

Assessing Heritage Interpretation's Inclusion of Building Conservation: Insights from a Quantitative Data Analysis of Eight Welsh Properties

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Abstract

One of the main goals of heritage interpretation is to convey the value of cultural heritage to the public effectively. This process fosters an organic connection between heritage and the public, encouraging individuals to develop a sense of ownership, maintain ongoing interest, and engage in direct activities related to the heritage. Historic buildings use various interpretive methods to communicate with visitors, but how often does this focus on the process of building conservation? Interpretation material was collected from eight Welsh heritage properties from both online and on-site sources. Automatic processing tools were then used to analyse the text extracted from the sources. According to the analysis, the majority of online information pertains to historical narratives and significant events, with only 9.6% being building-related content, of which 3.6% specifically addressing building conservation and restoration. On-site, the proportion of building-related information is higher, at 12.9%, with 7.6% related to building conservation and restoration. By offering a deeper understanding of the building's historic fabric and its conservation, interpretation can foster a stronger connection between people and heritage sites while enriching visitors' experiences.

1. Introduction

Buildings have undergone significant changes due to social and environmental factors. However, they continue to be of architectural, cultural and social significance (Kahn, 1990, Fazio et al., 2013). While social and political transformations have reshaped urban landscapes, historic buildings remain preserved, protected, and passed down through generations as vital components of our collective heritage (Zucconi, 2014, Fazio et al., 2013). Nevertheless, conservation efforts are often overlooked as these buildings are adapted for public use with new functions.

Exhibitions and interpretive materials focus primarily on historical narratives and significant events, frequently neglecting to highlight the importance of conservation. This oversight can result in a disconnect between the public and the heritage they encounter, reducing appreciation for the importance of conservation efforts. However, the absence of publicly accessible information on the specific conservation efforts at Tredegar House, as shown in Figure 1, limits public understanding and appreciation of the conservation work involved.

Advanced technology is crucial in heritage conservation by enabling precise building surveys, early risk assessment, and enhanced preparedness through comprehensive data collection (Ioannides et al., 2014, Shotton and Prizeman, 2024). Integrating artificial intelligence and advances in scientific disciplines has made conservation efforts more systematic and efficient. However, despite these innovations, there remains uncertainty about how effectively conservation efforts and management processes are communicated to visitors.

More than 30,000 listed buildings in Wales contribute to the rich architectural heritage, including railings, gate piers, walls, war memorials, gravestones, post boxes and telephone boxes from Data Map Wales, Welsh Government's GeoPortal for Wales (Welsh Government, 1948). Across the UK, hundreds of thousands of historic buildings play a significant role in shaping the



Figure 1. Conservation work at Tredegar House, presented without accompanying details.

architectural landscape. However, information on conservation projects and maintenance processes remains relatively scarce.

Raising public awareness about building conservation and maintenance is crucial to safeguarding historic buildings in the UK (English Heritage, 2005). Without accessible guidance and resources, many listed buildings suffer from neglect or inappropriate repairs. Educating the public, property owners, local

communities, and volunteers can help prevent irreversible damage, ensure proper restoration practices, and foster a shared sense of responsibility. Increased awareness and engagement could also encourage more significant funding, policy support, and hands-on participation in conservation efforts, ultimately safeguarding these historic structures for future generations (May, 2020).

This study examines how information about the conservation, restoration, and maintenance of historic buildings is provided to online and on-site visitors. By collecting and analysing data, it explores the accessibility, quality, and reach of these resources to assess how effectively they inform and engage visitors in heritage preservation efforts.

2. Research Approach

An analysis of selected case studies is conducted to assess the current state of historic building interpretation in Wales. Although these case studies represent only a small fraction of listed buildings, they provide valuable insights into how different custodians present heritage sites to the public. The research focuses on two key methods of interpretation: online and on-site.

To ensure a comprehensive perspective, the study examines sites managed by four heritage custodians: a nationwide charity, national government, local government, and private heritage charities. Comparing these custodians helps identify variations in public engagement strategies, assess current challenges, and explore potential improvements for the future. Understanding these differences is crucial for shaping more inclusive and effective heritage interpretation across Wales.

