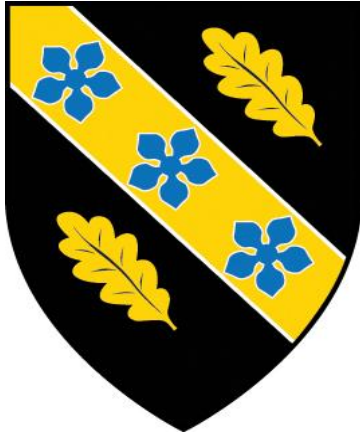




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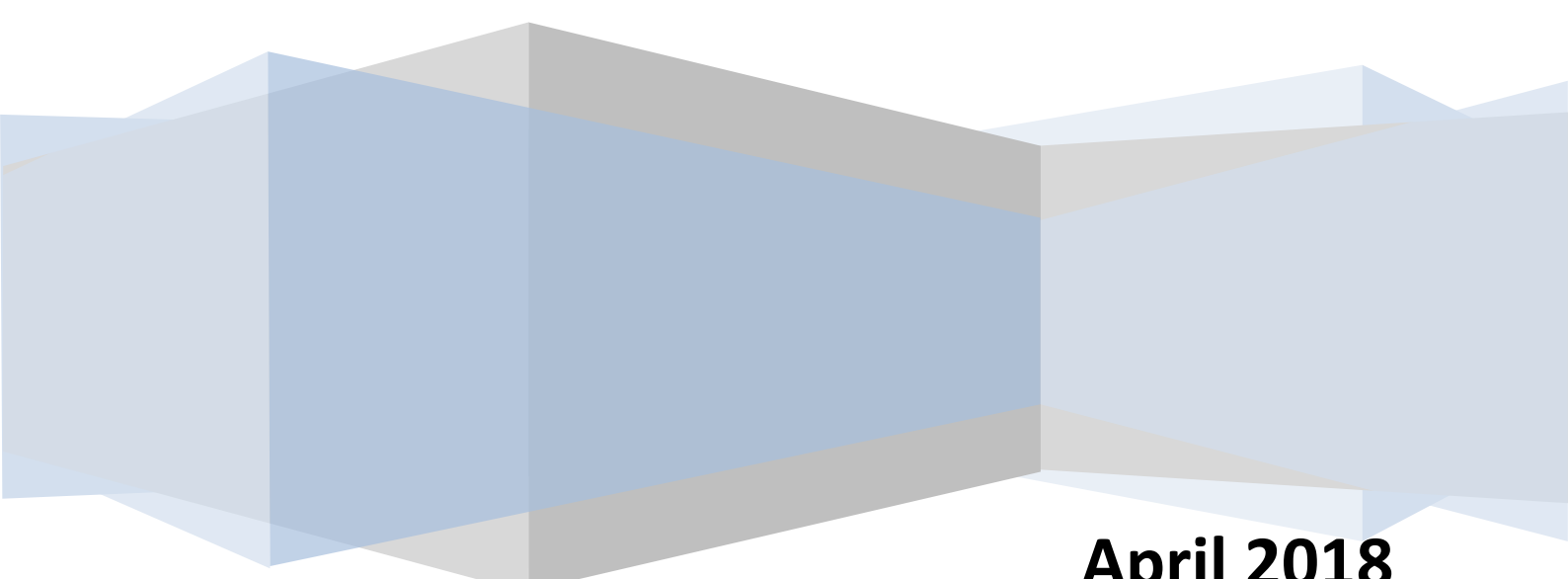
MSc Sustainable

Construction: Dissertation

Protecting All Our Pasts: Conservation,
Education, and the Built Historic Environment in
Wales – A Literature Review.

Grant Alden

P148228



April 2018

Copy statement

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Date 24TH APRIL 2018

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Abstract

The Welsh Construction and Built Environment (CBE) has the highest proportion of historic (pre-1919) buildings in the UK. Welsh CBE businesses spend approximately half their time working on these buildings. Yet currently there are no mainstream construction courses being taught at Further Education Institution's (FEI's) that contain a compulsory element on historic buildings, their pathology, performance, materials and characteristics.

This literature review paper will critically evaluate previous reports on skills shortages and the historic problems and barriers to change, and assesses current endeavours to embed such training into mainstream construction courses. It will highlight the potential for facilitating improved knowledge and skills within the construction industry, whilst scrutinising potential synchronisms with recent legislation, within the context of the Welsh sustainability agenda and its drivers for change.

The review will evaluate cross fertilisation of ideas pertaining to the Welsh Wellbeing Goals through a more holistic regulatory approach, and suggesting likely outcomes. It will appraise current research on Energy Efficiency Measures (EEM), Retrofit strategies and how incomplete understanding can lead to unintended consequences.

It will also provide current context for the Qualifications Wales 2018 Report: Building the Future, through a selective quantitative piece of research with regards to Further Education Institution's in Wales and attitudes towards the embedding of historic building skills and learning with mainstream construction courses. This research identifies suggested demand for content, issues in relation to up-skilling of teaching staff, training facilities and funding.

Through the course of the review barriers and opportunities will be identified and the potential for future research suggested.

Glossary

Arbed	Welsh programme of Energy Efficiency Measures (EEM)
ARCAL	Type of Steel Framed House construction (Non-Traditional)
ARR	Annual Recruitment Requirement
Article 50	Article of the Lisbon Treaty that signifies a desire to withdraw from the European Union
BISF	British Iron and Steel Federation
BIS	Department for Business Innovation and Skills
BRE	British Research Establishment
BREDEM	BRE Domestic Energy Model
BREEAM	British Research Establishment Energy Assessment Model
BS	British Standard
BSI	British Standard Institute
CADW	Welsh Government organisation responsible for heritage
CBE	Construction and Built Environment
CEPT	Centre for Environmental Planning Technology
CERT	Carbon Emissions Reduction Target
CESP	Community Energy Saving Programme
Cyfle	Welsh shared apprenticeship scheme
CHCFE	Cultural Heritage Counts for Europe
CITB	Construction Industry Training Board
CO ²	Carbon Dioxide
COTAC	Council on Training in Architectural Conservation
CPD	Continuing Professional Development
CSCS	Construction Skills Certification Scheme
CWIC	Construction Wales Innovation Centre
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DICRC	Design Innovation and Crafts Resource Centre
DPC	Damp Proof Course
ECO	Energy Company Obligation
EEM	Energy Efficiency Measures
EPC	Energy Performance Certificates
Estyn	Welsh Education and Training Inspection Body
EWI	External Wall Insulation
FDI	Foreign Direct Investment
FE	Further Education
FEI	Further Education Institutions
HE	Higher Education
HEI	Higher Education Institutions
GHG	Green House Gas
GPS	Global Positioning System
HBIM	Heritage/Historic Building Information Modelling
HEG	Historic Environment Group
HLF	Heritage Lottery Fund
HM Passport Office	Her Majesty's Passport Office
HM Treasury	Her Majesty's Treasury
HMG	Her Majesty's Government
HQE	High Quality Environmental
HS2	High Speed 2 - New High Speed Cross Country Rail Link

HVAC	Heating Ventilation and Air Conditioning
ICCROM	International Centre for the Conservation and Restoration of Monuments
ICOMOS	International Council on Monuments and Sites
IHBC	Institute of Historic Building Conservation
IT	Information Technology
IWI	Interior Wall Insulation
LEED	Leadership in Energy and Environmental Design
M&R	Maintenance and Repair
Met Office	UK Meteorological Service
MMC	Modern Methods of Construction
MP	Member of Parliament
NDB	Non-domestic Buildings
NHBC	National House Building Council
NHTG	National Heritage Training Group
NOS	National Occupational Standards
NSAC	National Specialist Accredited Centre
Ofqual	The Office of Qualifications and Examinations Regulation
Ofsted	The Office of Standards in Education
ONS	Office for National Statistics
OPC	Ordinary Portland Cement
OSAT	Onsite Assessment Training
PPW	Planning Policy Wales
R&C	Restoration and Conservation
R&D	Research and Development
rdSAP	reduced data Standard Assessment Procedure
RH levels	Relative Humidity Levels
RIAS	Royal Incorporation of Architects in Scotland
RIBA	Royal Institute British Architects
RICS	Royal Institute of Chartered Surveyors
RTPI Cymru	Royal Town Planners Institute
SAP	Standard Assessment Procedure
SAVE Britain's Heritage	British Built Heritage Charity
SME	Small and Medium Sized Enterprises
SPAB	Society for the Protection of Ancient Buildings
STBA	Sustainable Traditional Building Association
T-Level	New Technical Level Qualification being introduced in England
UK	United Kingdom
UN	United Nations
UNESCO	United Nations Environmental, Scientific and Cultural Organisation
US or USA	United States (of America)
USP	Unique Selling Point
VAT	Value Added Tax
VET	Vocational Education and Training
VOA	Valuation Office Agency
VOCs	Volatile Organic Compounds
WAG	Welsh Assembly Government
WBL	Work-based Learning
WCED	World Commission on Environment and Development
WFG Act	Wellbeing of Future Generations Wales Act
WHCS	Welsh Housing Conditions Survey

Introduction

The Construction and Built Environment (CBE) sector in Wales has had to adjust to a number of drivers (environmental, legislative, and financial) over recent years. Ensuring buildings are more efficient, sustainable and provide healthy environments in which to live and work is now a prerequisite for legislators and the construction industry alike. The success of these responses depends on knowledge, skills and education.

Whilst there is general agreement over the environmental drivers for change (climate change and sustainability), the means by which this change can be achieved is still open to debate.

However, there is a consensus that as a significant* proportion of existing building stock will still be in place in 2050, any solution must take into account the condition and performance of these buildings. As a result, regulatory changes have sought to improve the 'sustainability' and performance of the built (and wider) environments (Manguiat & Raine, 2018) (Kephelopoulou, et al., 2017) (Murphy, 2016) (Du Plessis & Brandon, 2015) (Lizarralde, et al., 2015).

This literature review study recognises that thirty five percent of existing building stock in Wales was built prior to 1919 (WAG, 2017) (CITB, 2013), and how maintenance, repair, improvement and particularly retrofit can and will affect any efforts to improve performance and sustainability. As such the success of any programme of intervention relies upon accuracy of data and breadth of understanding for all stakeholders involved in the process.

This study is constructed thematically and will look at the sustainability of maintaining and retrofitting our built heritage, and the role education can play in improving the performance and resilience of our existing buildings, through better understanding of how and why traditional buildings differ in pathology to newer construction types.

