

CRITICAL REVIEW OF THE DYLAN THOMAS CENTRE: IMPROVING FACILITY AND ASSET MANAGEMENT THROUGH BIM, SMART BUILDING TECHNOLOGIES AND DIGITAL RETROFIT

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1. INTRODUCTION

The Dylan Thomas Centre in Swansea is a historically significant mixed-use building which presents both opportunities and challenges for modern construction technology. This report includes a critical review of the building with the aim of explaining how a project of this type could be improved using current technologies, including BIM, scanning, artificial intelligence, smart buildings and digital twins. It also requires consideration of whole-life performance, maintenance, repair, retrofit and refurbishment, which is particularly important because the Dylan Thomas Centre is not a straightforward modern commercial building but a Grade II listed asset with cultural, educational and public uses.

The building was originally constructed between 1825 and 1829 as Swansea's Guildhall and was later extended in 1852. It became the Dylan Thomas Centre in 1995 following significant refurbishment after a period of vacancy between 1982 and 1995. The building is now known as Ty Llen and is used for university teaching, creative industries, exhibitions, events, student union activities, offices, a café, lecture spaces and a theatre. This mixed-use arrangement creates a complicated facilities management environment because different spaces have different heating, lighting, security, occupancy and conservation requirements.

The main argument of this report is that the Dylan Thomas Centre could be improved through a staged digital retrofit strategy. This should not involve turning the building into a fully automated "high-tech" building without considering its heritage value. Instead, BIM, laser scanning, smart sensors, digital defect reporting, energy monitoring and a light-touch digital twin should be used to improve decision making, maintenance planning, energy efficiency and user comfort.

2. EXISTING BUILDING CONTEXT AND OPERATIONAL ISSUES

The Dylan Thomas Centre's operational complexity comes from its history, ownership structure, age and mixed use. The building is owned by the City and County of Swansea, while UWTSU rents part of the building and sublets a section back for the Dylan Thomas exhibition. This arrangement means that decisions about repairs, investment and operational responsibility are not as simple as they would be in a single occupier building.

The current uses include lecture halls, a bar, lifts, museum areas, offices, classrooms, meeting rooms, a cafe, student union spaces, staff kitchens, toilets and a theatre. Each area has different performance requirements. For example, a museum or exhibition space needs stable temperature, humidity and lighting conditions, while lecture rooms require good ventilation, lighting control and reliable audio/visual systems. A cafe or bar space has different servicing, cleaning and ventilation demands. This reinforces why one generic maintenance approach is unlikely to be effective.

The site visit notes identify several operational complications, including the Grade II listed status, dated systems, competing requirements in different areas, inefficient building fabric between spaces, the lack of an easy defect reporting system and the fact that mixed-use areas mean parts of the building are always in use. These issues are typical of older public buildings. Age related defects may include deterioration of building fabric, poor thermal performance, damp risk, outdated mechanical and electrical systems, inefficient zoning, accessibility limitations and reactive maintenance caused by limited asset data.

The building's heritage status is particularly important. Historic England emphasises that retrofit in historic buildings requires a whole building approach because interventions that improve energy efficiency can also create unintended risks, such as trapped moisture, overheating, loss of significance or damage to historic fabric (Historic England, 2024). This is directly relevant to the Dylan Thomas Centre

because it would be inappropriate to recommend intrusive insulation, large visible plant, extensive cabling or replacement windows without careful assessment and listed building consent.

3. BENEFITS OF BIM FOR PLANNING WORK, RISK MITIGATION AND MAINTENANCE

Building Information Modelling would be one of the most valuable starting points for improving the Dylan Thomas Centre because it provides a structured digital method for organising information about the building. In an existing building, especially one with heritage constraints, BIM can support survey information, asset registers, maintenance schedules, repair history, condition data, risk information and operational decision making.