2.1 Case Study Selection Criteria

The National Trust manages approximately 500 sites, including 66 in Wales, of which 22 are historic buildings (National Trust, 2024). Cadw oversees 123 sites, 112 of which are open to the public and around 30 of which are non-ruined historic buildings (Cadw, 2024). Data on the total number of sites under the care of Councils and private trusts is not publicly accessible.

The analysis focuses solely on buildings accessible to the public as exhibition spaces, excluding ruins and parks. To ensure consistency across sites, only the principal structure that embodies the site's defining characteristics is considered. Ancillary elements such as stables, gardens, and orangeries were excluded to maintain a clear and focused scope.

Eight properties, including four historic houses and four castles representing North and South Wales, were selected. Two properties from each custodian category were selected to maintain consistency and ensure a representative geographical spread, focusing on similar building typologies. This approach allows for meaningful comparisons while capturing regional variations in heritage management and public engagement.

2.2 Summary of Selected Properties

Basic information about each site is provided in Table 1, while Figure 2 illustrates the current condition of the buildings. In the following, a short description of each selected property is provided.

Plas Mawr is a historically significant Elizabethan townhouse in Conwy, North Wales, built between 1576 and 1585 (Cadw,

	Name	Typology	Grade
Cadw	Plas Mawr	House	1
	Castell Coch	Castle	1
National Trust	Erddig	House	1
	Penrhyn Castle	Castle	1
Council	Cardiff Castle	Castle	1
	Margam Castle	Castle	1
Private Trust	Insole Court	House	2*
	St.John's House	House	2*

Table 1. Sites included as case studies.

2018). Renowned for its well-preserved original features, particularly its intricate decorative plasterwork, the house reflects the wealth and status of its original owner. 1993 Cadw took over the property and completed a four-year restoration project to return it to its 1665 appearance (Cadw, 2018). This project is a key example of historic conservation, showcasing techniques and challenges of the time.

Castell Coch, located north of Cardiff, South Wales, is a historically significant castle protected for its exceptional architectural value. Originally built as an 11th-century fortification, it was later replaced with masonry in the 12th and 13th centuries (Newman, 2001). In the late 19th century, the third Marquess of Bute and architect William Burges reconstructed the castle in the Gothic Revival style (McLees, 2018). Since then, Castell Coch has undergone numerous conservation projects, emphasising preserving its original structure and using local materials. Notable works include replacing roof tiles with slates in 1972 and weatherproofing in 2019 (McLees, 2018). These efforts continue to ensure the castle's preservation for future generations.

Erddig is a historic country house near Wrexham, North Wales, designated as a Grade I listed building. Known for its preservation, it offers a unique glimpse into aristocratic and servant life. After the National Trust took over in 1973, a four-year restoration project was completed with the help of local volunteers, and the house opened to the public in 1977 (Tinniswood, 2023). Erddig features 17th-century origins, 18th-century interiors, and an exquisite garden.

Penrhyn Castle built between 1820 and 1837 in the Norman Revival style, is one of Britain's largest residences. Funded by the Penrhyn slate quarry and sugar plantations in Jamaica, the castle has been managed by the National Trust since 1952 (Groves, 2023). Notably, the castle's interior has remained largely unchanged since its construction. It is part of the Slate Landscape of Northwest Wales, a UNESCO World Heritage Site since 1986 (Groves, 2023).

Cardiff Castle located in the city centre of Cardiff, is a complex site with a diverse history, including Roman origins (Newman, 2001). Its most striking feature is its High Victorian medieval-style interiors, created under the Third Marquess of Bute and architect William Burges in 1868 (Williams, 2014). The castle's exotic rooms, such as the Arab Room and Smoking Rooms, were crafted by leading artists.

Margam Castle built between 1830 and 1840 in the Gothic Revival style, is located near Port Talbot (Margam Country Park, n.d.). It was designed using local stone and bricks. After the estate was inherited in 1890, several alterations were made, including adding a bathroom, billiard room, and courtyard. 1941, the castle contents were auctioned, and a local businessman purchased them. However, it remained uninhabited, leading to its



Figure 2. Eight case studies in Wales. From top left to bottom right: Plas Mawr, Castell Coch, Erddig, Penrhyn Castle, Cardiff Castle, Margam Castle, Insole Court, and St. John's House.

decline (Margam Country Park, n.d.). The castle passed to the local council in 1973, and a fire in 1977 caused significant interior damage. Restoration projects have since aimed to preserve the building's historical value (Gregory, 2023).

