ADVANCED CONSTRUCTION TECHNOLOGY





Smart Building Technologies for Operational Optimisation of the Dylan Thomas Centre

Prepared by: Deian Davies
Student Number: 2320098
17 March 2026
Course Number: ACBA 6009

INTRODUCTION 3
OVERVIEW OF THE DYLAN THOMAS CENTRE 3
OPERATIONAL AND HERITAGE CONSTRAINTS 4
Heritage Constraints *4*
Governance and Stakeholder Complexity *4*
Existing Systems and Operational Challenges *4*
AGE-RELATED DEFECTS AND MAINTENANCE CHALLENGES 5
BUILDING INFORMATION MODELLING (BIM) FOR EXISTING BUILDINGS 5
Scan-to-BIM and Digital Surveying *6*
BIM for Risk Mitigation *6*
BIM for Facilities Management *6*
SMART BUILDING TECHNOLOGIES 7
Smart Sensors and IoT Monitoring *7*
Smart Lighting Systems *7*
Smart HVAC Control *8*
DIGITAL TWINS AND DATA ANALYTICS 8
Artificial Intelligence in Building Management *9*
ENERGY PERFORMANCE AND WHOLE-LIFE ASSET MANAGEMENT 9
SMART OPERATIONAL STRATEGY FOR THE DYLAN THOMAS CENTRE 10
Digital Survey and BIM Model *10*
Smart Environmental Monitoring *10*
Smart Energy Control *11*
Digital Twin Integration *11*
AI-Enabled Predictive Maintenance and Optimisation *11*
Implementation Considerations *12*
CRITICAL EVALUATION 12
CONCLUSION AND RECOMMENDATIONS 12
REFERENCES 14
APPENDIX 15
Appendix A - Smart Technology Application by Space *15*
Appendix B - Pictures of the DTC *17*

INTRODUCTION

The construction industry is undergoing a significant digital transformation, driven by technologies such as Building Information Modelling (BIM), smart building systems, digital twins and artificial intelligence (AI). These innovations are changing how buildings are designed, constructed and managed, enabling a shift from traditional approaches to more efficient, data-driven and lifecycle-focused practices (Eastman *et al.*, 2018). Increasingly, these technologies are being applied not only to new developments but also to existing and heritage buildings to improve their operational performance and long-term sustainability (Historic England, 2020).

BIM plays a central role in this transformation by providing a digital representation of a building that supports collaboration, reduces risk and improves decision-making throughout its life-cycle (BSI, 2019). Alongside BIM, smart technologies such as sensors and automated systems enable real-time monitoring of building performance, including energy use and environmental conditions. Digital twins further enhance this capability by linking digital models to live data, while AI supports predictive maintenance and system optimisation (Boje *et al.*, 2020).

This report focuses on the Dylan Thomas Centre as a case study. The aim is to critically evaluate how digital technologies can be applied to improve the planning, operation and maintenance of the building. Specifically, the report will examine how BIM and related tools can support planning and risk mitigation, explore the use of smart technologies, scanning, AI and digital twins, evaluate their impact on energy performance and asset management, and propose how these systems can be implemented while respecting heritage constraints. Through this analysis, the report demonstrates how digital approaches can enhance both operational efficiency and long-term building performance.

OVERVIEW OF THE DYLAN THOMAS CENTRE



The Dylan Thomas Centre (DTC) is a Grade II listed heritage building located within Swansea's Maritime Quarter. Originally a historic warehouse, it has been refurbished into a cultural venue and museum. The building is owned by Swansea Council and operated under lease by University of Wales Trinity Saint David, creating a multi-stakeholder structure that increases operational complexity.

The building functions as a mixed-use facility, incorporating exhibition spaces, offices, event areas, a bar and café, a commercial kitchen, and critical infrastructure such as a server room, plant room, lifts and a rooftop mechanical systems. While systems such as Mechanical Ventilation with

Heat Recovery (MVHR) indicate some level of modernisation, the integration of these systems within a historic structure presents ongoing operational challenges.

These varied functions create complex facilities management demands, particularly due to variable occupancy patterns and fluctuating energy requirements. Exhibition spaces require stable environmental conditions, while event spaces experience intermittent high usage. This mismatch highlights inefficiencies in traditional building operation and demonstrates a clear need for adaptive, data-driven building management systems.

