

Research Design Project - ACBA5024:

Research Proposal

**AI-Driven Quantity Take-Off Automation within BIM Processes:
Implications for the Future Role and Skills of Quantity Surveyors**

Prepared By: Morgan Owens
For Review By: Hannah Williams and Deborah Hughes

Abstract

This research proposal focuses on the increasing use of AI-driven automation for quantity take-off within BIM processes and how this development may influence the future of the quantity surveying profession. Traditionally, quantity take-off has relied heavily on manual measurement and professional judgement, often requiring significant time and effort and leaving room for human error. The introduction of AI-enabled BIM tools presents an opportunity to streamline this process by automatically generating quantities directly from digital models.

The study aims to explore how these technologies are changing current working practices and what this means for the role of the Quantity Surveyor moving forward. Rather than replacing the profession, AI-based automation may shift the focus of Quantity Surveyors towards tasks that require greater analytical thinking, such as cost planning, advising clients, and managing financial risk across the project lifecycle. The research will also consider the new skills and competencies likely to be required, particularly in relation to digital literacy, data interpretation, and BIM coordination.

By reviewing existing research, industry guidance, and practical examples, this proposal seeks to provide insight into how Quantity Surveyors can adapt to technological change and maintain their value within a rapidly evolving construction industry.

Contents

Abstract	2
Introduction	4
Background of the study	4
Research question(s)	5
Primary Research Question	5
Secondary Research Questions	5
Aims and Objectives	6
Literature Review	7
Identification of Gaps in Current Research	8
Research Design and Methodology.....	9
Research Design (Mixed-Methods Approach)	9
Data Collection Methods	9
Survey Questionnaires	9
Semi-Structured Interviews	9
Sampling Methods	10
Data Analysis Plan.....	10
Ethical Considerations	10
Detailed Research Timeline.....	11
Expected Outcomes.....	12
Potential Findings.....	13

Introduction

Background of the study

The construction industry in the United Kingdom has long faced challenges related to productivity, cost overruns, skills shortages, and inefficiencies in traditional project delivery methods. These issues have been repeatedly highlighted in influential industry reports such as The Latham Report, The Egan Report, and more recently Construction 2025, all of which call for greater innovation, digitisation, and collaboration across the sector. As a response, digital technologies have increasingly been promoted as a means of improving efficiency, transparency, and value for money throughout the construction lifecycle.

One of the most significant developments in this transformation has been the adoption of Building Information Modelling (BIM). The UK Government's mandate requiring BIM Level 2 compliance on centrally procured public sector projects has accelerated the use of digital models for design coordination, information management, and cost control. In Wales, BIM adoption aligns closely with wider Welsh Government priorities, including sustainable development, carbon reduction, and improved public sector procurement outcomes. Public bodies and local authorities in Wales are increasingly encouraging the use of digital construction tools to support the Well-being of Future Generations (Wales) Act, particularly in relation to long-term value and efficient use of public resources.

Within this context, the role of the Quantity Surveyor remains central to cost management, financial control, and commercial decision-making. Quantity take-off is a fundamental task underpinning cost planning, tendering, and contract administration. Traditionally, this process has relied on manual measurement from 2D drawings, guided by standards such as the RICS New Rules of Measurement (NRM). While this method is well established, it is time-intensive and susceptible to human error, particularly on complex projects with frequent design changes.

The introduction of BIM has enabled quantities to be derived from 3D digital models, offering the potential for improved accuracy and real-time cost information. However, in practice, BIM-based quantity take-off often still requires significant manual input and professional judgement. Challenges such as inconsistent modelling standards, variable levels of detail, poor data classification, and limited interoperability between software platforms can restrict the reliability of automated outputs. As a result, many Quantity Surveyors continue to rely on traditional methods alongside BIM, rather than fully embracing model-based measurement.

More recently, artificial intelligence has emerged as a further evolution in digital construction processes. AI-driven tools are capable of analysing BIM data, recognising building elements, applying measurement rules, and automatically generating quantities with limited human intervention. These technologies have the potential to significantly reduce the time spent on measurement tasks, improve consistency, and allow cost information to be updated dynamically as models change. In the UK and

Welsh context, this is particularly relevant given ongoing concerns around skills shortages and increasing workload pressures within the profession.

