ASSESSING THE EFFECTIVENESS OF MAINTENANCE PRACTICE, IN CARING FOR HISTORIC BUILDINGS

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Building maintenance constitutes a significant component of the construction expenditure of many advanced nations and critical to the sustainability of most built assets; yet there appears little retrospective analysis of just how effective is the delivery of this support service to the care of U.K. historic buildings, or what quality standards are implicitly accepted by those tasked with responsibility for the function. Despite numerous reports having been produced on maintenance practice, over the past three decades, standards of service delivery appear highly variable. This present study reports on assessments made of a sample of eighty case-study buildings (all designated of historic or heritage value). The buildings were evaluated by a detailed observation process as part of a stock condition survey and then condition rating their principal elements and components, against pre-determined criteria. The research method used observations, digital photography and a standard pro-forma template from which it generated quantative data that assessed the quality of maintenance care provided. Analysis of results emanating, indicates wide ranging disparities in the standard of delivery afforded to certain facilities. The aggregate average score of the sampled buildings reported herein, was only 52.3% (expressed as a percentage). Whilst the sample studied cannot claim to be comprehensive, it has generated data that indicates maintenance practice can be improved considerably.

Keywords: asset management, building conservation, condition surveys, maintenance management.

INTRODUCTION

This research aims to identify: 'just how effective is the care (Wood, 2005) and management of historic built assets?' Founded within the United Kingdom (U.K.) where formal procedures exist for the designation of buildings and structures of 'architectural or historical interest' (English Heritage, 2010 a; 2010 b) this investigative study identified statutorily protected assets that: continue to decay, historic fabric being irretrievably damaged, as a consequence of neglect, and a lack of care or inappropriate intervention being given. For society to sustain these premises and by association their contents and fittings (for the benefit of future generations) it appears essential that the most effective, appropriate and fully integrated maintenance and asset/ facilities management methods available, are identified, critically evaluated and best practice disseminated, to the custodianship and care of the asset. This broad argument has been made in many reports and formal studies (The Audit Commission 1986, 1988, 2000; Avis *et al.*, 1989; NHS Estates, 2002; 2004; Hooper *et al.*, 2009).

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The following sections present areas studied and evaluated by the research which following review of literature are based on field surveys, observation recording and subsequent analysis. Finally, results and conclusions are drawn with issues that warrant further noted.

CONTEXT

Historic built assets comprise a major component of the cultural heritage and capital of advanced nations. Buildings and estates encapsulated by such criteria engender a sense of purpose, continuity and pride. Whilst reflecting history, they also define and shape values, providing guidance for present and future societies. Many historic built assets afford enclosure and structural support; and act as a filter that moderates excesses imposed by natural and man-made environments which might otherwise threaten the comfort or even long-term sustainability of a heritage asset. Some built heritage assets are held 'inalienably' by 'custodians' for the benefit of future generations (Morris, 1877). It is crucial therefore, that wholly effective maintenance care is afforded to the delivery of services and the sustenance of what can be irreplaceable resources.

Managing the maintenance of buildings has often been referred to as the built environments ‘Cinderella’ (Seeley, 1976; Francis (1992, p.1) and although Wood (2005, p.1) could claim that ‘Cinderella has already been to the ball,’ the perception remains stereotypically of a minority specialism, undertaken by small and medium sized contractors - engaged at the fringes of mainstream construction activity. This concept is a misnomer, as repair and maintenance of buildings is a complex industry and potentially, the principal construction sector, in terms of financial output, number of individual work jobs undertaken, employment opportunities and skill sets required. (NHTG, 2008).Caring for buildings should afford the potential opportunity of a relatively stable workload and employment sector that allows for the development of long-term business relationships with clients/host organisations. This is an important consideration for contractors' during periods of economic downturn or where regular workflow is required (LEK, 2010). To this, one could also add the extension, periodic refurbishment (retrofitting), statutory compliance and upgrading of built assets, typically undertaken by these and similar firms/organisations. The full extent of the sector is not capable of being fully compounded, as it includes the often maligned ‘do it yourself’ (D.I.Y.) industry and the unquantifiable labour output of a black economy, much of which is focused upon building repairs and minor improvements to the existing building stock.