OPERATIONAL AND HERITAGE CONSTRAINTS

Heritage Constraints

As a Grade II listed building, interventions must preserve historic fabric, avoid structural alterations and minimise visible installations. These restrictions limit the feasibility of conventional retrofit strategies and require careful selection of technologies that are both effective and reversible.
This creates a strong case for non-intrusive digital solutions, such as wireless sensors and software-based control systems. These technologies allow performance improvements to be achieved without damaging or altering the building fabric, making them particularly suitable for heritage environments.

Governance and Stakeholder Complexity

The involvement of Swansea Council and University of Wales Trinity Saint David introduces challenges in decision-making and funding. Without integrated systems, this can lead to fragmented maintenance strategies and inefficiencies.



The implementation of BIM-based asset management systems and shared digital platforms would enable centralised data access, improving coordination between stakeholders. This would support more transparent decision-making and ensure that maintenance and upgrade strategies are aligned.

Existing Systems and Operational Challenges

The DTC operates as a complex mixed-use facility, incorporating exhibition areas, offices, event spaces, a bar and café, a commercial kitchen, and critical infrastructure such as a server room, lifts, plant room and rooftop mechanical systems. While systems such as Mechanical Ventilation with Heat Recovery (MVHR) demonstrate some level of modernisation, the building is still affected by the limitations of its age.

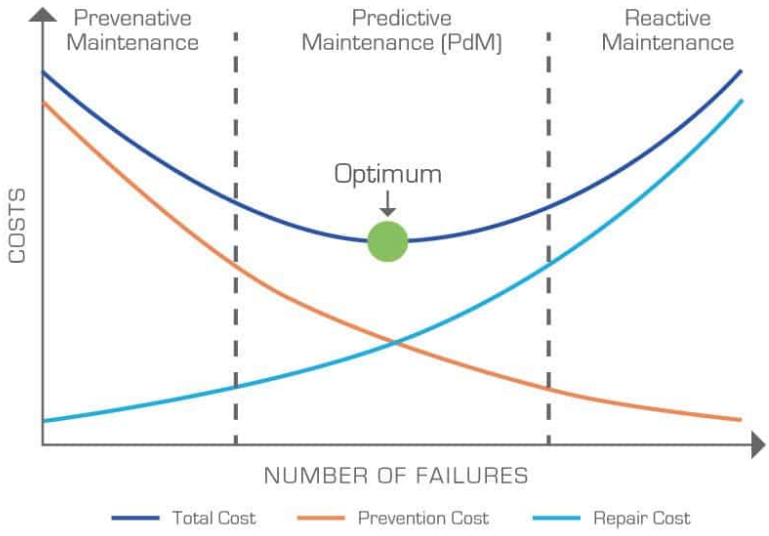
Key operational challenges include variable occupancy patterns, with fluctuating visitor numbers driven by events and seasonal demand. This results in inconsistent energy usage, creating peaks and inefficiencies in heating, cooling and ventilation systems. Additionally, museum spaces require stable environmental conditions to preserve artefacts, placing further strain on building services.

The presence of modern mechanical and electrical systems can lead to reduced efficiency, higher maintenance costs and limited integration between systems. In many cases, older buildings lack fully integrated building management systems, resulting in fragmented control of HVAC, lighting and ventilation. These challenges highlight an opportunity to improve performance through smart technology optimisation, such as digital monitoring systems and software-based controls, rather than relying solely on major physical retrofit interventions.

AGE-RELATED DEFECTS AND MAINTENANCE CHALLENGES

Heritage buildings are particularly renowned to outdated systems and poor thermal performance. These issues increase maintenance demands and operational costs, particularly where stable environmental conditions are required.

The lack of accurate documentation further increases risk, making maintenance planning more difficult and often leading to reactive interventions.



This highlights a key limitation of traditional maintenance approaches, which are typically reactive and inefficient. In contrast, digital technologies enable a transition toward predictive maintenance, where sensors and data analytics allow faults to be identified before failure occurs. For this building, such an approach would reduce disruption, improve reliability and support more effective long-term asset management.

BUILDING INFORMATION MODELLING (BIM) FOR EXISTING BUILDINGS

BIM provides a centralised digital model that can significantly improve the management of existing buildings. For this building, adopting BIM in accordance with ISO 19650 would establish a structured approach to information management across its lifecycle.