The review will elaborate on the themes highlighted above and focus on education and skills gaps and the influence this has downstream of policy changes, interventions and industry initiatives. It will explore possible synergies with other areas linked to the *Wellbeing of Future Generations Wales Act (WFG Act)*, *The Historic Environment (Wales) Act (HEW Act)*, and the wider implications for changes to construction training in Wales. Current changes to Further Education (FE) in England and proposed changes in Wales make it apposite to review and add to available data in relation to skills and training at FE level within Wales.

Looking at the relationship between policies and how, with better understanding (education) comes better planning and more successful outcomes

It will consider: 'Drivers' for change, 'Enablers', 'Outcomes' and 'Synergies'. See 'Figure 1' below – the list is not exhaustive but a visual representation of the strategic approach to this review:

*estimated percentages range from sixty percent (Pomponi, et al., 2015) to between seventy five to eighty seven percent (Dowson, et al., 2012) (Boardman, 2007) (Gieseckam, et al., 2017) (Schwartz, et al., 2018).

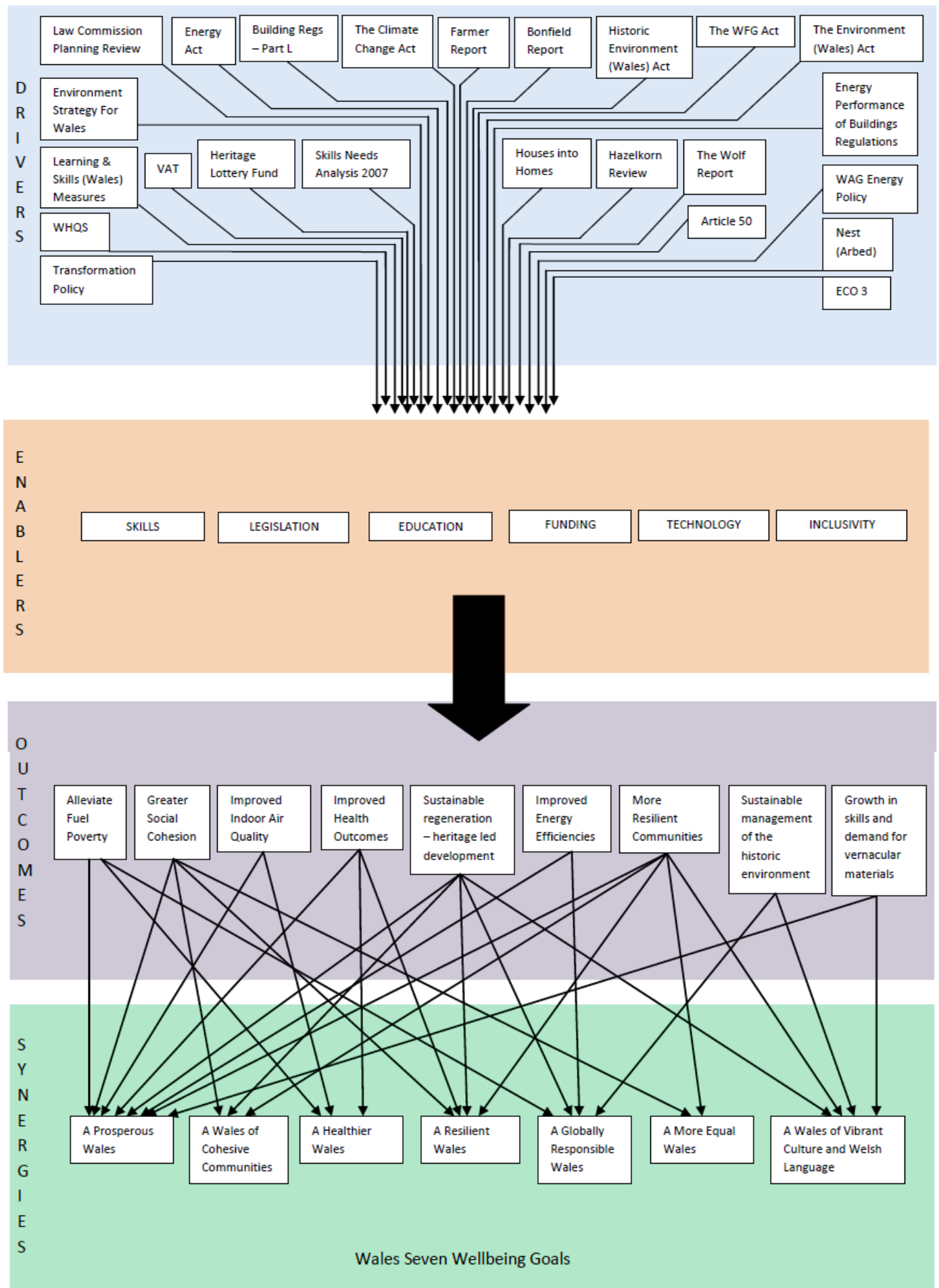


Figure 1 - Drivers Enablers Outcomes and Synergies

(Author's Own, 2018)

The study's focus is primarily at FE level, to reflect upon the suggested proposals of the Qualifications Wales Sector Review and other studies preceding it (NHTG, 2007) (CITB, 2013) (CITB, 2015). The outcomes and conclusions have a specifically Welsh determination to represent subtle differences in building stock profiles, stakeholders, educational systems and qualifications and to evaluate the potential differences that might arise from the recent qualifications review and the WFG Act.

The purpose of the study will be to improve understanding by evaluating existing literature, identifying gaps, and providing analysis of the factors effecting the success or otherwise of previous initiatives. During the scope of the investigations it will define terms, provide justification, evaluate objectives and suggest areas of future research.

It will elaborate on the evolution of the contextualisation of the research rationale, highlighting how unintended consequences can undermine policy initiatives, and how changes in education and training can facilitate improved outcomes not just within construction but also in other areas: Green House Gas (GHG) emissions (de Graaffe, 2011), sustainability (Fien & Winfree, 2014) (Athapaththu & Karunasena, 2018), energy performance (Shi, et al., 2015) (Jagger, et al., 2013), social cohesion (Power & Smyth, 2016) (Sella, 2013) (Jacobs, 1961), intergenerational equity (Matthews & Grant-Smith, 2017) (Goetcheus & Mitchell, 2014), urban renewal (Brand, 1994) (Rypkema, 2007), improved health and wellbeing and indoor air quality (Power & Smyth, 2016) (Carone, et al., 2017) (Broderick, et al., 2017).

The study is primarily and fundamentally a literature review and largely has a qualitative bias, however there is a small quantitative research element based on the limited sample group available (Further Education Institutions in Wales).

This mix of qualitative and quantitative research has been included to provide a current context to previous research that is discussed as part of the review. It has been used to evaluate whether data or attitudes have changed and provide a contemporaneous setting for this review and identify potential areas for further study. In summary, by identifying the importance of universality in the teaching of certain skills the study can appraise the role of education, not just primarily to improve standards and performance in the existing built environment, but in creating opportunities for improved realisation of legislative and policy ambitions in relation to a host of other areas.

Literature Review

1. Taxonomy and Context

“Language, properly used, should speak for itself” (Sumption, 2017)

The following review may make use of, or quote, a number of commonly used terms to describe the building stock that is the centre of this study: Traditional Buildings, Pre-1919 Buildings, Historic Buildings, Heritage Buildings, and Vapour Open/Permeable buildings.

“Traditional Buildings” as a term can be context dependent – based on the context or audience this term can mean those buildings of solid walled construction and generally no damp proof course (although not always), usually built before the widespread introduction of Ordinary Portland Cement (OPC) and cavity walls. However, the Royal Institute of Chartered Surveyors (RICS) uses the term “traditional” to differentiate modern on site construction methods from more contemporary off site methodologies known as Modern Methods of Construction (MMC) – volumetric, modular approaches (Ross, 2005). To illustrate, the term “traditional” (either skills or construction) is used twenty nine times in the eighty pages Farmer Review, but never in the context of a pre-1919, vapour permeable building (Farmer, 2016).

There are occasions when mention of “Non-Traditional”, does not mean those buildings not of solid wall construction, but actually system build construction methods such as steel frame (Trusteel, British Iron and Steel Federation (BISF), Arcal etc.) (Building Research Executive (BRE), 2002). As a result, the use of “traditional” (construction and skills) will be avoided where possible within the confines of this review.

An alternative designation used is “Pre-1919” as this particular date is used as a cut-off for the preponderance of solid walled construction in the United Kingdom (UK) before cavity wall construction becomes more prevalent. However, even the use of “pre”- and “post-1919” is problematic given the amorphous nature of the crossover from solid to cavity walls. Some solid wall buildings were still constructed up to 1950’s, and whilst cavity walls were introduced from the mid 1800’s they did not become more prevalent until the 1930’s (Building Research Executive (BRE), 2012). Therefore, use of an absolute single date designation is not particularly accurate and should be used in generality only.

The terms “Historic” and “Heritage” buildings have a tendency to be used interchangeably and to sometimes mean buildings of particular importance, whilst often having a level of statutory protection not shared with other buildings of similar construction typology. However, a less specific definition is provided by Historic England (2008):

- Historic buildings would suggest: *“Value deriving from the ways in which past people, events and aspects of life can be connected through a place to the present”*
- Heritage buildings are described as: *“All inherited resources which people value for reasons beyond mere utility”*

(English Heritage, 2008)-

Finally, we can also use as a starting point the Building Regulation (Part L1b, 2010), description: a “construction with permeable fabric that both absorbs and readily allows the evaporation of moisture” (Welsh Government, 2010) or what Colin King and others describes as “vapour open” and “vapour closed” pathologies/building physics (King, 2016).

This serves to highlight the sometimes imprecise nature of language used in the discussions around the building stock in the UK. This lack of clarity could lead to confusion or mistaken intent.

All of the above suggests a slightly confused and nebulous approach to classification and terminology reflecting the reality – there is no easy delineation in time or geography or architectural or cultural importance.

A change in building technology is being repeated as construction moves to more modular off-site modes of manufacture and production. There is a risk that twentieth century “on site” construction skills could be lost as new manufacturing systems gain popularity. Once common-place skill sets, technologies and materials used in constructing our built environment could be lost as the industry (and invariably training) moves forward (Farmer, 2016).

By moving from a craft-based, to an industrial, manufactured and standardised approach, this more uniform, scientific approach needs to be reflected in its language and taxonomies. Perhaps the most effective or scientific approach would be to base adjudication on building pathology/ physics looking at both the method of construction and the materials used (lime-based “breathable” buildings to more “closed” impermeable cementitious materials) in a more holistic approach to terminology.

Even this causes problems as buildings are not homogenous wholes unalterably reflecting original means of construction but a palimpsest reflecting numerous changes and complex morphology, meaning both could be present within the same building (Brand, 1994).