ISO 19650-3 is especially relevant because it focuses on information management during the operational phase of assets. The standard sets out requirements for managing information exchanges in the operational life of an asset using BIM (ISO, 2024). For the Dylan Thomas Centre, the practical benefit would be the creation of an Asset Information Model containing key information such as room data, plant and equipment details, inspection records, warranty information, maintenance frequencies, statutory compliance requirements, listed fabric constraints and digital drawings.

At present, one of the weaknesses identified in the case study is the lack of an easy system for users to report defects. A BIM linked facilities management system could improve this by connecting defects to specific spaces, assets or building elements. For example, if a lecturer reports that a classroom radiator is not working, the report could be logged against that room in the model, with the asset tag, previous repair history and maintenance responsibility visible to the facilities team. This is more effective than a generic email based system because it reduces ambiguity and improves prioritisation.

BIM would also help mitigate risk before any retrofit, repair or refurbishment works take place. Older buildings often have incomplete or inaccurate record drawings, which increases the risk of clashes, abortive work and damage to existing fabric. A scan-to-BIM process would allow the project team to create an accurate measured digital record of the building. Historic England identifies 3D laser scanning as a useful method for recording heritage buildings, particularly where complex geometry, architectural detail or conservation records are required (Historic England, 2018). For the Dylan Thomas Centre, scanning would be valuable before intrusive works because it could record walls, ceilings, roof spaces, service routes, window openings and heritage features before proposals are developed.



However, BIM also has limitations. A full detailed BIM model can be expensive and time-consuming to create. Therefore, the model should be proportionate. It would not be necessary to model every decorative feature in high detail unless it is relevant to conservation, maintenance or planned works. A more realistic recommendation would be a staged BIM approach, beginning with high risk areas such as plant rooms, lecture spaces, exhibition areas, roof voids and areas with frequent defects.

<https://www.oris-connect.com/en/blog/what-is-bim-building-information-modelling>

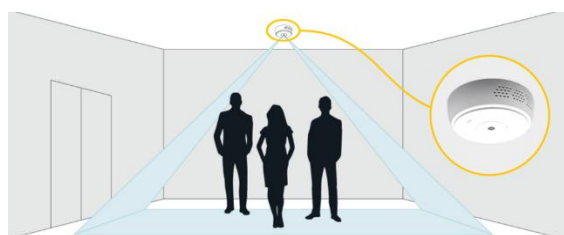
4. SMART BUILDING TECHNOLOGIES AND ENERGY MANAGEMENT

A smart building can be defined as a new or retrofitted building that uses technology to collect and analyse data and control operations to optimise building performance. The smart buildings source (lecture Notes, Moodle) identifies energy efficiency, automated systems, data analytics, connectivity, occupant comfort, safety, predictive maintenance and sustainability as key smart building features.

These features are relevant to the Dylan Thomas Centre, but they need to be applied selectively because of the building's listed status and varied use.

Energy monitoring should be the priority. Without reliable data, the facilities team cannot know which areas are wasting energy, which systems are underperforming or whether retrofit measures are working. CIBSE TM39 promotes best practice in energy metering and sub metering for non-domestic buildings (CIBSE, 2026). For the Dylan Thomas Centre, sub metering could separate energy use between exhibition areas, teaching spaces, offices, cafe/bar areas and theatre spaces. This would help identify whether energy is being wasted in areas with low occupancy or whether certain rooms are consistently more expensive to operate.

Occupancy sensors could also support better energy management. The current room booking process uses CELCAT, with programme leads submitting timetables and changes being managed through dedicated staff. Information is then displayed on staff and student systems and screens outside rooms.



This is useful for booking, but it does not automatically prove actual room use. Occupancy sensors linked to CELCAT data could show whether spaces are booked but unused. Over time, this could allow UWTSd to improve timetabling, reduce unnecessary heating and lighting, and improve space utilisation.