Using tools such as Autodesk Revit, a detailed model could be developed to support planning, maintenance and operational decision-making. This would address current issues relating to fragmented information and lack of documentation.

Scan-to-BIM and Digital Surveying

The building could benefit from terrestrial laser scanning, generating a point cloud that is converted into a BIM model. This would provide an accurate digital representation without invasive surveying, making it suitable for a heritage asset.

The use of HBIM would enable:

- Accurate documentation of building geometry
- Improved understanding of existing conditions
- Better planning of future interventions

This approach has been successfully applied at Oxford Town Hall and could be directly replicated. (BBC News, 2024)



BIM for Risk Mitigation

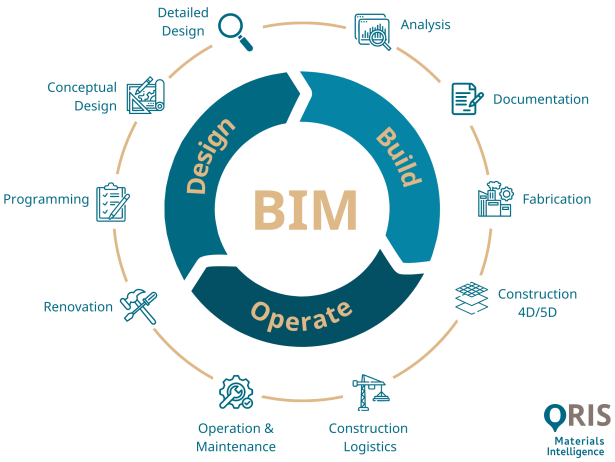
BIM plays a crucial role in reducing risk, particularly in heritage projects where uncertainty is high. By providing a detailed and accurate digital model, BIM allows project teams to:

- Perform clash detection between structural elements and building services
- Improve service coordination before installation
- Plan interventions digitally, testing solutions before implementation
- Reduce unexpected site conditions and associated costs

This is especially important in historic buildings, where hidden services, undocumented alterations and fragile materials increase the likelihood of unforeseen issues. BIM enables a more controlled and informed approach to intervention.

BIM for Facilities Management

Beyond design and construction, BIM provides significant value in facilities management (FM) when integrated with systems such as Computer-Aided Facilities Management (CAFM) platforms and digital asset registers. These integrations allow building operators to manage information efficiently throughout the building's lifecycle.



Key benefits include:

•Planned maintenance scheduling, reducing reactive repairs

•Lifecycle costing and asset tracking, supporting long-term budgeting

•Improved documentation, ensuring accurate and accessible building information

By acting as a single source of truth, BIM enhances operational efficiency, supports better decision-making and enables a transition toward more proactive and data-driven facilities management strategies.

SMART BUILDING TECHNOLOGIES

Smart buildings are defined as built environments that utilise sensors, automated systems and data analytics to monitor, control and optimise building performance in real time. These systems integrate building services—such as heating, ventilation, lighting and energy use—into a unified, responsive network. The aim is to improve operational efficiency, reduce energy consumption and enhance occupant comfort, while supporting more informed facilities management.

Smart Sensors and IoT Monitoring

Smart buildings rely on Internet of Things (IoT) sensors to continuously monitor environmental and operational conditions. These sensors can track:

- Temperature – ensuring thermal comfort and system efficiency
- Humidity – critical for preservation and indoor air quality
- CO_2 levels – indicating ventilation effectiveness
- Occupancy – detecting how spaces are used
- Energy consumption – identifying inefficiencies and peak demand



The key benefits of these systems include:

- Environmental monitoring, supporting stable internal conditions
- Energy optimisation, by adjusting systems based on real-time demand
- Operational awareness, providing facilities managers with actionable data

This data forms the foundation for more advanced systems such as automation and predictive maintenance.

Smart Lighting Systems

Smart lighting technologies play a significant role in reducing energy consumption and improving user experience. These systems typically include:

- Occupancy sensors, which turn lights on or off based on space usage
- Daylight harvesting, adjusting artificial lighting based on natural light levels
- Automated lighting schedules, aligned with building use patterns

In practice, this can deliver several improvements:

- Circulation spaces and corridors can dim or switch off when unoccupied
- Function and event spaces can activate lighting automatically when booked or in use
- Office areas can switch off lighting when occupants leave, reducing unnecessary energy use

Such systems are particularly effective in buildings with variable occupancy patterns.