However, for the purposes of this study it will prove to be the most effective in determining the group of buildings, materials and skills to which we wish to reflect upon. It will compliment the investigation into the drivers for changes to construction course curricula and better reflect the differences in building physics of vapour open and vapour closed methodologies.

For the reasons alluded to above this study will restrict reference to either “historic” or “vapour permeable/open” where possible, although direct quotes and references may use one of the alternative designations mentioned.

Correspondingly, construction “training” and “education” are terms used in their more general observance, to represent all learning systems whether they be classroom based, on-site, or a mixture of the two, and include apprenticeships, National Vocational Qualifications (NVQ’s), Diplomas, Higher National Certificates (HNC’s) etc. – see Appendix 1 – Credit and Qualifications Framework for Wales (CQFW).

2. Environmental Drivers - Climate Change and Sustainability

There is an overwhelming body of evidence plus clear scientific and (to a lesser extent) political consensus that anthropogenic climate change is the biggest challenge facing humankind. As a result, the UK government has, through the *Climate Change Act 2008*, targeted an eighty percent reduction of carbon dioxide (CO²) emissions from a 1990 baseline, by 2050 (HM Government, 2008).

In Wales, *The Environment (Wales) Act 2016* sets out a similar target of at least eighty percent reduction by 2050, with five yearly carbon budgets (the first budget due to be set this in the summer of 2018 and set in regulations by the end of that year) (WAG, 2018). This will directly affect the CBE industry as housing accounts for thirty percent of final energy usage and space heating accounts for half that total (HM Government - DBEIS, 2017).

The Environment (Wales) Act 2016 and its commitments to reducing carbon emissions is supported to an extent by *The Wellbeing of Future Generation (Wales) Act 2015 (WFG)* although the latter is far more holistic in its terms of reference and ambitions, and its sustainability agenda may not always accord with the strictly energy focus of the *Environment (Wales) Act*.

In Wales, historic buildings of vapour permeable characteristic with solid walls and no Damp Proof Course (DPC) account for approximately thirty five percent of the existing housing stock which is higher than the UK average (King, 2016). This would suggest that traditional properties have an important role in any overall strategy for reducing CO² emissions in Wales – if the presumption that traditional buildings are the poorest performing in terms of thermal efficiency is accepted (and which is challenged later in this review).

Climate change presents challenges, not just in terms of the legislative demands and the responses, both intended and otherwise, but real physical and environmental impacts on our built heritage.

For Wales, the UK Meteorological Office model predicts:

- higher mean temperatures throughout the year, with;
- hotter, drier summers or wetter summer conditions;
- warmer wetter winters;
- more frequent extreme weather. For example, flooding and droughts.

(Historic Environment Group (HEG), 2013)

These projections suggest a future of more extreme and capricious environmental challenges, which could be particularly problematic for building stock that rely on vapour open building physics and a delicate balance of moisture management within the structure and its internal and external environments. Future protection and performance therefore requires a considered approach based on accurate data. As the Heritage Council suggested in 2016:

“The care of anything, especially old things, means anticipating what’s going to happen next. How is the environment changing? Forethought is required. Looking back at history can also help in tracing what works in terms of ideas or the effect of time on materials. Curatorship means coming to terms with time, creating a Long Now” (Heritage Council, 2016).

Sustainability and built heritage conservation are interlinked thematically as they both consider the “Long Now” approach (Eno, 2003) (Brand, 2008). As a result, to properly prepare for this “Long Now”, a better understanding of the current issues facing this proportion of our built environment is required – an

understanding that needs to be shared by all who may be involved in its maintenance, repair, improvement and retrofit. Fundamental to this greater and more widespread understanding is education, training and skills.

Therefore the following treatise will highlight the main challenges facing our historic buildings and the role education can play in meeting these challenges.

Conservation

Conservation of the built environment like the environmental conservation movement is based upon the theology of stewardship meaning that we as a society have a moral obligation to conserve resources to ensure future generations are able to enjoy the benefits of them as we have done. For the built environment it also implies heritage allows for other symbiotic benefits connected to a sense of identity, social cohesion, intergenerational equity and cultural resilience. Whilst building conservation has existed for centuries, the modern ethos can be traced back to Robert Reid, Kings Architect and Surveyor in Scotland, who suggested in 1829:

“Restoration or embellishment should not be the object, but that repairs...should be executed...with the view solely to their preservation, and in effecting that object the less appearance of interference with their present state and construction the better” (Fawcett, 2002).

This idea was greatly developed by Ruskin in his 1849 work “Seven Lamps of Architecture” and codified by William Morris, Phillip Webb and others in the 1877 Manifesto for the “anti-scrape” movement otherwise known as the Society for the Protection of Ancient Buildings (SPAB).

More recently the ideas have been developed and enhanced through a number of charters from both international and national organisations: the Venice Charter, the Burra Charter, the Nara Document on Authenticity, English Heritage’s Conservation Principles and BS 7913: 2013 (Royal Incorporation of Architects in Scotland (RIAS), 2016).

Sustainability

Sustainability was defined by the Brundtland Commission as *“meeting the needs of the present without compromising the ability of future generations to meet their own needs”* it incorporates a wide number of issues: social, economic and environmental (World Commission on Environment and Development (WCED), 1987).

Indeed the United Nations (UN) has adopted seventeen Sustainable Development Goals (SDG’s) as part of its sustainable development agenda and whilst this study will not discuss all of these goals, it will refer to a number of the subject areas, including: Good Health and Wellbeing, Quality Education, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Decent Work and Economic Growth (United Nations Division for Sustainable Development, 2015).

With regards to construction the literature review will address the conservation of the built environment within the context of sustainability. It will also take regard of the definition provided by the Welsh Assembly Government (WAG) in the auspices of the WFG Act:

“...the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals” (WAG, 2016).

Conservation of the built environment is inherently sustainable as it is maximisation of use through minimal input of new materials, resources and energy (Torodovic, 2015) (Wang, et al., 2018). It must also provide appropriate uses for our built heritage. Economic utilization of buildings is an important element of providing for the long term maintenance and repair of the asset (Bullen & Love, 2011) (Kiroff & Xiaotian, 2016), if the asset is to avoid Kent’s timeline of dilapidation, from coherent whole to archaeology:

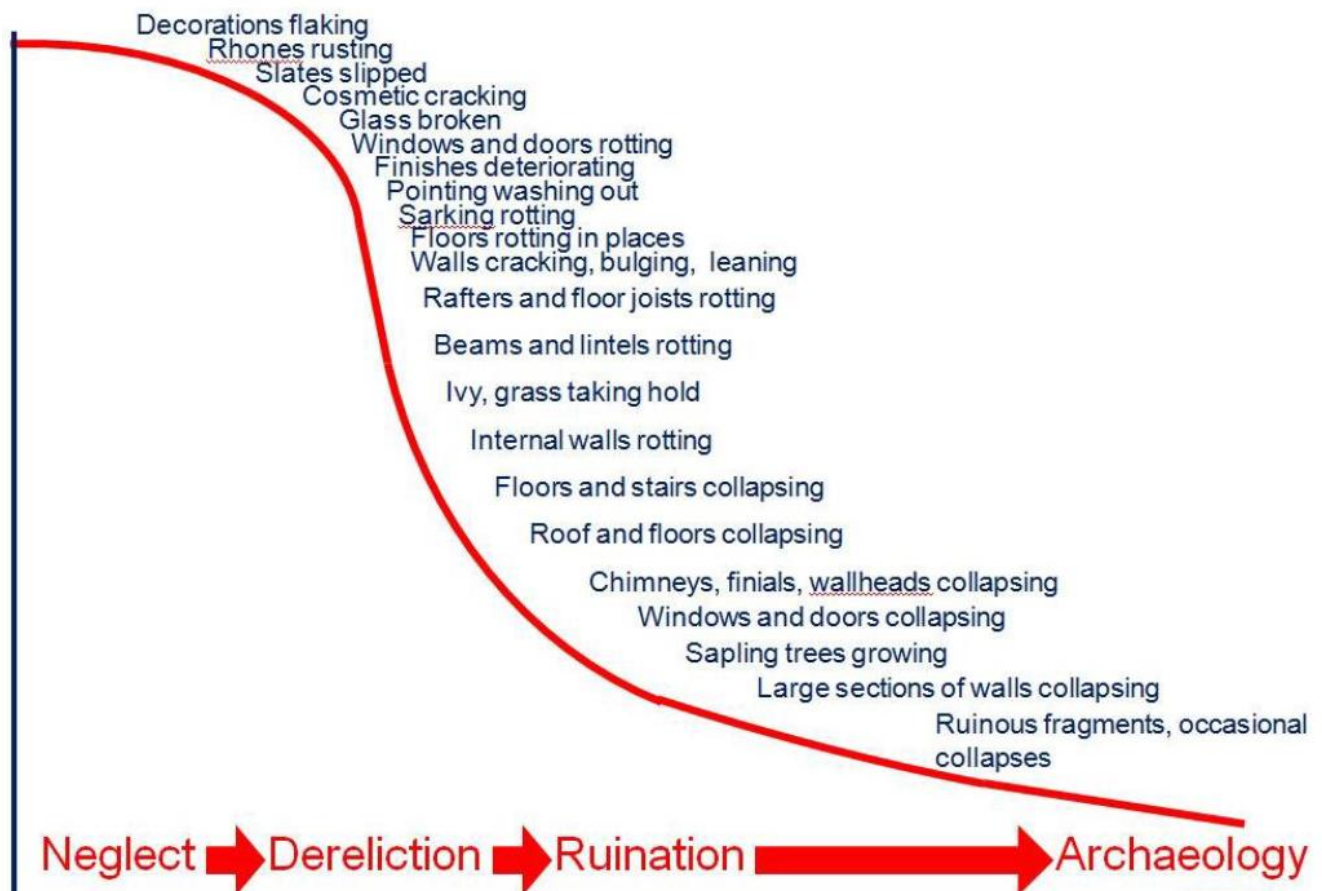


Figure 2 - Robin Kent's Timeline of Dilapidation

(Kent, 2016)

For conservation (and by implication maintenance and repair) to be truly effective however, there needs to be sufficient understanding of the requirements of different systems of construction pre and post 1919. Not only understanding of the building physics, but of the materials themselves, their characteristics and performance potential and the skills required to effectively utilise the materials. Also, an understanding of what more current technologies and materials can be introduced without detriment to the vapour permeable building type (Stahl, et al., 2017) (Berardi, 2018). Watt goes even further and suggests teaching of building pathology shouldn't just be about physical attributes and behaviours of materials and buildings, but how that construct is “used, occupied and maintained” as this plays a vital role in its success (Watt, 2008).