Insole Court is located north of Cardiff's city centre and was initially built in 1855 as the home of a prominent family, according to the Cadw Full Report for the Listed Buildings (Cadw, 2003). The building has undergone several name changes and expansions, with notable influences from Cardiff Castle (Lamble, 2018). Designated as a Grade II* listed building, it is of particular national importance and exceptional interest. Insole Court is celebrated for its high-quality interiors. Its transformation and the involvement of the local community have been essential in preserving the building and ensuring its ongoing use as a valuable community space.

St. John's House is the oldest habitable residence in Bridgend, dating back to 1511–1512, as determined by dendrochronological analysis as Cadw Full Report for the Listed Building described (Cadw, 1986). Managed by St. John's Trustees and local volunteers, the house retains remarkable structural integrity, which is uncommon among late medieval and early post-medieval buildings in Wales. Over the years, the house has undergone various alterations, including adding a Georgian kitchen and demolishing the Georgian shop porch.

3. Data Collection

Information was collected from both online resources and on-site visits.

3.1 Online

Online information was initially gathered during the pre-visit phase. Similar to general visitors, this information informed the development of a visit schedule and enhanced understanding of the buildings based on the site's resources. Data analysis was conducted during the post-visit phase. The online information was primarily sourced from the official website provided by the site management, focusing on publicly accessible texts, videos, apps, and virtual tours related to the buildings. Secondary actions requiring registration or membership were excluded, and social media sources were not considered.

This approach aligns with the International Council of Museums (ICOM) concept of Museums for Equality: Diversity and Inclusion (ICOM, 2020), prioritising publicly accessible information to ensure equitable access and foster a consistent experience across different properties.

3.2 On-site

During the site visit, a range of on-site information sources were collected. Text-based information, such as the exhibition's graphic panels, leaflets, and park maps, served as primary sources. Small and portable books purchased in the souvenir store were also analysed. Additionally, on-site videos related to the buildings, displayed in exhibition spaces or visitor centres, were included in the analysis.

Live interpretation methods, such as guided tours and conversations with room stewards, were available at some properties. However, these interactive interpretation methods were excluded from this study due to potential inconsistencies and a lack of clarity in the information provided. Since explanations may vary depending on the guide's condition or audience engagement, including live interpretation could compromise the uniformity and reliability of the data. Additionally, audio guides, specific on-site exhibitions, and digital resources were excluded from the study due to access conditions that varied by location or visitor status. For example, some audio guides were available only to members or for a fee, which could result in inconsistent data across sites. Furthermore, Plas Mawr featured an exhibition unrelated to the site's history. At the same time, Insole Court hosted a temporary exhibition during Heritage Weekend, which did not meet the criteria for consistent public access. These exclusions were made to ensure uniformity and maintain focus on relevant, accessible information across all sites.

4. Data Processing and Analysis

On-site data in image format was converted to text using Optical Character Recognition (OCR), which extracts characters from images and transforms them into machine-readable text. This method significantly reduces the time required for manual

Name	Online				On-site			
	Virtual tour	Website	Video	App	Leaflet	Book	Graphic Panel	On-site video
Plas Mawr	2,004	249	-	-	1,704	13,658	-	3,181
Castell Coch	1,882	2,455	-	-	194	20,750	2,150	-
Erddig	-	4,557	-	-	325	17,833	16,222	1,608
Penrhyn Castle	-	2,575	-	-	32	3,488	3,131	844
Cardiff Castle	1,182	3,868	1,182	(Family)5,516 (Main) 8,156	573	1,354	7,179	-
Margam Castle	-	4,707	-	-	1,911	5,128	7,177	-
Insoel Court	-	3,999	-	-	1,206	-	2,881	-
St.John's House	-	2,903	-	-	160	-	1,624	-

Table 2. Collected Online and On-site data number of words.