Smart HVAC Control

Smart HVAC (Heating, Ventilation and Air Conditioning) systems enable demand-based control of indoor environments, ensuring that heating and ventilation are only provided when and where needed. Key approaches include:

- Demand-Controlled Ventilation (DCV), which adjusts airflow based on CO_2 levels or occupancy
- Zone-based heating control, allowing different areas of a building to be heated or cooled independently

These systems are especially beneficial in mixed-use buildings, where different spaces have varying occupancy levels and environmental requirements. For example, exhibition areas may require stable conditions, while event spaces experience fluctuating demand. Smart HVAC systems can respond dynamically to these differences, improving comfort while reducing energy waste.

DIGITAL TWINS AND DATA ANALYTICS

A digital twin is an advanced digital representation of a physical building that is continuously updated using real-time data. While BIM provides a static model of a building's geometry and asset information, a digital twin extends this by creating a dynamic, live connection between the physical asset and its digital counterpart.

The key distinction is:

- BIM is static, information-rich model used for design and documentation
- Digital Twin is dynamic model that integrates real-time operational data

Digital twins integrate multiple systems, including:

- BIM models (geometric and asset data)
- Smart sensors (live environmental and performance data)
- Building Management Systems (BMS) (control and automation systems)

This integration enables a continuously updated view of building performance.

The implementation of a digital twin offers several significant advantages:

- Real-time monitoring: Continuous tracking of environmental conditions, system performance and energy use
- Predictive maintenance: Early identification of faults through trend analysis, reducing



downtime and repair costs
- Operational optimisation: Ability to simulate and test building performance scenarios to improve efficiency

A notable precedent is the use of digital modelling at Durham Cathedral, where advanced digital tools have been applied to support conservation, maintenance planning and long-term asset management in a historic structure.

Artificial Intelligence in Building Management

Artificial Intelligence (AI) enhances digital building systems by enabling advanced data analysis and automated decision-making. AI systems can process large volumes of data generated by sensors and building systems to identify patterns and optimise performance.

Key applications of AI include:
- Pattern recognition, identifying trends in energy use and system behaviour
- Energy optimisation, adjusting systems to reduce consumption while maintaining comfort
- Predictive maintenance, detecting anomalies that indicate potential system failures

For example, AI can dynamically adjust heating and ventilation schedules by analysing:
- Weather forecasts, anticipating external temperature changes
- Occupancy patterns, based on historical and real-time data
- Past performance data, identifying the most efficient operating conditions

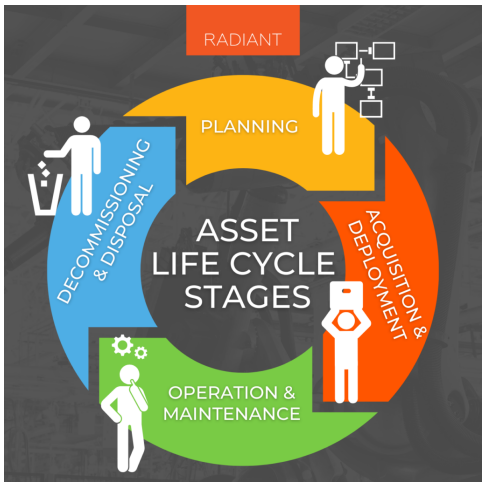
This allows building systems to operate proactively rather than reactively, improving efficiency, reducing costs and supporting more sustainable building operation.

ENERGY PERFORMANCE AND WHOLE-LIFE ASSET MANAGEMENT

Explain whole-life performance.
Mention:
- lifecycle cost
- operational energy
- maintenance planning.

Reference:
- UK Green Building Council

Explain technologies supporting:
- energy modelling
- measurement and verification
- carbon reduction strategies.



SMART OPERATIONAL STRATEGY FOR THE DYLAN THOMAS CENTRE

This section proposes a practical and non-invasive implementation strategy for integrating digital technologies within the Dylan Thomas Centre. The approach focuses on improving operational efficiency, energy performance and facilities management while respecting the constraints associated with a Grade II listed heritage building. Rather than relying on major physical alterations, the strategy prioritises digital optimisation of existing systems, aligning with best practice for heritage asset management.