<https://www.terabee.com/occupancy-sensors-smart-detectors-for-smarter-buildings/>

Automatic lighting controls would be a practical low risk retrofit. The case study notes lecture halls as possible areas for automatic light dimmers. This is sensible because lecture theatres and classrooms often experience changing requirements between teaching, presentations, cleaning and vacancy. Occupancy based LED lighting with dimming controls can reduce energy waste without major impact on listed fabric, provided fittings and wiring routes are designed sensitively.

Environmental monitoring is particularly important in the museum and exhibition areas. Temperature, humidity, CO₂ and light level sensors could help facilities managers identify unstable environmental conditions, which may affect visitor comfort and collection care. One suggestion is to install smart sensors for temperature and humidity in the museum area. This is a strong recommendation because it provides evidence before major HVAC changes are made. For instance, if a gallery experiences high humidity at certain times of year, the facilities team could investigate ventilation, fabric moisture, visitor numbers or heating patterns rather than guessing the cause.



A useful case study is The Edge in Amsterdam, which uses more than 28,000 IoT sensors and a mobile app to support workspace booking, comfort control and building performance. The Dylan Thomas Centre is very different in age, scale and heritage sensitivity, but the principle of using sensors to understand occupancy and comfort is transferable.

<https://edge.tech/portfolio/the-edge>

5. DIGITAL TWINS, AI AND PREDICTIVE MAINTENANCE

A digital twin is a digital representation of a physical asset that is connected to data from the real asset. The National Digital Twin Programme describes a digital twin as an extension of a virtual model that includes right time, two-way data flows between the real and digital asset (National Digital Twin Programme, 2026). For the Dylan Thomas Centre, a digital twin would not need to be overly complex at the beginning. A practical version could combine a BIM model, room data, sensor data, energy meters, maintenance records and defect reports.

The main value of a digital twin would be better facilities management. Instead of managing the building reactively, the facilities team could use live or regularly updated data to identify patterns. For example, if a room regularly has high CO₂ levels during lectures, this could indicate poor ventilation or over occupancy. If a heating zone regularly operates when the room is empty, the controls may need adjustment. If humidity is consistently high in an exhibition space, this could trigger investigation before damage occurs. These are realistic improvements that directly support energy management, whole life performance and asset management.

AI could add further value by analysing trends in defects, energy use and occupancy. For example, AI supported analytics could identify abnormal energy consumption, predict likely plant failure or flag



repeated defects in the same building zone. The uploaded smart buildings material notes that predictive maintenance works by monitoring equipment health and performance in real time so that potential issues can be detected early, reducing downtime and repair costs. This would be particularly useful for lifts, boilers, air handling units, pumps, lighting systems and security systems.

<https://www.12dsynergy.com/innovation-showcase/digital-twins-explained/>

The Empire State Building retrofit provides a useful example. Energy efficiency improvements included upgraded windows, insulation, regenerative lift braking, chiller plant upgrades, CO₂ tracking and sophisticated temperature control. The uploaded source states that the retrofit reduced energy usage by as much as 50%. The Dylan Thomas Centre would not be able to copy every measure because of listed building constraints, but the case study shows that older landmark buildings can be significantly improved when retrofit is evidence-led and performance is monitored.

6. PROPOSED DIGITAL RETROFIT STRATEGY FOR THE DYLAN THOMAS CENTRE

The most suitable retrofit strategy for the Dylan Thomas Centre should be phased, proportionate and conservation led. The first phase should be information gathering. This would include a 3D laser scan, condition survey, review of existing operation and maintenance information, asset tagging of key plant and creation of a basic BIM asset model. This would reduce uncertainty and provide a digital baseline for future works.

The second phase should focus on easy win facilities management improvements. A QR-code based defect reporting system should be installed in rooms, toilets, lecture spaces, circulation areas and staff areas. Users could scan a code, select the issue, upload a photo and automatically link the report to a room number. The case study already identifies QR codes as a possible improvement to the current defect reporting process. This would be relatively low cost and would immediately improve communication between building users and the facilities team.