This review seeks to address the full breadth of the historic building stock, and not just those afforded legislative protection, as any development of skills and understanding cannot be limited to specialists but needs to be industry wide.

Further investigation is necessary to determine:

- the role education has to play in addressing the problem of lack of understanding and shortage of skills
- the role of auxiliary legislation and financial support
- and what potential barriers there are to change

Inclusivity and Interconnectedness

Educational changes need to be reinforced by a theoretical framework based around sustainability and sharing some of the intellectual and philosophical approaches of the ecological and environmental conservation movements and develop a new intellectual frame of reference.

The work of the deep ecology movement and writers such as Arne Naess, Aldo Leopold, Bill Devall and George Sessions developed ideas of interconnectedness and an eco-centric approach to relationships and proposed a more holistic way of approaching problems. They suggested a move away from single issue focus to a more inclusive, comprehensive approach (Naess, 1989) (Leopold, 1968) (Luke, 2002) (Sessions & Devall, 1985). Whilst this may seem far removed from the practices of modern construction industry, the philosophical framework of holistic thinking, connectivity, interdependence and long term thinking underpin modern ideas of sustainability, well-being and living within one's means, and are thematically linked to the *WFG Act*.

This inclusiveness needs to be recognised and supported both politically and economically so that any movement to protect and enhance built heritage is not patrician in nature but widely democratic (Priyadarshani, 2017) (Teelucksingh, 2017) (Shand, 2017). Like the tenets of the deep ecology theory, this should not just be considered a top down approach. The ethos of The Burra Charter is that if conservation is to be truly democratic and representative, then people need to be considered a constituent part of the environment and an integral element of significant places. Inclusivity needs to be a cornerstone of any conservation programme (Riganti, 2017) (Ashley, et al., 2015).

This approach is also reflected in some areas of the built environment conservation movement, where a "whole house" approach is now proposed (Leinartas & Stephens, 2015) (May & Griffiths, 2015) (STBA, 2015). However this has not necessarily been translated into legislation which, it is suggested, focuses more on energy and energy efficiency savings in buildings rather than taking a more holistic approach (Preston, 2017).

Energy

Efforts to improve the energy performance of buildings has led to the large scale roll out of energy improvement programmes under government and non-governmental funded schemes such as the Community Energy Saving Programme (CESP), the Carbon Emissions Reduction Target (CERT), Arbed, the Green Deal, Energy Company Obligation (ECO)(indeed, the third iteration of the ECO scheme is currently underway). Unfortunately, there has been a tendency for the exigencies of implementation to lead to a "one size fits all" approach which needs to be addressed (Preston, 2017) (King, 2016).

Such an approach results from a number of factors: funding mechanisms, poor or ill-defined specification, over reliance on manufacturer and installer information, lack of appropriate materials and/or contractors and installers with the requisite knowledge and skills (Glew, 2017).

Indeed, the retrofitting of energy efficiencies measures continues to grow, driven by governmental commitments to target CO² emissions. Whether this has led to an over-emphasis on the energy element of building stock rather than a more holistic whole house strategy is increasingly being questioned (King, 2016).

The large body of evidence surrounding performance gaps (Cali, et al., 2016) (Kampelis, et al., 2017), indoor air quality (Frey, et al., 2015) (Hall, et al., 2013) (Broderick, et al., 2017), interstitial condensation (Edwards, 2017) (Rye, 2017) (Little, et al., 2015) and a myriad of other unintended consequences, both for buildings and wider communities suggests a number of possible underlying causes: lack of knowledge, lack of commitment, industry apathy, inappropriate decision making, commercial necessities, confused or conflicting decision making at government/industry level (Gooding & Gul, 2017) (Galvin & Sunikka-Blamk, 2017) (Chandler, 2015) (Rosenow & Eyre, 2016).

One of the most recent studies, undertaken by Caroline Rye of Archimetrics, suggests following the application of a vapour permeable External Wall Insulation (EWI) and lime render system, Relative Humidity (RH) levels within wall structures fluctuate over linear periods but also oscillate between seasonal extremes. However, despite the initial spike in RH levels following the introduction of moisture via the render application, there appears to be a reversion to original RH levels over time (Rye, 2017).

It adds further evidence to the consensus of data that implies that solid wall moisture levels are a subtle balance between orientation, original construction methods, wind, solar gain, external and internal moisture levels, post construction introduced fabric elements (plaster/render/insulation/pointing) and their permeability and occupation patterns and behaviour. By association, energy and heat load requirements will therefore be effected as damp building fabric (such as walls with a high moisture content) can be thirty percent less energy efficient than dry (BS 7913:2013, 2013).

Nevertheless, despite the focus on energy, there are a number of differing approaches for the construction industry to take in evaluating building performance - moving away from quantitative targets and towards factors that may not be as easy to measure but are just as important:

- whole life carbon (Wen, et al., 2016) (Zhang & Wang, 2015) (Moncaster & Symons, 2013)
- embodied energy (Koezjakov, et al., 2018) (Dixit, 2017)
- sustainability (Megahed, 2014) (Hamza, et al., 2017)
- society (Yung, 2012) (Allison, 1996) (Murzyn-Kupisz & Dzialek, 2013)
- culture (McKenzie, 2015) (Vakhitova, 2015)
- intergenerational equity (Nasser, 2003) (Matthews & Grant-Smith, 2017)
- health and well being (Taylor, et al., 2018) (Mohareb, et al., 2017).

Whilst it is accepted that some or all of the above factors may play a role, for the purposes of this review, attention will focus on the perceived lack of (widespread) knowledge and understanding of traditional building pathology within the mainstream construction industry (NHTG, 2007) (CITB, 2015).

3. Legislative Drivers - Regulations and Policy

Whilst climate change poses a threat to built heritage physically there is a secondary problem from political responses to the existential threat of climate change.

How and why interventions are undertaken within our built environment depend on a myriad of factors including environmental, social, cultural, economical, political and commercial. The decision making processes are informed by science, data and understanding of the information available at any given time. Where data or understanding is flawed or incomplete then the decision-making process is compromised and the desired outcomes may not be achieved or may be achieved but with unintended consequences that raise further challenges (Kelly, et al., 2012).

There are also various levels of government and inter-governmental bodies that have spheres of influence over policy and guidance – see Appendix 2.

The English Housing Condition Survey of 2010 calculated CO² against Standard Assessment Procedure (SAP) ratings for various constructions periods. This appeared to confirm perceptions that this group of existing housing stock is the poorest performing in terms of energy efficiency, consumption and emission levels.

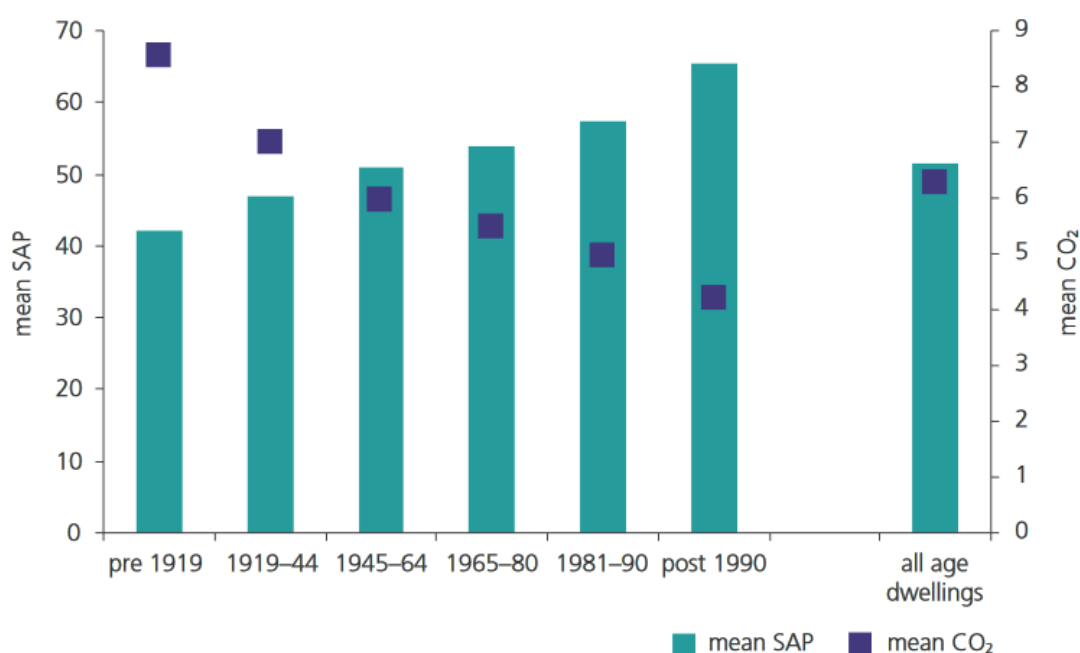


Figure 3 – Mean SAP Ratings & CO² by construction date

(English Housing Survey, 2008)

The survey went on to state:

“Building age is a strong indicator of energy efficiency, with pre-1919 dwellings averaging twenty-four SAP points fewer than post 1990 homes ... whilst their average notional CO² emissions for heating and lighting per dwelling were twice those of post 1990 stock”

However, the survey data was based upon SAP methodology used in the Building Research Establishment (BRE) Domestic Energy Model (BREDEM) that then provides the algorithms for calculating the buildings energy consumption demands – and the problem lies in the fact that the SAP algorithms are an oversimplification of building physics (Hughes, et al., 2016). In 1994 SAP was cited in Part L of UK Building Regulations as a means of

assessing the energy performance of a dwelling and in 2005 the less data intense reduced data Standard Assessment Procedure (rdSAP) was brought into use as a quicker and less costly means of determining the energy performance of dwellings (Department of Energy & Climate Change (DECC), 2014).

This has resulted in SAP, rdSAP and BREDEM being used to justify and support the creation and roll-out of a number key energy and environmental policy initiatives over the last fifteen years based on compromised assumptions/data and a number of areas of uncertainty (Hughes, et al., 2016) (Palmer, et al., 2013) (Kavgic, et al., 2013) (Shorrock, et al., 1994).

Legislative/Economic Initiatives relating to energy efficiency measures:

- The Treasury's stamp duty exemption for zero carbon homes
- The Code for Sustainable Homes
- The Green Deal
- Energy Company Obligation
- Local Authority Stock Reporting
- Arbed
- Affordable Warmth Obligation
- Renewable Heat Initiative
- CESP
- Energy Performance Certificate's

In the pursuit of improved energy efficiency, these initiatives designed to effectuate a solution, have the potential to create a number of negative effects on building fabric, moisture levels, indoor air quality, human health, fuel poverty, and architectural heritage.