Internationally, AI-enabled quantity take-off and cost management tools are gaining traction in countries such as the United States, Singapore, and across parts of Europe, where digital construction strategies are being used to address similar productivity and efficiency challenges. In these regions, automation is increasingly viewed not as a replacement for construction professionals, but as a way of enabling them to focus on higher-value activities such as strategic cost advice, risk management, and whole-life cost analysis.

For Quantity Surveyors in the UK and Wales, the increasing use of AI within BIM processes raises important questions about the future of the profession. While automation may reduce reliance on traditional measurement skills, professional judgement, commercial awareness, and ethical decision-making remain critical. At the same time, there is a growing expectation that Quantity Surveyors will possess enhanced digital capabilities, including BIM literacy, data interpretation skills, and an understanding of AI-driven systems.

Despite the growing adoption of BIM and emerging AI technologies both nationally and internationally, there remains a lack of research focused specifically on how AI-driven quantity take-off automation impacts the role, responsibilities, and skill requirements of Quantity Surveyors within the UK and Welsh construction industry. This study seeks to address this gap by exploring how technological advancement is reshaping professional practice and how Quantity Surveyors can adapt to remain relevant and valuable in an increasingly digital and automated construction environment.

This research is positioned from a quantity surveying perspective, focusing specifically on cost management practice rather than software development or design coordination.

Research question(s)

Primary Research Question

- How does AI-driven quantity take-off automation within BIM processes impact the role and skill requirements of Quantity Surveyors in the UK and Wales?

Secondary Research Questions

- How is AI-enabled quantity take-off currently being used within BIM-based cost management practices in the UK construction industry?
- What benefits and limitations are associated with AI-driven quantity take-off from the perspective of Quantity Surveyors?
- To what extent does automation affect traditional quantity surveying tasks, such as manual measurement and cost planning?

- What new skills and competencies are required for Quantity Surveyors as AI and BIM integration increases?
- How do international approaches to AI-driven quantity take-off compare with current practices in the UK and Welsh construction sectors?
- What role does professional judgement continue to play in cost management despite increasing automation.

Aims and Objectives

The primary aim of this study is to critically investigate the impact of AI-driven quantity take-off automation within Building Information Modelling (BIM) processes on the role, responsibilities, and skill requirements of Quantity Surveyors in the UK and Welsh construction industry. The research also seeks to consider how international developments in AI and BIM may influence future professional practice within the UK.

To achieve this aim, the study will pursue the following objectives:

- To review and analyse existing academic literature, industry reports, and professional guidance relating to BIM, artificial intelligence, and automated quantity take-off within the construction sector.
- To examine the current level of adoption and application of AI-driven quantity take-off tools within BIM-based cost management practices in the UK and Wales.
- To identify the key benefits of AI-enabled quantity take-off, including potential improvements in efficiency, accuracy, and consistency, as well as its contribution to cost certainty and project decision-making.
- To explore the limitations and challenges associated with AI-driven quantity take-off, such as data reliability, modelling quality, interoperability, and reliance on digital inputs.
- To assess how increasing automation may reduce, redefine, or transform traditional quantity surveying tasks, particularly those related to manual measurement and bill preparation.
- To investigate the emerging skills and competencies required of Quantity Surveyors in response to AI and BIM integration, with a focus on digital literacy, data analysis, and strategic cost management.
- To compare UK and Welsh practices with international approaches to AI-driven quantity take-off in order to identify global trends and lessons that may inform future professional development.
- To evaluate the continuing importance of professional judgement, ethical responsibility, and commercial awareness within an increasingly automated construction environment.

Literature Review

The construction industry has experienced a gradual but significant shift towards digital working practices, largely driven by long-standing concerns surrounding productivity, efficiency, and cost certainty. Within the UK, these issues have been widely documented in government and industry reports, leading to increased emphasis on innovation and modernisation. Building Information Modelling (BIM) has emerged as one of the most influential digital tools in this transformation, providing a structured method for producing and managing project information across the lifecycle of a built asset. Research suggests that BIM supports improved collaboration between project stakeholders and enables more informed decision-making through the integration of graphical and non-graphical data.