Code	Description
Architectural Feature	Decorative and stylistic elements defining the building's character (e.g., wallpaper, plasterwork).
Building Material	Structural materials used in construction, excluding decorative aspects (e.g., stone, slate, tiles).
Conservation & Restoration	Preservation efforts, including repairs, surveys, and reconstructions.
Current Use	How the building functions today (e.g., community centre, wedding venue).
Date	Significant historical periods or construction years (e.g., Elizabethan period, 18th century).
Extension & Alteration	Structural changes over time, including additions, demolitions, and partitions.
Inhabitant	Information about property owners and residents, including their families and servants.
Layout	The arrangement of rooms and spaces (e.g., kitchen, brewery, gatehouse).
Ownership	Property transfers, inheritance, and management by heritage organisations.
Use of the Building	Original function and changes over time (e.g., family house, council offices).

Table 3. Coding Framework for Text Analysis

transcription and enables efficient processing of large volumes of data.

In addition, online and on-site video data in audio format were transcribed into text using Automatic Speech Recognition (ASR). However, text from web pages was directly collected without needing further conversion. The extracted text was then analysed using Qualitative Data Analysis (QDA), which assessed the quantity of text dedicated to various topics. The result of the collected sources and the number of words after preprocessing is presented in Table 2.

4.1 Automatic Speech Recognition (ASR)

Automatic Speech Recognition (ASR), also known as speech-to-text, is a technology that converts spoken language into written text (Malik et al., 2021). ASR was applied to online and on-site videos to extract voice information in text format. Advanced ASR systems incorporate Natural Language Processing (NLP) to enhance accuracy (Lu et al., 2020).

However, background noise and recording quality can negatively impact recognition accuracy. For example, the ASR software struggled to recognise speech when a video was played from one device to another, resulting in lower accuracy than direct speech input. Additionally, many ASR tools are costly. After evaluating various options, YouTube's automatic captioning was identified as a practical alternative. YouTube's machine learning-based speech recognition generates captions automatically, though with varying accuracy (Kim et al., 2019). A video can be uploaded privately, captions can be enabled, and the transcript feature can be used to obtain text.

4.2 Optical Character Recognition (OCR)

Online and offline information was processed using OCR technology provided by Image to Text¹. OCR quickly converts

images containing text into a machine-readable format, automating data extraction. OCR software scans images, identifies characters, assembles them into words, and forms sentences, making the content accessible for editing and analysis. This process significantly reduces manual transcription efforts (Chaudhuri et al., 2017).

4.3 Qualitative Data Analysis (QDA)

NVivo 14, a qualitative data analysis (QDA) software, was used to analyse online and on-site textual information. This tool helps organise and examine non-numerical or unstructured data, such as interviews, survey responses, and historical texts.

Ten coding categories were developed to systematically compare the data as shown in Table 3. Some codes directly describe building attributes, such as *Architectural Features*, *Building Materials* and *Layout*. Others capture visual modifications (*Extensions & Alterations*) or conservation efforts (*Conservation & Restoration*). Additional codes classify historical and social aspects, including *Date*, *Inhabitant* and *Ownership* with occasional overlaps, such as between *Ownership* and *Inhabitant*. The past and present functions of the buildings are separately coded as *Use of the Building* and *Current Use*.

For example, a text from Cardiff Castle states:

"The original house of the early 15th century was enlarged by the 2nd Earl of Pembroke in the 1570s."

Here, '15th century' and '1570s' are coded as *Date*, 'enlarged' as *Extension & Alteration* and '2nd Earl of Pembroke' as *Ownership* and *Inhabitant*.