The assumptions inherent in rdSAP produce a standardised level of data that is simplified for speed and costs implications. Other countries have a more nuanced approach (admittedly that are more expensive and take longer to produce). It also do not allow for new relevant data on in situ performance of solid walls (Rye, 2015) (Gori, 2017).

Focusing on energy efficiency and using the flawed presumption of the SAP calculations, led to Boardman's 2005 study "The 40% House" Scenario which recommend large scale demolition of existing historic housing to achieve governmental emission reduction targets (Boardman, 2007). This was used to support the Governments Pathfinder schemes involving large scale demolition of older properties – precipitating claims of social cleansing and gentrification. Unfortunately, this also led to housing shortages in some areas (Sheffield City Council's demolition programme led to an increase in social housing waiting lists by four hundred percent from 14,301 to 58,706 between 2001 and 2007) (Hatherley, 2011).

However, more recently there has been a greater appreciation that the algorithms and underlying suppositions of the modelling scenarios do not represent a full picture of performance in real life. Data, particularly for vapour open buildings has been poorly represented within the modelling software due to lack of options (there were only two stone types in SAP (sandstone and granite) or incorrect values for what are inevitably non-uniform materials.

Indeed, there is an increasing body of evidence to suggest that traditional properties may not necessarily perform as badly as predicted (Baker, 2011) (Rye, 2012) (Moran, 2013) (Currie, et al., 2013), and may even perform better than more recently constructed properties (Hay, et al., 2014) (Mariani, et al., 2018) (Wallsgrave, 2008) (National Trust for Historic Preservation, 2011).

Key stakeholders such as Historic Scotland, Historic England, SPAB, Sustainable Traditional Buildings Alliance (STBA), and BRE have all invested in studies to investigate whether the modelling systems used to underpin SAP, reduced data SAP (rdSAP), BREDEM and U-values etc. are sufficiently sophisticated to accommodate pre-1919 dwellings. This new body of evidence has already had an effect in prompting a change to the default U-values of solid walls in October 2017.

In addition to the initiatives listed, there have been a number of industry reviews that have either directly or indirectly influenced the political, economic and professional environments surrounding the CBE sector. One of the most important, from the point of view of this literature review, is The Bonfield Review which sort to address issues surrounding the widespread implementation of Energy Efficiency Measures (EEM) through retrofit programmes.

The Bonfield Review (“Each Home Counts”) 2016

The “Each Home Counts Report” was commissioned following the revocation of funding of the Green Deal scheme, by Amber Rudd, minister for the Department of Energy and Climate Change (DECC – now defunct). It charged Peter Bonfield with investigating the sector through an Independent Review of Consumer Advice, Protection, Standards and Enforcement for Energy Efficiency and Renewable Energy.

Whilst it proposed some admirable changes with regards to standards and consumer protection, heritage groups were critical of its initial findings. It was suggested that it failed to take account of vapour open buildings adequately (if at all) – which is surprising given the report’s author, as BRE Chief Executive, would have intimate knowledge of BRE’s own studies on the matter – including “Solid wall heat losses and the potential for energy saving” by Colin King (King, 2016).

In fact the Institute of Historic Building Conservation (IHBC), in response to the release of Colin King’s report stated:

“Colin King’s work has been published by BRE as a technically focussed “Route-map for Change”; what the published report does not make clear, and IHBC among others needs to take forward, is the scale of the problem in terms of

- *buildings (total number of traditional buildings awaiting retrofit)*
- *skills (in traditional building construction, not just in relation to ventilation and moisture management), and*
- *training needed.”*

(Preston, 2016)

In a written response to the Bonfield Review, the IHBC challenged the failure to address vapour open buildings (and in particular solid walled properties), exacerbated by the lack of heritage body input and no consultation outside the review’s “contacts in industry... The Retrofit Standards Task Group has been established under the auspices of the British Standards Institute (BSI) but doesn’t include a heritage expert.” It also contained no reference to BS 7913:2013, despite the standard specifically addressing many of the concerns of interventions in heritage buildings and a fabric first approach (Edwards, 2013).

DECC originally accepted a requirement for some expert guidance on buildings of vapour open construction and created an Older Properties Working Group. However the group was disbanded and its members were not provided with an opportunity to take an operational role in the Bonfield Review.

New National Vocation Standards for Older, Traditional and Vulnerable Buildings that were created by the Older Properties Working Group, were approved, and published by AssetSkills. There are qualifications in Scotland and Wales, and through the Construction Industry Training Board (CITB) in England that have been based on these standards, but again, the review failed to make mention of them and they are no longer available on-line due to the demise of AssetSkills (Preston, 2017).

Also in relation to skills and training, the report failed to reference any requirement for training in traditional construction techniques or understanding, and the IHBC suggested a future action of the report should have included a requirement of the CITB Energy Efficiency & Retrofit of Pre-1919 Traditional Buildings Level 3 Award.

It also overlooked maintenance and repair as a fundamental part of energy efficiency savings – which is a pre-requisite of BS 7913:2013 – and a number of BRE and STBA reports on solid walled and vapour open buildings despite stating the review had “access to the latest standards and best practice guidance” (Preston, 2017).

This illustrates a lack of holistic, joined-up thinking and continued promotion of “voluntary uptake” of initiatives rather than more robust compulsory measures based on evidential standards. It reflects a continued adherence to soft touch regulation of the construction sector, reflected in on-going issues in both the new-build and retrofit sectors, and in contrast to some other European countries such as Germany where the market has higher levels of regulation and where “Master Craftsman” has legal status and is a formal license to trade (Schulten & Schulze-Buschoff, 2015).

At the other end of the scale, New Zealand operated a more relaxed regulatory approach - the idea of “performance” based regulation (rather than prescriptive standards) which it was hoped would facilitate innovation and faster development of new build systems. Unfortunately this system was not as successful as anticipated and the relaxation of standards and pursuit of new building systems led to the “leaky building” crisis at the early part of this century – the effects of which are still being felt by homeowners in Auckland today (Mumford, 2010).

The Farmer Review (“Modernise or Die”) 2016

The Farmer Review emphasises the importance of training and skills, but perhaps concentrates overly on innovative and off-site manufacturing skills. Fifty percent of all construction activity is maintenance, repair and improvement (Shacklock, 2006), so there will still be high demand for more traditional skills given that eighty seven percent of existing housing stock will still be in use in 2050 (Boardman, 2007). The highlights of the report: Skills shortages; low predictability; insufficient collaboration; low level improvement culture; and poor investment in research and development whilst alarming, suggests little that has not been identified in previous reviews and reports (Farmer, 2016).

As far back as 1934 Bossom described the UK construction industry as inefficient, adversarial, uncompetitive, expensive, poorly planned, uncooperative, and achieved unsatisfactory results for its clients (Bossom, 1934).

These shortcomings have been echoed in numerous reports since:

The Placing and Management of Building Contracts	(Simon, 1944)
Survey of Problems before the Construction Industries	(Emmerson, 1962)
The Placing & Management of Contracts for Building and Civil Engineering Work	(Banwell, 1964)
Constructing the Team	(Latham, 1994)
Rethinking Construction	(Egan, 1997)
Construction 2025	(HM Government, 2013)
Unlocking Productivity	(Pisano & Pritchard, 2015)

What the above illustrate perhaps is that the industry appears competent at identifying underlying causes for concern and even proposing strategies for tackling these issues. It appears the deficiencies arise at implementation. Whilst the limits of the literature review mean the reasons for failure of implementation cannot be addressed at any length, they do mirror the problems of implementation arising from studies in relation to heritage skills.

It should be recognised that policy and policy implementation does not occur in a vacuum and requires consideration and mutually beneficial support from other legislation for full realisation of its objectives (World Economic Forum, 2016) (Pavoni, 2010).

As will be discussed later in the review, there have been a number of studies identifying and proposing solutions to the skills and understanding shortfall problems for historic buildings which have also been less than successful in implementing change.

Within the Welsh context, there are a number of other legislative proposals that have or will influence the socio-economic environment within which the CBE sector operates. These include both the *Historic Environment (Wales) Act 2016* and the *Wellbeing of Future Generations (Wales) Act 2015 (WFG)*.

In addition, the Law Commissions' examination of current planning law in Wales and the proposed changes which were recently open to consultation (the consultation process closed on 1st March 2018) could also have a significant effect on the sustainable conservation of historic buildings in Wales. The proposals, which included the removal of a need for listing building consent, were heavily criticised by nine major heritage organisations (including SPAB and SAVE Britain's Heritage) – who issued an open letter suggesting:

'The unintended consequence of this would be the dilution of the special status of listed buildings in the planning process and their potential future loss... [and could] diminish the architectural heritage of Wales and frustrate and impede the many people and organisations who care for it' (Pitcher, 2018).

SPAB also suggested that it could also undermine some of the beneficial changes implemented by the *HEW Act* that has led to Wales having some of the strongest cultural heritage protection in the UK (SPAB, 2018), with the possible merging of three consents: planning, listed building and conservation area consents.

The Royal Town Planners Institute Cymru (RTPI Cymru) whilst broadly positive of the changes, did not agree with the proposal to merge consents into a single application system and expressed concern about the loss of specialism, focus, and technical detail required for listed buildings consent (Willmott, 2017).

The WFG Act has also had an effect on Planning Policy Wales (PPW) with the restructuring of legislative “themes” to better reflect the legislative requirements of the WFG Act. Whilst still maintaining its sustainable development ethos, PPW has now created some new policy areas reflecting linkages with the other Act:

Placemaking	Active and Social Places	Productive and Enterprising Places	Distinctive and Natural Places
Creating Sustainable Places Good Design Promoting Healthier Places The Welsh Language Making Spatial Choices Placemaking in Rural Areas	Housing Retail and Commercial Centres Community Facilities Recreational Spaces Transport	Economic Development and Tourism The Rural Economy Transportation Infrastructure Telecommunications Energy Minerals Waste	Landscape Coastal Areas Historic Environment Green Infrastructure Biodiversity Water, Air, Soundscape & Light Flooding De-risking

Figure 4 - PPW and Wales Wellbeing Goals

(WAG, 2018)

The above suggests a more holistic approach through the integration of various legislative vehicles tied to a sustainable development ethos and suggests synergies between policy instruments. As will be discussed later, the introduction of changes in the construction learning programmes at FE level could equally lead to improved policy outcomes for other sectors and perform a mutually supportive role to legislation.

Wales Seven Wellbeing Goals

The Seven Wellbeing Goals establish the philosophical framework for the WFG Act and along with the Five Ways of Working, create a uniquely Welsh regulatory landscape based on sustainability.