Digital Survey and BIM Model

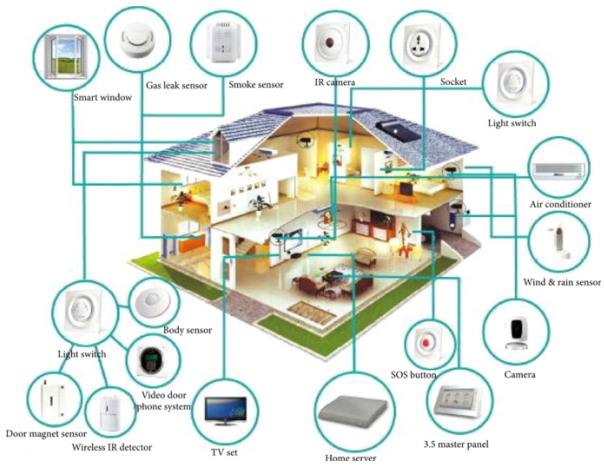
A fundamental first step is developing a digital baseline model through terrestrial laser scanning and scan-to-BIM processes. This would involve capturing accurate point cloud data and converting it into a Historic Building Information Model (HBIM).
This model would serve multiple functions:

- Establish a comprehensive digital asset register
- Provide an accurate representation of building geometry and services
- Support future maintenance planning and retrofit decision-making

This directly addresses the current issue of limited and potentially outdated documentation, reducing uncertainty and improving coordination between stakeholders. Furthermore, the HBIM model would form the foundation for all other digital systems, including facilities management platforms and digital twin integration.

Smart Environmental Monitoring

To address the need for stable environmental conditions—particularly within the museum space—wireless sensor networks should be installed throughout the building. These sensors would monitor temperature, humidity, CO_2 levels and occupancy in real time.



The implementation of these systems would:

- Ensure consistent environmental conditions required for artefact preservation
- Improve occupant comfort in offices and public areas
- Provide facilities managers with live operational data

Importantly, the use of wireless technologies ensures that installation is non-invasive, avoiding disruption to historic fabric. This approach directly responds to the previously identified challenges of environmental instability and lack of real-time performance data.

Smart Energy Control

Smart control systems should be introduced to optimise energy use across different functional areas, responding to the building's variable occupancy patterns.
Specific applications include:

Offices:
Occupancy-based lighting and heating systems should be implemented to ensure energy is only used when spaces are occupied.
Function and Event Spaces:
HVAC and lighting systems should be linked to booking schedules, allowing systems to activate only when required.
Exhibition Areas:
Environmental controls should prioritise stability over fluctuation, maintaining consistent temperature and humidity levels.
Bar and Commercial Kitchen:
Ventilation systems should operate based on operational hours and demand, reducing unnecessary energy use during inactive periods.



This targeted approach ensures that energy use is responsive rather than constant, significantly reducing inefficiencies identified in the existing system.

Digital Twin Integration

Building on the BIM model and sensor network, a digital twin should be developed by integrating real-time data with the building's digital representation. This would create a live, continuously updated model of building performance.
Through this system, facilities managers would be able to:

- Monitor environmental and energy performance in real time
- Identify inefficiencies and abnormal system behaviour
- Simulate operational changes to improve performance

This represents a transition from reactive to data-driven facilities management, allowing informed decision-making and improved operational control.

AI-Enabled Predictive Maintenance and Optimisation

Artificial Intelligence (AI) should be introduced to enhance the performance of the digital twin and building systems. By analysing data from sensors and building management systems, AI can identify patterns and optimise performance.
For this building, AI could:

- Adjust heating and ventilation systems based on occupancy trends and weather forecasts
- Detect early signs of system failure, enabling predictive maintenance
- Optimise energy usage by learning from historical performance data

This directly addresses the issue of reactive maintenance practices, enabling a more proactive and efficient approach to asset management.