5. Results and Discussion

5.1 Analysis of Representative Code

There are distinct variations in the quantity of coded references across the different sources. Table 4 summarises the codes with

¹ <https://www.imagetotext.info> (accessed: 2 July 2024)

	Source	Code	Examples	Rate (%)
Plas Mawr	Website	Architectural feature	Townhouse, ornamental plasterwork	12.45
	Virtual Tour	Inhabitant	Dorothy Wynn, Wynn children	0.73
	Leaflet	Layout	Hall, main living room, Parlour	4.73
	Book	Layout	Gatehouse, Great chamber, brewhouse	2.66
	On-site video	Conservation & Restoration	Lime plaster mix..., conserved, replaced..	100
Castell Coch	Website	Conservation & Restoration	Preserving..., re-pointing of stone walls..	12.13
	Virtual Tour	Layout	Banqueting hall, drawing room	4.73
	App	-	-	0
	Leaflet	Layout	Lady Bute's bedroom, kitchen	9.18
	Graphic panel	Conservation & Restoration	Wait for the wall dry..., and restore the ornate decorations	10.43
Erddig	Book	Layout	Gatehouse, Servant's stair, dressing room	3.27
	Website	Conservation & Restoration	restoration and conservation project..., severe state of deterioration	12.18
	Leaflet	Inhabitant	Louisa Yorke, Annie Parry, Philip Yorke I	4.11
	Graphic panel	Inhabitant	Simon IV, John Meller, Lily Gillam	5.39
	Book	Inhabitant	Rose Williams, Philip III, George Dickinson	4.77
Penrhyn Castle	On-site Virtual Tour	Layout	Servants' Hall, New Kitchen, Stateroom	8.35
	Website	Inhabitant	George Hay Dawkins-Pennant, Edward Douglas-Pennant	2.77
	Leaflet	-	-	0
	Graphic panel	Layout	Great Staircase, Grand Hall, Breakfast Room	3.37
	On-site video	Layout	Drawing Room, Ebony Room, Chapel	6.93
Cardiff Castle	Book	Ownership	George Hay Dawkins- Pennant, Edward Douglas- Pennant	1.07
	Website	Layout	Small Dining Room, Library, Banqueting Hall	1.78
	App	Inhabitant	Lord Bute, Bute family	0.89
	Leaflet	Inhabitant	Richard Beauchamp, 3rd Marquess of Bute	4.95
	Graphic panel	Layout	Nursery, Winter Smoking Room, Summer Smoking Room	3.49
Margam Castle	Book	Inhabitant	Lord, his family	3.31
	Website	Conservation & Restoration	Virtual reconstructions..., creating a virtual Margam..	4.01
	Leaflet	Ownership	Christopher Rice Mansel Talbot, Neath Port Talbot Council	4.15
	Graphic Panel	Ownership and Inhabitant	Miss Emily Charlotte Talbot	0.28
	Book	Ownership	Captain Andrew Mansel Talbot Fletcher, Sir David Evans-Bevan	2.41
Insole Court	Website	Current use	Wedding, Filming, Conferences	0.97
	Leaflet	Inhabitant	Insole family, George Insole	3.53
	Graphic Panel	Extension & Alteration	large extension built, further extensions and alterations	6.65
St. John's House	Website	Layout	Central passage, Great Hall, Solar	4.2
	Online video	Current use	Community focus, themed events	6.39
	Leaflet	Use of the building	Town House, Hospice, Cobbler's shop	4.21
	Graphic Panel	Architectural feature	Hearth passage house	3.04

Table 4. Highest code in each property and examples.

the highest frequency from each source, examples, and their corresponding rates.

For Cadw properties, Plas Mawr features the code *Architectural Feature* and *Layout* are the most frequently mentioned codes, as shown in Table 4. While *Inhabitant* and *Conservation & Restoration* were discussed less frequently, the *Conservation & Restoration* code, which relates to the on-site video, sets Plas Mawr apart from other sites by providing insight into previous restoration projects. This illustrates how interpretive tools can raise conservation awareness, though the lack of online access limits broader engagement. However, this raises questions about how effectively the video enhances visitors' understanding of the restoration process. In comparison, Castell Coch prioritises *Layout* as the most frequently coded theme, followed by *Conservation & Restoration*, reflecting the importance of both design and preservation. However, this site's overall volume of data was notably lower, and references focused more on deterioration than specific conservation projects or processes.

For the National Trust properties, Erddig stands out with the most frequent mention of *Inhabitant*, which strongly focuses on its past residents' lifestyle and domestic experiences. *Conservation & Restoration* and *Layout* were less emphasised but still noteworthy. However, the conservation content is primarily related to ongoing work on the collection, with very limited reference to the conservation of the building itself. Penrhyn Castle has a more balanced distribution, with *Layout* being mentioned most often, followed by *Inhabitant* and *Ownership*. This suggests that while the physical design is key, the historical context of ownership was also significant, but not the primary focus.