Figure 5 - Wales Seven Wellbeing Goals

(WAG, 2016)

The Wellbeing Goals are underscored by Five Ways of Working:

- Long Term
- Integration
- Involvement
- Collaboration
- Prevention

(For further discussion of the above, please see Appendix 3).

In looking at how to sustain the built heritage of Wales and in particular how education at FE level can be a catalyst for change, the above goals and ways of working will be both referenced and used as a lens for critically evaluating potential improved understanding, skills and training could have on Welsh built heritage.

Article 50

Whilst it is not within the scope of this review to discuss the ramifications of Brexit on the construction sector, it should be acknowledged that the shortage of specialist skills that currently exist are likely to be exacerbated by a more general shortage of labour following the implementation of Article 20 – as will funding (Sykes & Ludwig, 2016) (RIBA, 2018). As the Farmer report states in its discussion of migrant labour levels:

“A post-Brexit UK will potentially struggle to replicate the model of migrant labour additionality which it has historically relied on, so it makes the case for action even more critical” (Farmer, 2016).

Research and Development (R&D)

Many of the previous industry reports listed have shared a common criticism – that of a lack of foresight. The CBE sector fails to properly understand/acknowledge its past and fails to prepare for its future. One could argue that this is endemic of many other sectors of the economy, but it is particularly relevant to construction whose investment (as an industry) in R&D compares poorly to other industries and has been consistently declining since 2000 compared to a thirty five percent increase across other sectors (Department for Business Innovation and Skills (BIS), 2013).

4. Financial Drivers - Value Added Tax (VAT), Maintenance and Urban Renewal

“The unintended consequences of national tax changes on the management of historic assets can threaten their financial viability. We call on all political parties to examine ... the implications of tax changes for heritage enterprises.”

(The Heritage Alliance, 2015)

VAT

From its inception in 1973, VAT was zero rated for new build and alterations whilst repairs were taxed at the standard rate (HM Government, 1972). Nigel Lawson in his 1984 Budget widened the scope of the standard rate to include alterations (although approved alterations on listed buildings could still benefit from the lower rate).

George Osbourn’s decision to abolish zero rated VAT relief for approved alterations to listed buildings in 2012 further stressed the economics of repair, alterations and refurbishment of historic buildings.

As SAVE Britain’s Heritage stated:

“One simple solution would be to equalise VAT for alterations and repairs at 5%. The 5% level is already in place for residential conversions and for works to bring long term empty homes back into use ... and correct the ‘perverse anomaly’ in a system which favours alterations over repairs. It would also help unlock thousands of stalled restoration projects, injecting millions into local economies, improving the environment and encouraging tourism.”

(SAVE Britains Heritage, 2012)

This view is echoed by the Heritage Alliance who argued that the current tax position encouraged and incentivised demolition and new build in place of the more sustainable pathway of repair, planned maintenance and improvement of historic buildings. They called for parties of all political persuasion to reduce VAT to 5% as soon as possible (The Heritage Alliance, 2014). It remains to be seen whether the onset of withdrawal from the European Union will remove the current legislative rationale for the maintenance of VAT at the twenty percent rate.

Alternatively, other fiscal incentives are available to encourage the continued maintenance and timely repair of the built heritage. Looking at a range of other tax allowances in number of countries including the USA, Canada, France, Belgium, Germany, Denmark, Spain and the Netherlands, a study by RICS found a suite of fiscal measures that could encourage conservation and re-development of historic buildings and heritage:

- *Income tax deductions and credits for costs incurred in conservation activities*
- *Income tax credits for the provision of social housing in heritage buildings*
- *Property tax exemption, abatement or freeze for heritage buildings*
- *VAT (sales) concessions or rebates relating heritage conservation activity*
- *Use of tax systems to provide an incentive to donations and corporate sponsorship activities through the establishment of heritage trusts and foundations*
- *Inheritance, gift and capital gains tax exemptions and concessions* (Pickard & Pickerill, 2007)

It also suggested the economic multiplier effect from the work generated by such fiscal interventions would overcome any loss of revenue to the Exchequer. Rypkema suggests conservation and considered re-

development of the historic built environment generates direct (economic) benefits through its more labour intensive nature over new build, creating localised circular economic gains, higher property values, better rental returns, more attractive to start up businesses and so on (Rypkema, 2007).

Maintenance

“Stave off decay by daily care” (Morris, 1877).

As Pickard and Pickerill imply, maintenance, repair and re-purposing of historic buildings can fulfil a wider remit. Rather than facing a conservation or development dichotomy, repair, renovation and adaptive re-use can provide a sustainable development pathway that has implications for social, personal, economic and environmental capital (Pickard & Pickerill, 2007). This would beneficially impact on the aims and ambitions of the *WFG Act* along with the *HEW Act*, which endeavours to encourage “sustainable management” of the built environment through use, re-use and adaptive re-use of all historic buildings, irrespective of listing protection (WAG, 2016).

Since 1973, the Netherlands have operated a maintenance and repair guidance organisation known as Monumentenwacht. It undertakes inspections and provides advice on preventative action in historic houses to avoid more costly interventions at a later date. Their motto is “Prevention is better than cure” (Federatie Monumentenwacht Nederland, 2000).

Such a system of funded and guided maintenance is reflective of Article 4 of the Venice Charter:

“It is essential to the conservation of monuments that they be maintained on a permanent basis” (ICOMOS, 1964).

It could be given a more contemporary focus in Wales through incorporation with the *WFG Act*’s Ways of Working – one of which is “Prevention”. By using the theoretical framework and language inherent in the Act could provide a mutually supportive basis for improved and more widespread protection and enhancement of the Welsh historic landscape.

The Welsh Assembly Government (WAG) and its subsidiary, CADW, working with amenity societies and community groups could facilitate a national maintenance and repair body similar to the Netherlands model to support and expedite the aims of the *WFG Act* and other legislative ambitions.

It would also move away from the idea of remunerating inattention to maintenance. A 2005 report by Harriett Devlin (the then compiler of the Buildings at Risk Registers for Northern Ireland) suggested that English Heritage’s grant system rewarded neglect by funding repairs for “at risk” buildings, rather than a widespread and subsidised system of survey, inspection and planned, preventative maintenance (Devlin, 2005).

It could be argued that a preventative, maintenance led funding system for all historic buildings (and not just listed) could be more democratically effective, and reflective of the Core One Principle of the *HEW Act* - inclusive involvement of people and communities in the protection of the historical assets in their environments. In doing so it would support the aims of the *HEW Act* in a mutually beneficial way. It could facilitate the successful introduction of the educational changes, by creating and maintaining the legislative, socio-political environment that would be required for successful implementation.

It might avoid previous deficiencies by providing extra regulatory guidance and support that may have been missing previously - as the historic built environment has suffered through the gaps in legislation or policy vacuums left by un-coordinated legislative decision making (Delafons, 1997).

By introducing compulsory training on historic buildings alongside a centrally funded and operated, planned maintenance guidance service, cost savings could be made on more costly later interventions, as well as heating and health costs. For example, a damp wall can take thirty percent more energy to heat than a dry wall. Whilst such an undertaking obviously comes with a financial burden, it could be mitigated by savings on the one billion pound cost of absenteeism, loss of productivity and ill health caused by damp homes (Hibbert, 1998) (Stafford, 2014). By education, advice and guidance the modern ‘myth’ of maintenance free buildings could be challenged and the rewards and benefits of regular planned maintenance emphasised.

Urban renewal

Maintenance, repair and enhancement also allows for a more conservative, organic approach to urban planning. Described as “constructive and conservative surgery” it implies a considered and incremental series of actions - thereby reflecting the ethos of minimal intervention of the heritage specialist, but on a macro, urban scale (Geddes, 1915).

Influenced by the work of theorists like Herbert Spencer and Frederick Le Play, Patrick Geddes opposed the sweeping slum clearances and the rationale that underpinned them (suggesting a slower rate of change allowed for a more considered approach to development) describing them as the *“most disastrous and pernicious blunders in the chequered history of sanitation”* (Geddes, 1915). Parallels could be drawn between the sweeping generalisations underpinning the clearances, done with the best of intentions but loaded with potential unforeseen circumstances and the one-size-fit-all approach of energy efficiency measures currently being pursued - a twenty first century re-iteration of the patrician-like thought processes of the city centre clearances decades before.

Geddes was also one of the first urban planners to suggest a multidisciplinary approach, stating: *“Each of the various specialists remains too closely concentrated upon his single specialism, too little awake to those of the others. Each sees clearly and seizes firmly upon one petal of the six-lobed flower of life and tears it apart from the whole”* (Geddes, 1917). This holistic approach to conservation and development resonates in contemporary “whole house” retrofit strategies suggested for historic houses. It also reflects modern ideas of community based democratisation of the development process, rather than a top down imposed vision - an idea echoed by Jane Jacobs when describing “gradual money” and “cataclysmic money”, with the latter producing “drastic changes” and with little of the economic filtration to the local community within which it takes place (Jacobs, 1961).

As a rule of thumb, new builds tend to be fifty percent labour and fifty percent materials whilst rehabilitation or renovation tends to be sixty to seventy percent labour. This is beneficial for local economies on two levels – money is paid to local trades people/personnel, who then go on to spend this money in other local businesses and shops, thereby improving the sustainability and resilience of communities and creating a small circular economy (Rypkema, 2007).

However, the economic arguments for retaining and re-using our built heritage are not widely understood or accepted within the construction sector, where demolition and new build appears on the face of it to be more attractive, but less democratic (Cressingham Gardens (Minton, 2017)) and this is by no means unique to the UK and similar challenges are faced in China (Wu & Wang, 2017), Denmark (Mette-Louise & Jensen, 2017), Canada and Germany (Mosgen, et al., 2018), and indeed most areas undergoing urban renewal involving widespread demolition and re-building programmes.

A joint 2003 Irish Heritage Council project with Dublin City Council “Built to Last: the sustainable re-use of buildings”, has shown that *“constructing new buildings on brown-field sites is more expensive than retaining and*

re-using existing buildings, except in circumstances where the extent of building repair and refurbishment required is extremely high". If Greenfield sites are taken into account, the re-use argument becomes even more overwhelming (The Heritage Council, 2012).

Built heritage is a form of cultural capital with irreplaceable social, environmental and economic value. This idea has been developed by the Council of Europe's "Conclusions on Cultural Heritage as a strategic resource for a sustainable Europe" – recognising the economic role of cultural heritage in attaining the Europe 2020 targets for "smart sustainable and inclusive growth" (Cultural Heritage Counts for Europe (CHCFE), 2016). It gives distinctiveness, meaning and quality to the places in which we live, providing a sense of continuity and a source of identity (Historic England, 2015) and incorporates both Core Values One and Two of the HEW Act – involving people and communities and integrating them into the decision making process.