Implementation Considerations

The proposed strategy should be implemented in a phased approach, prioritising low-cost, high-impact interventions such as sensor installation and digital monitoring systems before progressing to more advanced technologies such as digital twins and AI integration.
Crucially, all interventions must:

- Remain non-invasive and reversible to comply with heritage constraints
- Be aligned with stakeholder responsibilities and funding structures
- Include staff training to ensure effective use of new systems

CRITICAL EVALUATION

To address these limitations, the proposed strategy should be implemented using a phased approach, prioritising low-cost, high-impact interventions such as sensor installation and digital monitoring systems before progressing to more advanced technologies such as digital twins and AI integration. This ensures that early benefits can be realised without significant financial risk, while allowing organisational capability to develop over time.
Crucially, all interventions must remain non-invasive and reversible to comply with heritage constraints, ensuring that the historic fabric is preserved. In addition, implementation must be aligned with stakeholder responsibilities and funding structures to avoid fragmentation in decision-making. The inclusion of staff training and organisational support is also essential to ensure that digital systems are effectively utilised. This balanced approach enables the building to adopt innovative technologies while managing risk, cost and operational complexity.

CONCLUSION AND RECOMMENDATIONS

This report has critically evaluated how digital technologies can be applied to improve the performance, management and sustainability of the Dylan Thomas Centre. It has demonstrated that technologies such as BIM, smart sensors, digital twins and AI offer significant opportunities to address key challenges associated with heritage buildings, including inefficient energy use, reactive maintenance practices and fragmented facilities management systems.
The findings indicate that smart, data-driven technologies can deliver substantial improvements without requiring intrusive physical alterations, making them particularly suitable for a Grade II listed building. By enabling real-time monitoring, predictive maintenance and optimised system control, these technologies support a transition toward more efficient and sustainable building operation.
Recommendations

Based on the analysis above, the following recommendations are proposed:

- Undertake a laser scan and develop a BIM (HBIM) model
  to establish an accurate digital representation and asset register
- Implement a smart sensor network
  to monitor environmental conditions, occupancy and energy use in real time

- Introduce an integrated Building Management System (BMS)
  to enable centralised and automated control of building services
- Develop a digital twin
  to support ongoing performance monitoring, analysis and facilities management
- Implement AI-based optimisation gradually
  to enhance energy efficiency and enable predictive maintenance as data maturity increases

Overall, the building has the potential to become a digitally enabled heritage asset, demonstrating how modern technologies can be successfully integrated within historic environments. By adopting a phased and carefully managed approach, it is possible to enhance operational performance while preserving the building's cultural and architectural significance.

REFERENCES

BBC News (2024) 'Historic town hall set for external restoration', *BBC News*, 11 July. Available at: https://www.bbc.co.uk/news/articles/cd6ge70pew8o (Accessed: 27 April 2026).

Boje, C., Guerriero, A., Kubicki, S. and Rezgui, Y. (2020) 'Towards a semantic Construction Digital Twin: Directions for future research', *Automation in Construction*, 114, p. 103179. Available at: https://doi.org/10.1016/j.autcon.2020.103179 (Accessed: 27 April 2026).

BSI (2019) BS EN ISO 19650-1:2019 Organisation and digitisation of information about buildings and civil engineering works, including building information modelling (BIM): Information management using building information modelling. Part 1: Concepts and principles. London: British Standards Institution. Available at: https://www.iso.org/standard/68078.html (Accessed: 27 April 2026).

Eastman, C., Teicholz, P., Sacks, R. and Liston, K. (2018) *BIM handbook: A guide to building information modelling for owners, designers, engineers, contractors, and facility managers*. 3rd edn. Hoboken, NJ: Wiley. Available at: https://www.wiley.com/en-gb/BIM+Handbook-p-9781119287537 (Accessed: 27 April 2026).

Historic England (2020) *The use of BIM for heritage assets*. London: Historic England. Available at: https://historicengland.org.uk/images-books/publications/bim-for-heritage/ (Accessed: 27 April 2026).

Hou, C., Remøy, H. and Wu, H. (2020) 'Digital twins to enable smart heritage facilities management', *Pacific Rim Real Estate Society (PRRES) Conference Proceedings*. Available at: https://www.prres.org/uploads/564/2356/Hou_Digital_twin.pdf (Accessed: 27 April 2026).

Mazzetto, S. et al. (2024) 'Integrating emerging technologies with digital twins for heritage buildings', *Heritage*, 7(11). Available at: https://www.mdpi.com/2571-9408/7/11/300 (Accessed: 27 April 2026).