Council-managed properties include Cardiff Castle and Margam Castle. Cardiff Castle presents a balanced focus on both the *Layout* and the *Inhabitant*, suggesting equal emphasis on both physical design and the historical narratives of its inhabitants. Margam Castle, however, places greater importance on *Ownership*, reflecting a strong interest in the site's historical ownership context. At the same time, *Conservation & Restoration* also play a role due to the ongoing project.

Finally, the coding shows more balance for the Private Trust properties, Insole Court and St. John's House. Insole Court mentions *Current Use*, *Inhabitant*, and *Extension & Alteration*, emphasising both the building's presence and adaptations. St. John's House also shows an even distribution, highlighting various aspects like *Layout*, *Current Use*, and *Architectural Features*, which suggests a broad interest in the design, activities, and usage of the building.

The analysis reveals different priorities between groups. For example, properties under Cadw and National Trust focus on the *Inhabitant* code, emphasising the historical and lifestyle aspects. On the other hand, *Layout* codes are prominent in Cadw and Council-managed properties, emphasising the importance of spatial organisation for the visitor experience. Meanwhile, *Conservation & Restoration* codes are most significant in Cadw and Council properties, highlighting ongoing preservation efforts. However, except Plas Mawr, all information provided was temporary, and no comprehensive information was available regarding past, present, or future conservation plans.

These findings suggest that while Cadw properties stress design

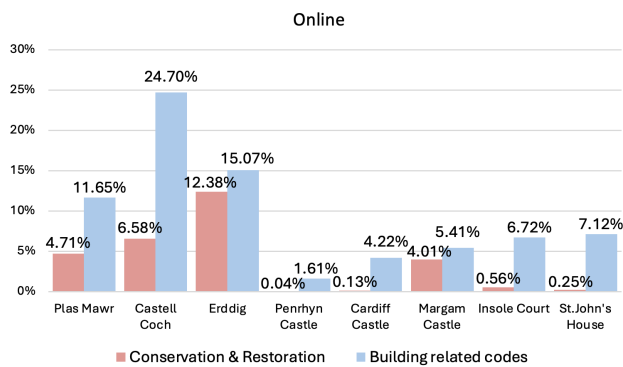


Figure 3. Percentage of *Conservation & Restoration* textual content in online sources compared with building-related codes.

and conservation, National Trust properties emphasise lifestyle and history, and Council-managed properties focus on both historical narratives and spatial Layout. Privately-managed trusts, however, appear to prioritise adaptations to meet the current needs of the local community.

5.2 Analysis of the Building and Conservation Code

This analysis compares the values associated with representing historic buildings and building conservation across each property. Online and on-site data values were calculated separately by dividing the total amount of information by the number of sources for each case, whether online or on-site. The coverage percentage was analysed as the representative metric, considering words, references, and percentages.

Two groups are designed: one focusing on building-related codes and the other on building conservation. The codes related to the building, as briefly outlined in the methodology, facilitate an understanding of the quantity of information about historic building interpretation. These codes include *Architectural Features*, *Building Materials*, *Conservation & Restoration*, *Extension & Alteration*, and *Layout*. Given the notable disparities between online and on-site information, each category will be compared separately to enhance the accuracy of the analysis. The *Conservation & Restoration* will be compared across all properties to evaluate the amount of information provided to the public, promoting engagement in conservation efforts.

5.2.1 Online Figure 3 shows that Castell Coch provides substantial online content about its building, with 24.7% dedicated to building-related aspects. This high percentage likely reflects its ongoing restoration project. However, information coded under *Conservation & Restoration* (6.58%) is comparatively lower and appears to focus more on the collection conservation aspect. Even when excluding the conservation of the collection content, a significant portion still emphasises architectural features and design.

Erd dig also stands out, with 12.38% of its online material covering conservation and restoration and 15.07% focusing on building-related information. Since the coding approach combines building and general restoration, Erd dig's percentage includes architectural restoration and collection care content. This dual emphasis suggests a more integrated interpretation of the site's ongoing work.