Conservation of heritage buildings falls clearly within the maintenance sector but is potentially, that where the highest levels of skill, care and due-diligence are necessary. Ongoing research within this area utilises a case study approach that involved field observation linked to the application of recognised building stock condition methods to record the physical condition of built heritage assets and the standards of care which they are given. To-date more than eighty buildings have been sampled. The research seeks to develop upon work undertaken by Maintain our Heritage (MOH, 2004) and at their instigation reports by, Arup (2003a, b and c); De Montfort Expertise Ltd (2003) and the University of the West of England (2003 a, b and c) who were commissioned to produce a series of extensive inter-linked reports that form a benchmark for this discipline. The limitation of these studies did not attempt to assess and review actual standards of repair and maintenance or service delivery to

individual built heritage assets although they and the NHTG (2008) did explore the training needs and basic structure of the sector.

LITERATURE REVIEW

Repair and Maintenance (R & M) is big business, accounting for a significant proportion of U.K. Gross Domestic Product (GDP). Official figures place this somewhere between 34% and 52% of total construction output as identified by BMI (1998), MOH (2004) BCIS (2010). The U.K Government's 'Office of National Statistics' (O.N.S.) data (2011) official figures, indicate the proportion of repair and maintenance spend appears to be falling at a time of severe economic downturn within the new build construction sector. Either these figures are incorrect and the ONS are unable to glean true figures (due to their being concealed by the black economy) or there is an alarming reduction in expenditure on maintenance which is either being deferred or an additional back-log created that will inevitably result in decay of historic fabric. Efficient maintenance being critical to ensure premises operate effectively - as pieces of functional plant that aid and enhance organisation, individual and societal performance. This is vital with heritage estates and facilities that may also house valuable artefacts' that need to be conserved as opposed to being renewed, restored or replaced.

Caring for existing buildings can preserve cultural resources and skills whilst retaining capital and embodied carbon assets. As a consequence, this is possibly one of the most sustainable activities that society can embrace - if it is to serve the needs and expectations of future generations. Building conservation (although only a small component part within a much wider industry focused on the repair of largely traditional buildings) offers philosophies and approaches that can greatly assist with delivering best practice. As the management of buildings and the fiscal and legislative regimes in which buildings are operated becomes increasingly complex, building maintenance must continue to develop and evolve - as a key professional discipline - if it is to serve the needs of all building users and ensure that we fulfil responsibilities of guardianship in protecting the asset, for use by future generations. How many existing organisations (Public or Private Sector) fail to understand (or do not wish to grasp) the true cost of running their property portfolio? This argument has been made many times during the last twenty five years in the public and private sectors by authors such as: Avis, M. *et al.*, (1989) The Audit Commission (1986, 1988 and 2000), English Heritage (2010c) but still appears to be seen as a cost burden and a negative draw on limited revenue expenditure - as opposed to being considered a positive investment opportunity in a significant, capital asset that can enhance the quality of occupancy, business use or building performance. Consider the true cost of a breakdown or building defect failure - to the productivity of an organisation, stakeholders/clients and loss of historic fabric.

Defining Building Maintenance

British Standard 7913 (1998, p.3) described maintenance as the: 'Routine work necessary to keep the fabric of a building… in good order' yet, it can often prove difficult to conclude, exactly where maintenance work ceases and a repair action starts. This British Standard describes 'repair', as being distinct and greater in scope than maintenance, but lesser in scale than restoration or alteration. A repair involves placing the element, component or building in good order. The issue is that whilst repairs are inevitable they will always lead to a loss or change in fabric. This is to be mitigated wherever possible, in the case of a historic asset.