The third phase should introduce targeted sensors. These should include temperature, humidity and CO₂ sensors in museum/exhibition areas, lecture halls and densely occupied classrooms; window sensors in rooms where windows are frequently left open; occupancy sensors in teaching and meeting spaces; and sub meters for major energy zones. Window sensors are specifically identified as a possible improvement in the case study and could be paired with smart thermostats or a digital twin. This would help avoid heating spaces while windows are open, which is a common source of energy waste in older buildings.

The fourth phase should connect the data to a dashboard or light touch digital twin. Facilities staff should be able to view urgent defects, environmental alerts, energy trends, occupancy trends and planned maintenance tasks. Senior managers could use summary dashboards to make investment decisions,

such as whether to upgrade heating controls, improve insulation in specific areas or change room allocation patterns.

The fifth phase should involve targeted physical retrofit measures based on the data collected. These may include LED lighting upgrades, improved heating zoning, smart thermostatic controls, discreet draught proofing, secondary glazing where permitted, plant upgrades, improved ventilation controls and fabric repairs. Historic England stresses that improving historic buildings requires careful consideration of building performance, moisture movement and heritage significance (Historic England, 2024). Therefore, fabric first measures should be selected carefully and monitored after installation.

7. RISKS, LIMITATIONS AND SUITABILITY

Although smart technologies offer significant benefits, they also introduce risks. Cyber security is one of the most important. The uploaded smart buildings source notes that building automation systems can be poorly protected and connected to the internet, making them vulnerable to cyber-attacks. The NCSC also warns that connected places and operational technology require secure design, management and resilience because digital infrastructure can create new vulnerabilities (NCSC, 2021; NCSC, 2024). For the Dylan Thomas Centre, smart systems should not be installed without clear responsibilities for data security, software updates, network separation, user permissions and supplier management.

There are also heritage risks. Sensors, cabling, control panels and plant upgrades could harm historic fabric if poorly installed. The digital retrofit should therefore prioritise wireless or minimally invasive systems where appropriate, reversible fixings, careful service routes and early engagement with conservation officers. Listed building consent may be required for some interventions, especially if they affect the character or fabric of the building.

Cost is another limitation. A full BIM model, digital twin and smart building management platform could be expensive, particularly when funding is limited. The case study itself identifies available funding as a complication. This reinforces the need for a phased strategy. The aim should not be to specify every possible technology, but to prioritise measures that solve real operational problems: defect reporting, energy waste, poor environmental monitoring, inefficient room use and reactive maintenance.

8. CONCLUSION

The Dylan Thomas Centre is a complex building because it combines heritage value, public cultural use, university teaching, events, offices, student union functions and hospitality spaces. Its Grade II listed status and mixed ownership arrangement mean that any retrofit strategy must be realistic, phased and sensitive to conservation requirements. However, these constraints do not prevent improvement. In fact, they make digital technologies more valuable because they allow the building to be better understood before intrusive work is undertaken.

BIM would provide the foundation for improved asset information, maintenance planning and refurbishment risk management. Laser scanning would create an accurate record of the building and reduce uncertainty before works are planned. Smart sensors would allow the facilities team to monitor occupancy, temperature, humidity, CO₂, window opening and energy use. A QR-code based defect reporting system would improve user engagement and allow issues to be linked to rooms and assets. A light touch digital twin would then bring this information together to support planned maintenance, energy management and long-term decision making.

The most appropriate solution is not a fully automated high-cost smart building retrofit, but a practical digital asset management strategy that starts with data capture and builds towards predictive maintenance and better whole-life performance. Examples such as The Edge and the Empire State Building show that smart technologies can improve building performance, but the Dylan Thomas Centre requires a more careful heritage led approach. If implemented properly, these technologies could reduce

energy waste, improve comfort, protect exhibition spaces, streamline maintenance and support more effective facilities management while preserving the building's historic and cultural significance.

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