In contrast, Plas Mawr presents a notable gap between the two categories—only 4.71% of its content addresses conservation

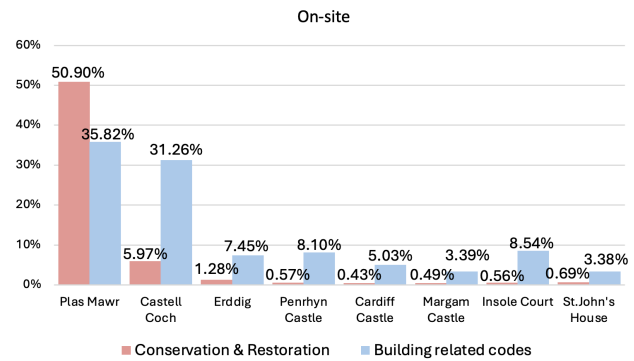


Figure 4. Percentage of *Conservation & Restoration* textual content in on-site sources compared with building-related codes.

efforts, while 11.65% focuses on architectural description. This imbalance may reflect a shift toward showcasing its unique Elizabethan design rather than past restoration activities.

At Margam Castle, digital restoration and ongoing conservation account for 4.01%, slightly less than the 5.41% related to architectural features. This indicates an emphasis on active projects and current interventions rather than historical conservation narratives.

Meanwhile, Penrhyn Castle shows very low values in both categories (0.04% for conservation and 1.61% for building), suggesting that its online interpretation may prioritise other aspects of the site, such as social history or thematic storytelling, over architectural or restoration content. Similar trends can be seen at Insole Court and St. John's House, where building-related codes are moderately represented, but conservation aspects remain minimal.

Looking across management types, Cadw properties (e.g., Castell Coch, Plas Mawr) emphasise architectural features and ongoing conservation efforts, especially through building descriptions. National Trust sites (e.g., Erd dig) highlight both the building and its collections, suggesting a more holistic interpretive strategy. Council-managed properties (e.g., Cardiff Castle and Margam Castle) place more emphasis on spatial design. At the same time, private trust sites (e.g., Insole Court and St. John's House) display a more balanced distribution between architectural detail and current adaptation projects.

Overall, these findings reveal a tendency for online content to favour descriptions of the building itself, sometimes at the expense of deeper narratives about restoration or conservation work. On average across all sites, 9.6% of the textual content corresponds to the building, while only 3.6% to the *Conservation & Restoration* efforts. This may influence public perceptions, leading to underappreciation of the ongoing effort required to maintain heritage sites. Future digital strategies could benefit from a more even emphasis, showcasing both the beauty and the behind-the-scenes work of heritage preservation.

5.2.2 On-site As mentioned in Figure 4, Plas Mawr stands out with the highest proportion of on-site content related to the previous conservation project, accounting for 50.9%. However, building-related codes are lower at 35.82%, partly due to the larger number of categories averaged during analysis. Nonetheless, both values suggest that Plas Mawr places a strong interpretive focus on the building and its restoration efforts compared to other sites.

Castell Coch also has a relatively high percentage of building-related issues, at 31.26%, while the conservation content is lower, at 5.97%. This suggests a stronger emphasis on the building's architectural layout and spatial qualities rather than materials or restoration processes.

Among Cadw-managed sites, both Castell Coch and Plas Mawr reflect a clear emphasis on building interpretation, either through conservation efforts or structural design. In contrast, National Trust properties such as Erddig show a notable drop in on-site building-related content (7.45%) compared to their online presence, indicating a shift in interpretive focus depending on the platform.

Council-managed sites and private trust properties show relatively low mentions of *Architectural* and *Conservation & Restoration* codes. As seen in Figure 4, except Insole Court, only 3–5% of the codes are related to buildings, and none of the sites have more than 1% focused on conservation. This indicates that these two heritage custodians place their focus on areas other than building and conservation.

In general, the on-site data show a greater variation in emphasis between sites and management bodies. Although some prioritise conservation narratives (e.g. Plas Mawr), others focus more on spatial or architectural elements, highlighting the diverse strategies used to engage visitors in the physical space of heritage. In this case, *Conservation & Restoration* content represents a 7.6% across all sites on average, with building content being 12.9%.