Restoration could be considered an anathema, as it is clearly at the opposite end of the spectrum to sustainable conservation. B.S. 8210 (1986) 'The Guide to Building Maintenance Management' defined building maintenance as: ‘work, other than daily and routine cleaning, necessary to maintain the performance of the building fabric and its services’ and suggests that planned maintenance is: ‘… work organized and carried out with forethought, control and the use of records, to a predetermined plan based on the results of previous condition surveys.’ This concept is that being applied to the research study, founded as it is, on the principle of establishing what is actually happening to the elements and components of historic buildings. Likewise, BS EN 1534 (2007) asserts maintenance performance results from actively managing resources to retain or restore an asset to a state where it can perform its required function. This more recent Standard stresses how maintenance performance depends upon factors including: building location, organisational culture and scale, policy, procedures, processes, use of the building and age. Being highly dependant upon the use of preventive, corrective and improvement maintenance, it requires: labour, technology, materials, organisational methods, and operational techniques to be utilised effectively. Maintenance is therefore a highly skilled specialist discipline requiring considerable competence, especially when applied to the care of historic assets.

Asset Management

The importance of built asset management and maintenance was stressed by NHS Estates (2004) when they made the case for: ‘… a systematic approach… ensuring the asset base of (an) … organization directly supports building objectives … whilst achieving best value’ The NHS view of 'asset management' can be summarised broadly as an attempt to formulate where an organisation and its estate are currently, by reviewing standards, benchmarking and comparing estate fit with organizational aims, aspirations, mission and objectives. Following review of standards, facility delivery, and maintenance requirements can then be pro-actively identified, planned, changes implemented, serviced delivered and reviewed.

This goal appears easier to attain with a modern facility than where the facility is of heritage value, It is noticeable that the health sector has gradually been migrating from retention of older properties within its estate portfolio. This is not however, an option for all buildings or organisations and given a need to attain best value in maintenance the sector is starting to look to incorporate lean methodologies (Sharp, 2010) borrowed from the manufacturing and automotive industries.

RESEARCH METHOD

The research developed a condition based assessment founded on established condition survey methods to complete a pro-forma to record: construction; age; use; condition, and maintenance backlog at each asset. This with the aim of attempting to identify: 'just how effective is the care and management of historic built assets?' Accepting that when using this method it was not possible to research all buildings and types within a very large population, a sampling frame was necessary that would allow a range of buildings to be assessed, critically evaluated and relevant data generated, within reasonable timescales. Use of questionnaires were initially considered but subsequently discounted - as the resulting data would only be as accurate as the questions raised and rest heavily upon: the knowledge and honesty of the respondents; the number of responses received and the analysis and evaluation arising.

A means of gathering relevant valid data, independent of potential bias was sought. This had to allow data to be reported on the actual state of condition of fabric and facilities service delivery - as opposed to that stated by employees/consultants tasked by an organisation to care for the asset or that contained within policy documents. As suitable secondary data-sets did not appear to be available, data was collected independently by the researcher - a practising Chartered Building Surveyor with experience of historic buildings and familiar with the use of a range of building survey methods. The focus of the study made use of physical observations to record and evaluate condition data against 'set criteria'. Being cross-disciplinary in nature and independent of any host organisation, funding bodies or project partners, it is argued that a more reflective balanced view was taken.

The initial research involved a wide ranging sample of 100 case-study historic buildings and estates although only 80 are currently reported (as some were later found to be unsuitable for statistical analysis within the context of this briefing paper - as not all attributes could be assessed). These will be used as part of future refinement and further investigation. Each of the facilities was visited, surveyed and extensively photographed using digital cameras. A pre-printed form was completed at the time the building survey data was being collated. This allowed for the capture and establishment of asset condition and facilities services delivery at a specific point in time. Although the sample was broad in scope, it considered buildings under discrete use, location and ownership typologies; thereby allowing comparisons to be drawn.