Within quantity surveying literature, BIM is frequently discussed in relation to its potential to improve quantity take-off and cost management processes. Several studies identify that BIM-based quantity extraction offers improved accuracy and efficiency when compared to traditional 2D measurement techniques, particularly on complex projects with frequent design changes. BIM also allows quantities to be updated dynamically as the design evolves, reducing duplication of work and improving cost certainty. However, the literature also highlights that BIM-enabled quantity take-off is highly dependent on model quality, level of detail, and consistency in classification systems. As a result, professional judgement remains essential to validate outputs and interpret data correctly.

More recently, academic and industry research has begun to explore the application of artificial intelligence within BIM processes. AI-driven tools use algorithms, rule-based systems, and pattern recognition to automatically interpret model elements and generate quantities. International studies, particularly from regions with advanced digital construction strategies such as Singapore, the United States, and parts of Europe, indicate that AI-enabled quantity take-off can significantly reduce time spent on measurement tasks and improve consistency in cost data. These studies also suggest that automation may support earlier and more reliable cost planning during the design stage.

Alongside technological discussions, professional literature increasingly considers the changing role of the Quantity Surveyor. Research suggests that as routine tasks become more automated, the profession is gradually transitioning towards higher-value activities such as commercial management, risk analysis, value engineering, whole-life costing, and strategic client advice. Professional bodies, including RICS, emphasise the growing importance of digital competence, BIM awareness, and data literacy, while stressing that ethical practice and professional judgement remain fundamental.

While several studies emphasise the efficiency benefits of AI-supported cost management, they largely focus on technical performance rather than professional implications. In contrast, professional guidance from RICS highlights the continued

reliance on professional judgement, suggesting a disconnect between academic research and industry expectations.

Identification of Gaps in Current Research

Despite a growing body of literature on BIM adoption and emerging research into artificial intelligence applications within construction, several gaps remain evident. Much of the existing research focuses primarily on the technical capabilities of BIM and AI tools, rather than their implications for professional practice. Studies often assess improvements in speed or accuracy, but give limited attention to how automation affects the day-to-day responsibilities of Quantity Surveyors.

There is also a noticeable lack of research that specifically examines AI-driven quantity take-off within BIM environments as a combined system. While BIM and AI are frequently studied independently, fewer studies explore how their integration impacts cost management workflows and professional roles. This limits understanding of how automation influences the balance between technology and professional judgement in practice.

Furthermore, relatively little research is focused on the UK and Welsh construction context. Many studies rely on international case studies, which may not fully reflect UK procurement routes, regulatory frameworks, or professional standards such as the RICS New Rules of Measurement. Welsh-specific considerations, including public sector procurement priorities and sustainability-led policy frameworks, are rarely addressed in existing research. In addition, there is limited exploration of how automation influences skills development, education, and long-term career pathways for Quantity Surveyors.

This research seeks to address the identified gaps by focusing specifically on AI-driven quantity take-off automation within BIM processes from a quantity surveying perspective. Rather than concentrating solely on technological performance, the study will examine how these tools affect professional roles, responsibilities, and skills within the UK and Welsh construction industry.

The research will build upon existing BIM and AI literature by analysing their combined impact on quantity take-off and cost management practices. By focusing on the perspective of Quantity Surveyors, the study will explore how automation is reshaping traditional tasks, altering workflows, and influencing the balance between measurement, analysis, and professional judgement.

In addition, by considering the UK and Welsh context alongside international examples, the research will provide a comparative understanding of how global technological trends may influence local professional practice. The findings aim to contribute to a clearer understanding of future skill requirements, supporting informed discussion around education, professional development, and the long-term evolution of the quantity surveying profession in an increasingly digital construction environment.

Research Design and Methodology

Research Design (Mixed-Methods Approach)

This study will adopt a mixed-methods research design, combining quantitative and qualitative research methods to explore the impact of AI-driven quantity take-off automation within BIM processes on the quantity surveying profession. A mixed-methods approach is suitable at Level 6, as it allows for both breadth and depth of analysis, strengthening the validity of the findings through triangulation.