In general (but not always) sites need a socio-economic function for it to retain some relevance or importance to the society in which it is situated. Particularly if it has a maintenance requirement. Not all buildings or places of cultural significance can exist on state funding or tourist pounds or dollars. It does however, engender a feeling of social cohesiveness and community resilience (Goodmand-Shortall, 2016) (Plevoets & Sowinska-Heim, 2018).

Buildings are like machines for living – they need to be used and maintained or they fall into disrepair and lose their functionality. Sustainability reinforces the ethical reasons to re-use old buildings. There is an economic value in an existing structure relating to the physical embodied energy expended in their construction - By re-using buildings we save financial as well ecological resources (Yung & Chan, 2012) (Webb, 2017).

"The key economic reason for the cultural patrimony case is that a vast body of valuable assets, for which sunk costs have already been paid by prior generations, is available. It is a waste to overlook such assets." (The World Bank, 2001).

For such initiatives to work, however, there must be community buy-in, which in turn requires an appreciation of existing heritage by the local community – which is where education can play a role. In fact the Amsterdam Declaration makes this point:

"The architectural heritage will survive only if it is appreciated by the public and in particular by the younger generation. Educational programmes for all ages should, therefore, give increased attention to this subject." (ICOMOS, 1975).

Such benefits can be achieved by minimal cost, and for a far larger social capital. John Yates, (IHBC) suggested that both primary and secondary education would benefit the participants, enhance community cohesiveness and ideas of citizenship, create deeper feeling of cultural ownership and instil civic pride and a greater likelihood of public participation (Shacklock, 2006).

This also has implications for education choices later in life and mutually supports the drive to improve and grow the teaching of skills and understanding of historic buildings at all levels. By introducing children to these kinds of environments and raising awareness of future career options in the historic building sector in primary and secondary school, potentially improves outcomes at FE level (NHTG, 2007).

Urban regeneration and particularly gentrification or social/economic renewal of areas fails to acknowledge the considerations of the Amsterdam Declaration (Part F):

"The rehabilitation of old areas should be conceived and carried out in such a way as to ensure that, where possible, this does not necessitate a major change in the social composition of the residents, all sections of society should share in the benefits of restoration financed by public fund".

Again this supports the ethos of inclusivity of the HEW Act and stresses the importance of having mutually supportive legislation to ensure maximum gains.

5. Responses - Retrofit and Unintended Consequences

“For...decisions to be well-considered, knowledge and understanding are essential ...Thought and investigation should precede any action.” (Society for the Protection of Ancient Buildings (SPAB), 2001).

“All too often, well intentioned efforts to solve pressing problems create unanticipated ‘side effects’. Our decisions provoke reactions we did not foresee. Today’s solutions become tomorrow’s problems.” (Sterman, 2002).

Retrofit

There are a number of methodologies for assessing building performance (the most widely used in Europe being Building Research Establishments Environmental Assessment Methodology):

- BREEAM : accounting for eighty percent of buildings certified in the European Union
- LEED : (Leadership in Energy and Environmental Design) an American equivalent created in 1998
- HQE : (High Quality Environmental) created in France 1992
- Miljöbyggnad : (Environmental Buildings) Swedish methodology created in 2005
- DGNB : (German Sustainable Building Council) developed in 2007

The above systems, however, are not accurate predictors of performance or rating for historic buildings. The assumptions they tend to make are based on standardised materials and methods of construction not conducive to the accurate evaluation of historic buildings. Neither do they properly account for the considerable embodied energy saved in existing buildings, or their social and cultural value. This has a tendency to leave historic buildings poorly “valued” unless they have architectural or historical importance that leads to listing or conservation area protection.

Nevertheless, retrofitting of energy efficiency measures is generally seen by the majority of the industry as the most effective way of achieving reductions in the carbon emissions whilst also improving the performance of existing buildings.

At the 2017 STBA/SPAB conference, Peter Rickaby (Rickaby Thompson Associates Ltd) in his keynote speech on “UK Retrofit Policy”, postulated that 1.5 retrofits per minute would be required to achieve zero CO² emissions by 2050 at a cost of £625 billion (based on twenty five million properties at a unit cost of approximately £25,000) (Rickaby, 2017).

He also re-iterated the necessity for better “heritage” representation on the British Standards Institute (BSI) Retrofit Standards Task Group, echoing the concerns of John Preston (Vice-Chair of IHBC’s Policy Committee) in his response to the Bonfield Review in Context magazine’s “Retrofit Edition” (Preston, 2017) – a plea that has been addressed with a STBA member now sitting on the panel.

In the same edition, Guest Editor, John Edwards suggests that in the race for “Green” retrofit a one size fits all approach leads to an inevitable but entirely avoidable catalogue of unintended consequences. Despite the review referencing a holistic approach it fails to achieve this aspiration by using retrofit intervention as a starting point, rather than assessment and repair (Edwards, 2017).

Retrofit is usually characterized as introducing a building element, service or material that was not part of the original construction. However, it is possible to improve the performance/energy efficiency of a building

without necessarily having to make additions that were not there originally. This can take a fabric first approach based on a thorough survey that features building physics and thermographic surveys (Atkinson, 2017), and an appreciation of the difference between vapour open and vapour closed systems. This can be illustrated by reference to the holistic retrofit process as suggested by BS 7913:2013 below:

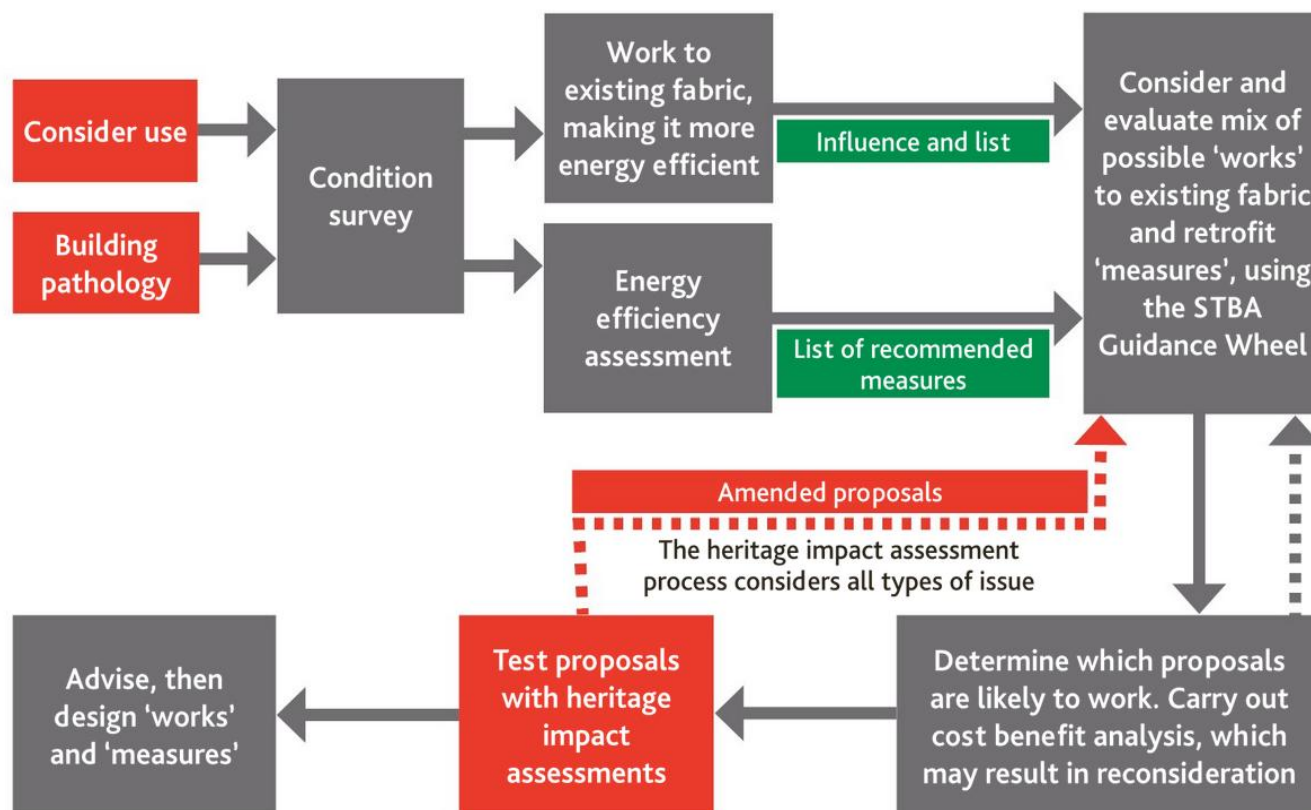


Figure 6 – BS 7913:2013 - Retrofit Process

(BS 7913:2013, 2013)

The removal of cement pointing and/or render can facilitate more effective hygrothermal performance of a solid wall by allowing trapped moisture to transfer out of the wall, allowing moisture levels to fall to manageable levels and thereby improving the heat load requirements of the building – as a property that has “damp” walls may be as much as thirty percent less efficient than a property that has low RH levels within its walls (Little, et al., 2015) (Rye, 2017), or can affect the fabric itself in traditional timber frames (Whitmand & Prizeman, 2016) (Radivojevic, et al., 2014).

Unfortunately, the improvement process is often driven by manufactures or installers with knowledge specific and often limited to the products and systems being sold – with systems and materials often inappropriate to historic building types: cement pointing and render, “Turnerisation” of roofs, chemical damp proof injections, plastic replacement windows and stone cladding being the most obvious. The precautionary principle is often ignored (Caird, 2017).

Improvement programmes in Wales, and in particular, group repair initiatives to ensure compliance with the Welsh Housing Quality Standard (WHQS) therefore require careful planning and should be individualistic in assessment and application. They should avoid blanket approaches and universal application system without due consideration for building pathology. This may not always be the case however – see the Preston scheme (de Selincourt, 2018).

The most recent WHQS guidance released merely states that insulation of walls should be sufficient to avoid the chance of condensation: *“all necessary steps should be taken to ensure the thermal performance of external*

walls is adequate to avoid the likelihood of condensation” (WAG, 2008) although it does reference the Energy Saving Trust for further advice and guidance.

Unintended Consequences

Although the next deliberation covers the unintended consequences of Energy Efficiency Measure (EEM) interventions, regard should also be paid to occupier behaviour and the extent to which we can apply digital modelling and assumption based software to complex physical constructs and even more complex human interactions (Stermann, 2002). Can socio-technical solutions ever be considered accurate – particularly when being used to justify interventions of the scale and cost previously mentioned by Rickaby? (Johnson, 2001). That is not to say we should do nothing – but perhaps greater consideration should be applied than is currently the case.