The Condition Survey ‘pro-forma’ was developed and weighted with consideration given to use of alpha or numeric condition rating scales. The latter being chosen. Numerous precedents and guidance for these methods exist. Similar ratings having been widely used as key components in the asset/facility management evaluation of large, estate portfolios within the UK, including: NHS Estates (2002 and (2004); The Ministry of Defence (NHS 2004) Valuation Office (2004) as well as the Higher and Further Education Funding Councils’ of both England and Wales. The rating system ultimately chosen for the surveys applied a numeric scale of 1-5, as this equated with that of the established 'Likert' research method. An ordinal scale with [1] being considered in poor repair and [5] rated as excellent. Quality related judgements arose from quantified information, gathered via the completed Survey pro-forma and condition based photographic data collected by the researcher.

Each of the sites was extensively photographed digitally whilst being recorded and assessed by direct observation. The survey pro-forma being completed by the researcher (against pre-set condition criteria) prior to undertaking basic statistical analysis. Whilst issue could be raised with the information gathering process (as there can be consistency factors, if a wide range of surveyors are engaged and briefing is variable) all these ratings have been undertaken by a single surveyor, working to pre-determined criteria - hence the risk of variables has it is argued been greatly reduced. Collected data was subsequently checked by two independent, similarly qualified and experienced surveyors who sample tested three of the buildings using 'attribute gauge analysis' methods to ensure that there was consistency and repeatability within the surveyor's judgements.

This Survey recorded the condition rating of each of the major components and elements, focussing upon the visual condition of the principal buildings, their elevations, accessible surface areas, contents and services.

Buildings and Historic Estates were categorised, into distinct typological ‘use groupings' (e.g.: Castles, Country Houses, Ecclesiastical buildings - the latter including Churches, Abbeys and Cathedrals). Geographically, the study was limited (due to resources) to sites, predominantly within Wales and the south of England, but a control sample of case-study buildings, was included, of structures from other regions and countries of the United Kingdom, including the south-east of England, the Midlands, the North and Scotland. From the completed pro-forma generated for each building - a unique case-study asset record (containing performance in–use and attribute data) has resulted. Use of digital photography has assisted in gathering detailed records of physical condition and repair in a timely manner. Images have been entered using Microsoft Power-Point software onto a data-base of case-study presentations. The captured images can also be interrogated using standard 'zoom in' functions available in most photographic software, thus allowing for detailed inspection via a computer screen which traditionally, would have required the use of binoculars and extensive periods to be spent on site. Each building is given a single case study reference number and the data gathered collated and analysed.

RESULTS AND ANALYSIS

Whilst it is not possible within the scope of this paper, to report fully the many results obtained, a small range of findings are outlined below. These focus predominantly on the 'Historic House' sector where 18 buildings were surveyed. From the results obtained, preliminary findings and recommendations have been drawn. Pivot-field table tests and average scores have been calculated for each typology. The aggregate average score for the eighty sampled buildings across all elements (when converted to a percentage is 52.3%). This clearly infers that standards of care are limited and that considerable scope for improvement existed. Further statistical testing of the data is ongoing.