The quantitative component will be used to identify general trends, patterns, and levels of adoption of AI-enabled quantity take-off tools across the UK and Welsh construction industry. In contrast, the qualitative component will provide deeper insight into professional experiences, perceptions, and judgement, particularly in relation to changing roles, responsibilities, and skill requirements. This combination supports a more comprehensive understanding of both technical and professional implications, which cannot be achieved through a single research method alone.

Data Collection Methods

Survey Questionnaires

Quantitative data will be collected through the use of structured online questionnaires distributed to Quantity Surveyors working within consultancy and contractor organisations in the UK and Wales. The survey will include a combination of closed-ended and Likert-scale questions to capture participants' experiences of BIM usage, awareness or use of AI-driven quantity take-off tools, perceived benefits and challenges, and views on how automation is influencing their role.

Surveys are an effective data collection method for this study as they allow information to be gathered from a relatively large number of professionals within a limited timeframe. This supports the identification of broader industry trends and provides measurable data that can be compared across different roles, experience levels, and organisational contexts.

Semi-Structured Interviews

Qualitative data will be collected through semi-structured interviews with selected Quantity Surveyors and construction professionals who have experience in BIM-based cost management. Semi-structured interviews allow for flexibility while maintaining a consistent focus on key research themes, such as professional judgement, skills development, and perceptions of automation.

Interviews are particularly appropriate for exploring complex professional issues that cannot be fully captured through quantitative data alone. This method enables participants to elaborate on their experiences with AI-enabled tools, discuss concerns or opportunities associated with automation, and reflect on how their role may evolve in the future.

Sampling Methods

The research will employ purposive sampling, targeting participants who possess relevant professional knowledge and experience. Survey participants will be Quantity Surveyors currently working within the UK and Welsh construction sectors, selected based on their involvement with BIM or digital cost management processes.

For the qualitative stage, a smaller sample will be selected for interviews based on criteria such as years of professional experience, level of BIM engagement, and exposure to automated quantity take-off tools. This targeted approach ensures that the data collected is informed, relevant, and aligned with the research objectives. While the sample size may be limited, the focus on industry-relevant participants enhances the credibility and depth of the findings, which is appropriate for Level 6 research.

Data Analysis Plan

Quantitative survey data will be analysed using descriptive statistical analysis, including frequency distributions and percentage comparisons. This will allow the research to identify patterns in BIM and AI adoption, as well as common perceptions regarding efficiency, accuracy, and impact on professional roles. The use of visual representations such as charts and tables may support clearer interpretation of findings.

Qualitative interview data will be analysed using thematic analysis, involving the identification of recurring themes and concepts across participant responses. Themes may include changes to traditional quantity take-off practices, reliance on professional judgement, emerging skill requirements, and attitudes towards automation. This structured approach supports systematic interpretation while allowing meaningful insights to emerge from participant narratives.

Findings from both data sets will then be compared and integrated to provide a balanced analysis, ensuring consistency between quantitative trends and qualitative experiences.

Ethical Considerations

Ethical considerations will be addressed throughout the research process in accordance with university ethical approval requirements. All participants will be provided with clear information outlining the purpose of the research, the nature of their participation, and how the collected data will be used. Informed consent will be obtained prior to participation.

Participation will be voluntary, and individuals will have the right to withdraw from the study at any stage without providing a reason. Confidentiality and anonymity will be maintained by removing identifying information from survey and interview data. All data will be securely stored and used solely for academic purposes, in compliance with

relevant data protection legislation, including the General Data Protection Regulation (GDPR).

Detailed Research Timeline

This research will be carried out over a period of approximately 16–18 weeks, which aligns with the timescale of a Level 6 undergraduate dissertation. The timeline has been planned to ensure there is enough time for background reading, data collection, analysis, and writing, while also allowing flexibility should any stage take longer than expected.

Weeks 1–2: Topic Selection and Initial Research

During the first two weeks, the main focus will be on finalising the research topic and gaining a basic understanding of the subject area. Initial reading will be carried out using academic journals, textbooks, and professional guidance related to BIM, artificial intelligence, and quantity surveying practice. This stage will also involve discussions with the project supervisor to confirm that the topic is appropriate, achievable, and relevant to the programme of study.

Outcome:

A clearly defined research topic and title, with an initial understanding of the key issues surrounding AI-driven quantity take-off and BIM.

