BIM is a smart construction concept that provides promising development in the construction industry by producing an accurate virtual computer-generated model and workflow to aid construction-related works (Eastman et al.2008). 5D BIM provides a workflow for quantity surveying applications by combining the 3D BIM model of the construction project with the construction schedule and contract price (Fung et al., 2014). Further, Nagalingam etal. (2013) suggest BIM technology is a potential solution for traditional problems in construction estimations. Olatunji and Sher (2014) argue that BIM offers a varying range of solutions for challenges in conventional quantity surveying practice but can provide solutions for all instances. According to a BIM survey in Malaysia conducted by Fung et al. (2014)

IV. BENEFITS

1. Accuracy in Cost Estimation
- Minimizes human error in manual calculations.
- Delivers precise breakdowns of material, labour, and equipment costs.

2. Time-Saving
- Accelerates quantity take-off and cost estimation processes.
- Automates routine tasks, allowing professionals to focus on strategic decision-making.

3. Real-Time Data Access
- Enables stakeholders to view up-to-date project data anytime, anywhere.

- Enhances responsiveness and facilitates faster decision-making and change management.

4. Better Budget Control
- Tracks expenses in real time against allocated budgets.
- Issues alerts when costs begin to exceed projected estimates.

5. Improved Project Management
- Seamlessly integrates with scheduling and procurement tools.
- Enhances planning, forecasting, and resource allocation.

6. Enhanced Collaboration
- Supports live collaboration on shared platforms.
- Reduces communication gaps between contractors, consultants, and clients.

V. FUTURE SCOPE

➤ Integration of Artificial Intelligence (AI) and Machine Learning: AI is transforming cost estimation through predictive analytics and automation. Machine learning algorithms can accurately forecast project costs and detect potential overruns early, supporting better decision-making and improving overall efficiency.

➤ Advanced Building Information Modeling (BIM): The use of 5D BIM integrates cost and time data into 3D models, enabling more accurate forecasting, visual planning, and efficient quantity takeoffs. This enhances collaboration and streamlines cost management throughout the project lifecycle.

➤ Emphasis on Sustainability and Green Building: Quantity surveyors are now playing a key role in promoting sustainable construction. By evaluating lifecycle costs and recommending eco-friendly materials, they contribute to environmentally responsible building practices aligned with global sustainability goals.

➤ Utilization of Drones and Remote Sensing Drones enhance site data collection, improving the accuracy of measurements, progress tracking, and surveys. This real-time data supports more informed decision-making in cost planning and site monitoring.

➤ Implementation of Blockchain Technology Blockchain ensures secure, transparent, and tamper-proof record-keeping for construction contracts and payments.

VI. CONCLUSION

The integration of Internet of Things (IoT) technology into quantity surveying marks a significant evolution in the construction and project management sectors. By harnessing real-time data, advanced analytics, and automation, IoT significantly enhances the efficiency, accuracy, and oversight of traditional quantity surveying practices. It streamlines material tracking, reduces manual errors, and enables surveyors to focus on strategic planning. Moreover, the availability of real-time data allows for more accurate quantity take-offs and cost estimations, improving financial forecasting and minimizing the likelihood of cost overruns. IoT also enhances project monitoring by providing continuous site updates, promoting transparency, and strengthening collaboration among stakeholders. As construction projects become increasingly complex, the adoption of IoT technologies empowers quantity surveyors to deliver more precise, timely, and data-driven insights— paving the way for smarter, more efficient construction practices in the digital era.