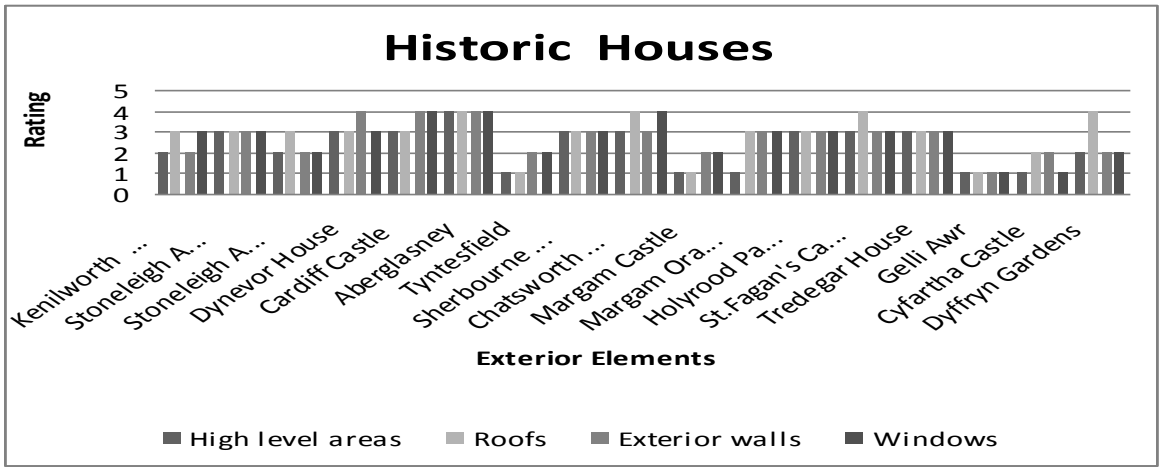

Figure 1. Exterior Elements.

Within Figure 1., the aggregated arithmetic mean score for the physical condition of the exterior facades - at the time of the survey inspection was (2.611) as opposed to (3.50 and 3.64 respectively) for the grounds and visitor-centre facilities Figure 2. It is noticeable that vulnerable high level areas of the buildings (such as parapets and roofs) often score a lower rating than the less vulnerable but much more easily accessed window and wall surfaces. There is a danger that high risk areas where the potential for damage and serious loss of fabric are given less care than areas where the asset is less at risk.

Grounds maintenance (Figure 2.) is an activity that scored reasonably in most incidences, especially where the provision is a basic 'scrape and graze finish' e,g, grass/gravel surface, but often faltered where a higher standard of horticultural skill was required. The rating for Cyfartha Castle was being reduced due it to being affected by ongoing refurbishment and building works, whilst Gelli-Aur was clearly compromised by the discontinuity in ownership between the historic house and garden. The building at serious risk due to alack of security and maintenance to ensure the roof covering was maintained.