Weeks 3–4: Research Proposal Development

In this stage, the research aim, objectives, and research questions will be fully developed. The background to the study will be written, explaining why the research is relevant to the UK and Welsh construction industry. A proposed research methodology will also be outlined. The completed research proposal will then be submitted for approval.

Outcome:

An approved research proposal providing clear direction for the rest of the study.

Weeks 5–7: Literature Review

These weeks will be dedicated to carrying out a detailed literature review. Academic papers, industry reports, and professional guidance (such as RICS publications) will be reviewed to understand current research and industry practice. Particular attention will be given to BIM use, AI in construction, and the changing role of the Quantity Surveyor. Key themes and gaps in the literature will be identified and documented.

Outcome:

A completed literature review chapter that clearly identifies gaps in existing research and supports the need for the study.

Weeks 8–9: Research Design and Ethics Approval

The research methodology will be finalised during this stage. Survey questions and interview prompts will be designed to ensure they align with the research objectives. An

ethics application will then be completed and submitted to ensure the research meets ethical and data protection requirements.

Outcome:

Ethical approval granted and finalised data collection tools ready for use.

Weeks 10–12: Data Collection

Primary data will be collected during this period. Online surveys will be distributed to Quantity Surveyors based in the UK and Wales, using professional contacts where possible. Semi-structured interviews will also be carried out with selected participants to gain more detailed insights. All data will be collected and stored securely.

Outcome:

A sufficient number of survey responses and completed interviews to support meaningful analysis.

Weeks 13–15: Data Analysis

Survey results will be analysed using simple descriptive statistics to identify trends and common responses. Interview data will then be reviewed and analysed using thematic analysis to identify key themes. The findings from both methods will be compared and linked back to the research questions and literature.

Outcome:

Clear findings that highlight how AI-driven quantity take-off impacts QS roles and skills.

Weeks 16–17: Discussion and Conclusions

The results will be discussed in relation to the literature reviewed earlier in the study. This section will consider what the findings mean for the future role of Quantity Surveyors in the UK and Wales, as well as the limitations of the research. Conclusions and recommendations for future study will also be presented.

Outcome:

A completed discussion and conclusion section that demonstrates critical understanding.

Week 18: Final Review and Submission

The final week will be used to proofread the dissertation, check formatting, and ensure all references are correctly cited using the Harvard referencing system. Any final amendments will be made before submission.

Outcome:

Submission of a completed Level 6 research project.

Expected Outcomes

Through this research, I expect to develop a clearer understanding of how AI-driven quantity take-off automation is currently being used within BIM processes in the UK and

Welsh construction industry. I anticipate that the findings will show that although AI-enabled tools are becoming more common, their use is still at varying stages of adoption, with many Quantity Surveyors relying on a combination of traditional methods and digital systems.

I also expect the research to demonstrate that automation has the potential to improve efficiency and reduce the time spent on repetitive measurement tasks. This may allow Quantity Surveyors to focus more on higher-level activities such as cost planning, commercial management, and providing advice during the early stages of a project. Another expected outcome is an increased awareness of the importance of digital and analytical skills, particularly in relation to BIM and data management, for those entering the profession.

Overall, I expect this study to highlight how the role of the Quantity Surveyor is evolving rather than being replaced by technology, while also identifying areas where further development and training may be required.

Potential Findings

The potential findings of this research may suggest that AI-driven quantity take-off is generally viewed as a useful support tool rather than a direct threat to the quantity surveying profession. I expect to find that while automation can improve speed and consistency, professional judgement remains essential, especially when model information is incomplete, inaccurate, or poorly coordinated.

It is also likely that the research will reveal differences in how AI and BIM tools are adopted across organisations, depending on factors such as company size, available resources, and individual experience with digital technologies. Some Quantity Surveyors may express concerns around over-reliance on automated outputs, lack of training, or trust in model-based data. Others may highlight positive outcomes, including improved collaboration, better cost visibility, and more efficient workflows.

Additionally, I expect the findings to identify a growing skills gap within the profession, particularly in digital competence and BIM understanding. This may highlight the need for greater emphasis on technology-focused training within education and professional development. These findings could help inform how Quantity Surveyors prepare for future practice in an increasingly digital construction environment.