Ni, Z. et al. (2024) 'Parametric digital twins for preserving historic buildings: A case study of Löfstad Castle', *arXiv preprint*. Available at: https://arxiv.org/ (Accessed: 27 April 2026).

Saleeb, N. (2025) 'FRESHBIM-FRESHDT: BIM, Digital Twins and AI for heritage buildings', *Engineering Professors' Council*. Available at: https://epc.ac.uk/article/case-study-freshbim-freshdt-framework-for-sustainable-heritage-through-bim-digital-twins-and-ai/ (Accessed: 27 April 2026).

UK Green Building Council (2021) *Whole life carbon roadmap for the UK built environment*. London: UK Green Building Council. Available at: https://www.ukgbc.org/ukgbc-work/whole-life-carbon-roadmap/ (Accessed: 27 April 2026).

Volk, R., Stengel, J. and Schultmann, F. (2014) 'Building Information Modeling (BIM) for existing buildings — Literature review and future needs', *Automation in Construction*, 38, pp. 109–127. Available at: https://doi.org/10.1016/j.autcon.2013.10.023 (Accessed: 27 April 2026).

Vuoto, A., Funari, M. and Lourenço, P. (2023) 'Digital twin for structural integrity of heritage buildings', *Infrastructures*, 8(5). Available at: https://www.mdpi.com/2412-3811/8/5/65 (Accessed: 27 April 2026).

APPENDIX

Due to the mixed-use nature of the building, different smart building technologies would be required across individual spaces within the Dylan Thomas Centre. Table A illustrates how digital systems could optimise energy use, environmental conditions and facilities management across the building.

Appendix A - Smart Technology Application by Space

Building Area	Operational Characteristics	Smart Technologies	Example Operational Improvements	Facilities Management Benefits
Museum / Exhibition Spaces	Requires stable temperature and humidity for artefact preservation; moderate visitor occupancy	Environmental sensors (temperature, humidity, CO_2), smart HVAC control, digital twin monitoring	Climate control adjusts automatically when humidity levels rise or occupancy increases	Protects exhibits, maintains environmental stability, reduces manual monitoring
Offices	Regular daytime occupancy but often partially occupied	Occupancy sensors, smart lighting, zone-based heating control	Lighting and heating automatically reduce when desks are unoccupied	Reduced energy consumption and improved workspace comfort
Function / Event Room	Irregular usage depending on bookings; large capacity	Booking-system integration with BMS, occupancy sensors, automated HVAC control	Heating, ventilation and lighting activate only when events are scheduled	Prevents energy waste when space is unused
Bar and Café	Variable occupancy throughout the day	Smart lighting, occupancy sensors, energy monitoring	Lighting adjusts based on occupancy levels and daylight conditions	Improved operational efficiency and reduced electricity use
Commercial Kitchen	High energy demand; heat-producing equipment; strict ventilation requirements	Smart ventilation controls, energy monitoring systems, equipment load monitoring	Extraction systems operate based on cooking activity rather than continuous operation	Reduced energy consumption and improved equipment management
Walk-In Fridge and Freezer	Continuous operation with strict temperature requirements	IoT temperature monitoring, automated fault alerts	Alerts triggered if temperatures deviate from safe ranges	Prevents food spoilage and reduces maintenance response times

Server Room / IT Equipment	Continuous operation; sensitive to overheating	Temperature sensors, automated cooling control, predictive maintenance analytics	Cooling systems adjust to equipment loads and environmental conditions	Prevents overheating and improves reliability of IT infrastructure
Circulation Areas / Corridors	Intermittent occupancy	Motion sensors, automated lighting systems	Lights dim to low levels when corridors are unoccupied	Reduced electricity consumption
Lifts	Periodic usage	Smart monitoring systems and predictive maintenance software	Lift systems monitored for unusual vibration or faults	Reduces downtime and improves maintenance scheduling
Plant Room (Roof Level)	Houses building mechanical systems	Equipment monitoring sensors, digital twin integration	Pumps, fans and HVAC components monitored for abnormal performance	Enables predictive maintenance and improved asset management
Whole Building Systems	Multiple interconnected services	BIM-based digital twin, building management system integration, AI analytics	Building systems optimise heating, lighting and ventilation based on occupancy and weather data	Data-driven facilities management and lifecycle optimisation

Appendix B - Pictures of the DTC



