6. Limitations

6.1 Constraints in Data Collection

This study primarily relied on textual sources, limiting the integration of live interpretation and temporary exhibitions. While some properties offered interactive interpretation methods, such as guided tours, audio guides and conversations with room stewards, these were excluded from the analysis due to concerns about consistency, as explained in Section 3.2.

These limitations, while necessary for maintaining consistency, also mean that some aspects of the visitor experience, such as live interpretations and temporary exhibitions, were not fully incorporated into the analysis. Future research could benefit from exploring these aspects further to provide a more comprehensive understanding of heritage interpretation.

6.2 Inaccuracies in ASR and OCR Data Processing

While NVivo 14 enabled the analysis of unstructured data, the accuracy of the data collection methods, specifically ASR and OCR, presented challenges.

For OCR, extracting text from images was complicated by misaligned text blocks, incorrect character recognition, and typographic elements, such as drop caps, that distorted the results. In some cases, OCR misinterpreted page layouts, merging separate sections or failing to distinguish between headings and body text. All OCR-generated text was manually reviewed and corrected to maintain accuracy, although some discrepancies may still exist.

These limitations were considered in the NVivo 14 analysis, and adjustments were made to minimise errors and preserve the integrity of the qualitative findings.

6.3 NVivo Coding Limitations

The coding framework was designed before a detailed analysis, leading to imbalances in the final coding distribution. A more iterative approach, refining the codes after becoming more familiar with the content, could have resulted in a more comprehensive and evenly distributed set of codes. This remains an area for future research.

Not all content was coded, meaning the total values in the graphs do not sum to 100%. In the case of Cardiff Castle, much of the material related to the wider site rather than the Victorian mansion, which significantly reduced the overall total of specific coded themes.

The *Architectural Feature* code covered various topics, including architectural style, building structure, and decorative elements. This made it difficult to assess the relative importance of these sub-themes. A more refined classification distinguishing between these elements would improve accuracy.

The selection of coded content also presented challenges. Some instances were coded at the word level, while others were coded at the sentence level, leading to inconsistencies. For example, in "Third Marquess of Bute", coding each word separately resulted in fragmented data, where terms like "Third" and "of" were irrelevant to *Ownership*. Future research could apply Natural Language Processing techniques to enhance text analysis beyond individual word coding (Fanni et al., 2023).

7. Conclusion

This research examined the extent to which historic building sites in Wales provide information on conservation and maintenance efforts, both online and on-site. The analysis, utilising ASR, OCR, and NVivo for text analysis, revealed that online content accounts for 9.6% of building-related information on average, with only 3.6% specifically addressing conservation and restoration. On-site, 12.9% of the content is related to building features, with 7.6% focusing on conservation efforts.

The findings suggest a significant opportunity to enhance public understanding of building conservation. Providing more comprehensive information on the conservation process, the role of conservators, and the ongoing preservation efforts can help foster a deeper connection between visitors and heritage sites. These efforts have the potential to enhance the visitor experience and inspire future generations to pursue careers in heritage conservation, ultimately supporting the long-term preservation of cultural heritage.

Given the limited sample size, this study offers an initial insight into heritage interpretation practices. Future research should include a broader range and greater number of sites to strengthen the generalisability of findings across the Welsh heritage landscape and beyond. It could also explore the potential of advanced digital tools, such as Augmented Reality (AR), Virtual Reality (VR), and Extended Reality (XR), to visually demonstrate the changes that buildings undergo throughout their life cycle, particularly in the context of conservation and maintenance. These advanced digital tools have already proved successful in the context of public engagement (Giordano et al., 2023, Tscheu and Buhalis, 2016). With these technologies, it should be possible to showcase restoration projects' pre- and

post-conservation effects, offering visitors an immersive experience highlighting the challenges of preserving historic structures (De la Fuente Prieto et al., 2017). This approach could help visitors understand the physical transformations and engage them in the real-time processes of building conservation (Tscheu and Buhalis, 2016, Bocconcino et al., 2024), enhancing their appreciation for the complexity of maintaining heritage buildings and making the conservation process more transparent and accessible.

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