These findings may inform quantity surveying education, continuing professional development, and organisational strategies for digital upskilling.

References

Adejumobi, A.M. (2024) AI-driven construction management systems integrating BIM, real-time analytics, and automation to boost productivity and minimise cost overruns risks. *International Journal of Civil Engineering and Architecture Engineering*, 5(2), pp.87–96. Available at: <https://www.researchgate.net> (Accessed: 24 March 2026).

Ambalam Vassen, S. (2021) 'Impact of BIM-based quantity take-off for accuracy of cost estimation', *International Journal of Construction Engineering and Management*, 10(3), pp.55–69. Available at: <http://article.sapub.org/10.5923.j.ijcem.20211003.01.html> (Accessed: 2 April 2026).

BIM Associates (2025) UK government BIM standards and guidelines: shaping the future of construction. Available at: <https://www.bimassociates.com> (Accessed: 28 March 2026).

FIG (2025) Digital transformation in quantity surveying: paving the way for smart cities and professional evolution. FIG Position Paper. Available at: <https://www.fig.net> (Accessed: 19 March 2026).

Gao, Y., Antwi-Afari, M.F., Huang, Y., Chen, Z.S. and Manzoor, B. (2026) 'Artificial intelligence in construction project management: a systematic literature review of cost, time and safety management', *Buildings*, 16(5), pp.1–28. Available at: <https://www.mdpi.com> (Accessed: 1 April 2026).

HM Government (2016) Building information modelling strategy. London: Department for Business, Innovation and Skills. Available at: <https://www.gov.uk> (Accessed: 26 March 2026).

Ivanova, S., Kuznetsov, A., Zverev, R. and Rada, A. (2023) 'Artificial intelligence methods for the construction and management of buildings', *Sensors*, 23(21), pp.1–22. Available at: <https://pmc.ncbi.nlm.nih.gov> (Accessed: 30 March 2026).

National Academy of Construction (2024) Adoption of artificial intelligence in quantity take-offs in engineering and construction organisations. Available at: <https://www.naocon.org> (Accessed: 21 March 2026).

National Institute of Building Sciences (2015) National BIM Standard–United States® (Version 3). Washington DC: NIBS. Available at: <https://www.nibs.org> (Accessed: 25 March 2026).

Parsafard, P., Elezaj, O., Ekundayo, D. and Vakaj, E. (2024) ‘Automation in construction cost budgeting using generative artificial intelligence’, Proceedings of the IEOM International Conference, Dubai, UAE, pp.1–12. Available at: <https://ieomsociety.org> (Accessed: 3 April 2026).

Royal Institution of Chartered Surveyors (RICS) (2015) BIM for cost managers: requirements from the BIM model. London: RICS. Available at: <https://www.rics.org> (Accessed: 20 March 2026).

Royal Institution of Chartered Surveyors (RICS) (2023) Quantity take-off from 2D and 3D models. Available at: <https://www.isurv.com> (Accessed: 27 March 2026).

Seidu, R., Adamu, Z. and Robinson, H. (2020) ‘Innovative changes in quantity surveying practice through BIM, big data, artificial intelligence and machine learning’, Applied Science University Journal of Natural Sciences, 4(1), pp.37–47. Available at: <https://core.ac.uk> (Accessed: 22 March 2026).

Taghaddos, H., Mashayekhi, A. and Sherafat, B. (2019) Automation of construction quantity take-off in a BIM model. Tehran: University of Tehran. Available at: <https://arxiv.org> (Accessed: 31 March 2026).

The Constructor (2025) How artificial intelligence is rewiring quantity surveying. Available at: <https://theconstructor.org> (Accessed: 18 March 2026).

Valinejadshoubi, M., Moselhi, O., Iordanova, I. and Valdivieso, F. (2025) ‘A cloud-driven framework for automated BIM quantity take-off and quality control’, Buildings, 15(21), pp.1–25. Available at: <https://www.mdpi.com> (Accessed: 4 April 2026).

Wao, J.O. (2024) ‘Quantity surveying and its association with building information modelling and digital twin’, International Journal of Scientific Research and Management, 12(12), pp.92–100. Available at: <https://www.researchgate.net> (Accessed: 29 March 2026).