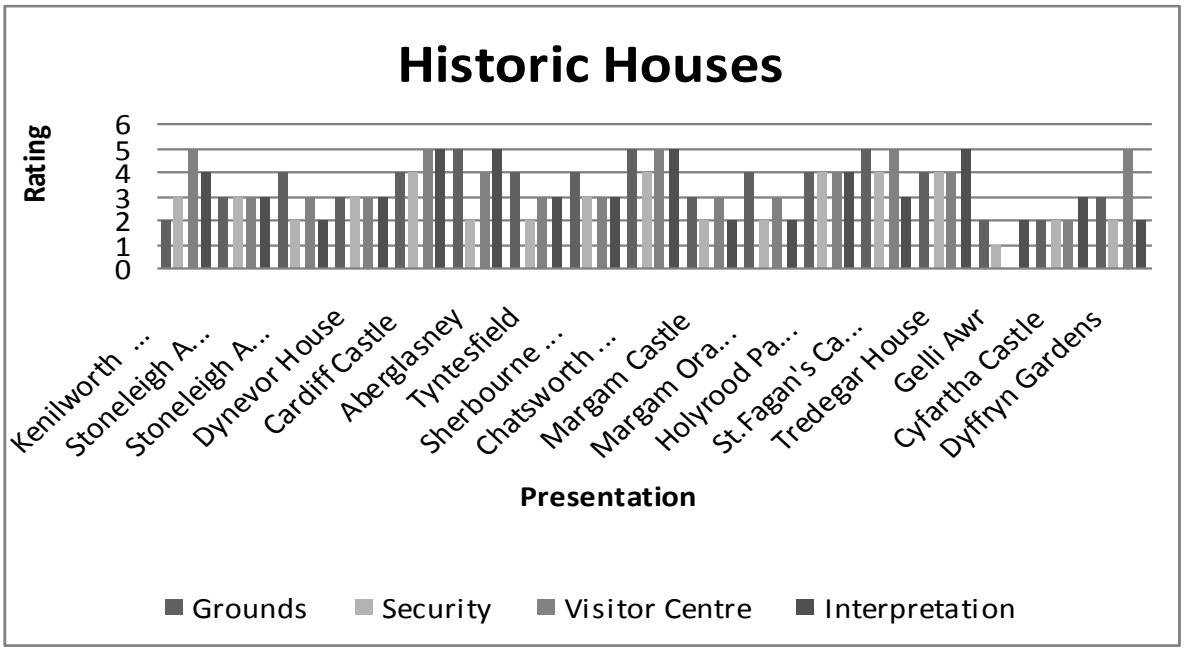

Figure 2. Presentation of the asset for tourism purposes.

It appears that many charged with guardianship of Historic Houses clearly believe in promotion of the facility, possibly as a means of generating funding that might in future years generate enhanced income streams (that could possibly be used to repair the facility) as very high ratings were identified for the provision and upkeep of some high quality visitor centre facilities, often at long established venues such as: Kenilworth Castle, Cardiff Castle, Chatsworth House, St. Fagan's Castle etc. Many have received significant grant aided funding, but it is surprising to note recent substantial expenditure on what are very poorly maintained historic facilities such as Dyffryn Gardens, or the recent partially rebuilt Aberglasney, where the building is desperately in need of re-use (despite the huge success of the restoration of the grounds), or the fire ravaged Margam Castle which remains in very poor physical condition after more than two decades, but where there has been a multi-million pound investment in a highly sustainable modern building. The opportunity to fit out the existing building incorporating visitor reception facilities within the original structure has been ignored.

The research reveals that at certain sites, much greater emphasis is placed upon tourism and promotion of the heritage facility, than the care of the external fabric of the built heritage asset that is the attraction.

Providing access to facilities for everyone and 'Disability Discrimination Act' compliance works are often limited by the topographical nature of an individual site on which a building is constructed. The original physical / architectural form and use

of the building are factors, posing demands on potential funding sources. Increased emphasis on accessibility issues and awareness of legislation has seen improvements being made; although some buildings will always pose a challenge. Buildings ‘Listed as being of special architectural or historical significance' may limit the opportunity for interventions and challenge site managers to adopt alternative options within 'design and access statements'.

CONCLUSIONS

Building conservation, building maintenance and asset management are extensive inter-related disciplines that need to be effectively but sensitively engaged, if the asset is to be successfully retained in good repair. Research has identified, adopted and refined a method (which although rooted in established surveying practice) appears well suited to the preventative care of built assets and facilities at a range of differing organisations (and at times, branches of the same organisation). The study is scoping in its attempt to identify inter-dependencies, inter-faces and examples of best, reasonable and indifferent practice whilst allowing effective procedures and recommendations to be offered, to aid professional practice.

Whilst accepting the study is far from comprehensive, research completed affirms that the effectiveness of care given to historic built assets is variable with considerable scope for improvement. Some premises are at serious risk of damage, due to the questionable tendency to focus scarce assets and resources upon visitor attractions at some sites, possibly at the expense of the physical fabric. This is of particular concern where it impacts on the routine care of the high level in-accessible areas, which although often partly out of sight to visitors; are the areas where great long term damage can occur. In others, significant improvements are necessary both to the funding and the service delivery standards. As few facilities scored highly across the range, the concepts of a sustainable long-term care approach to Historic Buildings are missing. Many require an integrated, holistic approach, to be taken to management and facility care. Potential benefits accruing from the integration of these disciplines, would allow a comprehensive approach to be taken for the benefit of succeeding generations. There is scope therefore to further refine and then apply this research method widely across a range of built assets and organisations, in order to identify average aggregate and benchmark sector best practice scores.

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