Whilst some interventions can be more intrusive than others, unless they are part of a whole house approach the consequences can be considerably diverse. Shrubsole et al suggest up to one hundred possible issues resulting from a poorly thought out or badly executed intervention strategy (Shrubsole, et al., 2014). However, the unintended consequences can also result from policy development or implementation - see below:

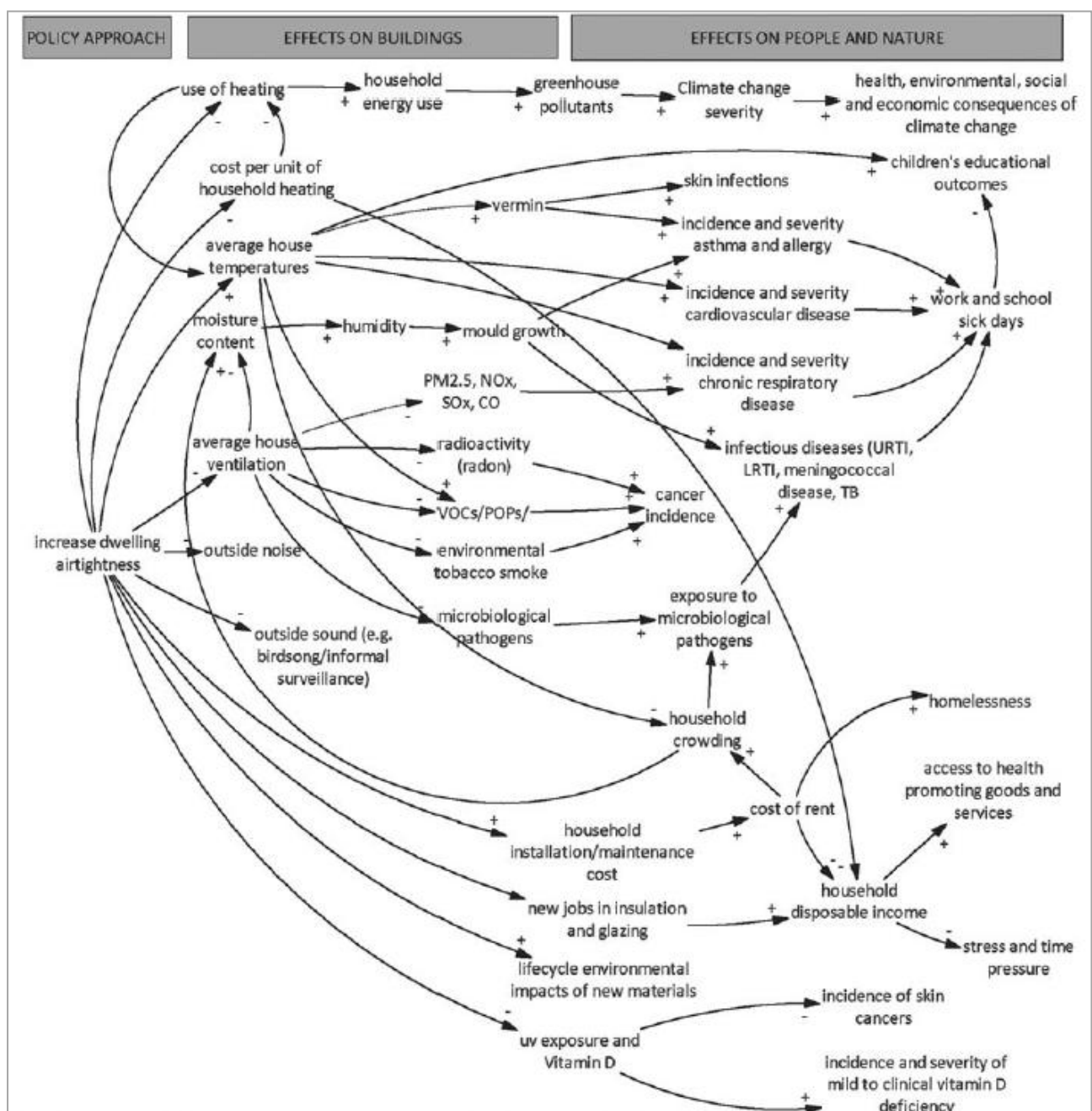


Figure 7 - 100 Unintended Consequences

(Shrubsole, et al., 2014)

By placing too much emphasis on energy rather than a more holistic sustainable approach there is a very real danger that not only will the desired carbon savings not be fully realised but that any gains will be cancelled out by the range of social, economic, environmental, health and heritage consequences illustrated above (Ibrahim & Pelsmakers, 2018) (Gupta & Gregg, 2016) (Shrubsole, et al., 2018).

Taking a more holistic, fabric first approach to energy efficiency interventions and through a more educated and considered approach to interventions systems and materials, then synergies may be possible with legislation such as the WFG Act. By encouraging better widespread understanding of historic buildings, pathology and materials, it should be possible to avoid unintended consequences such as interstitial condensation, poor indoor air quality, mould growth and condensation and the resultant health implications they bring (Boomsma, et al., 2017) (STBA, 2015) (Edwards, 2017).

Education is key - better understanding would also bring benefits for the long term sustainable future of the historic built environment, prolonging the potential useful life of a building and reducing embodied energy by the use of more sustainable materials (Lombardo, 2012) (De Joana, 2015) (Esin & Yuksek, 2008).

Scale of the Issue

Whilst listed buildings and buildings in conservation areas have a modicum of regulatory protection, this is not the case for the majority of historic buildings in Wales. They may not have the same architectural uniqueness or historical importance of a listed building, but as a group, they represent an important part of the social history of Wales. So how big a group of buildings does this include?

In 2007, The joint NHTG, CITB and CADW, “Traditional Buildings Craft Skills Study” stated that: *“There are 497,000 pre-1919 buildings in Wales”* (which is not referenced) and goes on to say, *“one third of all Welsh housing stock dates from before 1919”* which references Welsh Housing Statistics of 2004. It should be noted that one references housing stock whilst the other mentions more generally “buildings”.

A CITB report entitled “Skills Needs Analysis of the Construction and Built Environment Sector in Wales” produced in 2013 had greater detail, listing the number of pre-1919 dwellings as 459,000 or thirty-four percent of headline total of 1.35 million dwellings – referenced from an earlier report that sourced the total figure from Welsh Dwelling Stock Estimates. See Appendix 4.

The 2015 CITB report “A Material Issue” again discusses pre-1919 “buildings” also uses a one third figure (thirty-four percent) of “current housing stock” with no headline figure but referencing the earlier CITB report of 2013.

The most recent “Welsh Dwelling Stock Estimates”, released in 2017, provide a figure of 1.4 million dwellings. (WAG, 2017). This figure generally corresponds to an estimate of 1.41 million houses in Wales as of 2017 (Valuation Office Agency (VOA), 2017)

Breaking those numbers down into pre and post 1919 construction dates, approximately four hundred and forty-two thousand homes were built prior to 1919 according to Valuation Office Agency figures – which is slightly less than the figure quoted in the 2013 CITB report – see Appendix 5. Of that number, 228,684 are classed as social housing units (Statistics for Wales, 2017) with Registered Social Landlords (Housing Associations) owning sixty-two percent and Local Authorities owning the other thirty-eight percent.

However, what the above figures do not include are non-domestic buildings. There is no accurate data available for the age profiles of all non-domestic buildings (NDB's), however the Valuation Office does provide statistics on the total number of rateable properties for Wales. (Valuation Office Agency (VOA), 2017). This list suggests

there are 113,110 non-domestic ratings in Wales – see Appendix 6. Nevertheless this list does not include non-domestic buildings that do not attract a rating (or have an exemption of some kind) such as places of worship and agricultural buildings (HMG, 2018).

The Royal Commission on the Ancient and Historical Monuments of Wales lists 6,426 chapels on its database although not all are still extant (RCAHMW, 2018). The Church in Wales lists one thousand five hundred congregations and there are 4,290 other registered places of worship in Wales (HM Passport Office, 2018).

The Department for Environment, Food and Rural Affairs in collaboration with the Welsh Assembly Government (WAG) produced a 2016 report that listed the number of farms in Wales as 35,200 (DEFRA, 2016), whilst WAG produced a further report in 2017 listing the total number of Welsh farms at 37,282 (WAG, 2017).

Based on an estimated 1.2 million pre-1914 historic farm buildings in England distributed amongst 218,000 farms (Gaskell & Owen, 2005), an extrapolation of similar farms to buildings ratio of 1:5 for Wales would suggest there might be in the region of 186,000 farms buildings of similar age. Even if that ratio was reduced to reflect the different farming methods and preponderance of sheep farming in upland areas to 1: 4, that would still suggest a number near 150,000. See Appendices 7 and 8 for a further breakdown. What the above estimations would imply is that there may be a far large number of historic buildings in Wales than there is official data for and is deserving of further study.

6. Skills Analysis Reports – Skills Shortages and Knowledge Gaps

There continues to be a shortfall in the number of construction personnel with the requisite skills to engage in heritage works (particularly trades) to the extent that it may threaten to affect national infrastructure projects (such as Crossrail 2 and HS2*) and even the renovation of the Houses of Parliament (£3.5-4 billion over five to eight years) (Independent, 2017). It is estimated that apprentice and trainee numbers for traditional skills courses fell by seventy-eight percent in the period between 2005 and 2014 (Historic England, 2017). In general there appears to be a fall in numbers, with the recent announcement by the Chancellor, Phillip Hammond that apprenticeships started in January 2018 were thirty-one percent lower than January 2017 (FE Week, 2018).

Previously there have been missed opportunities or options not taken:

“The government rejected the Tomlinson Report’s recommendations for enhanced vocational qualifications, which might have boosted entry into conservation trades. There has been little support for mature students and others interested in moving to a new career in conservation work. Postgraduate conservation courses have developed, but remain pitifully few in relation to the potential need.” (Shacklock, 2006).

Indeed as long ago as 1997, the Kennedy Report on widening participation in the Further Education sector suggested the most important driver for change would need to be funding (Kennedy, 1997). It also highlighted coherence and clarity as essential, which has not always been the case at FE level with a plethora of qualifications and standards often leading to confusion and unrealised objectives (NHTG, 2005).

This is partially a result of the nature of the industry: *“the complexity of the work involved in CBE inevitably has a bearing on the variety and complexity of qualifications.”* This is also a result of the differences between large and small employers, who each have differing modus operandi, and as a result have divergent requirements for their staff and their skill sets (Qualifications Wales, 2018) (NHTG, 2007).

The first organisations to attempt to address the issue of conservation skills were CITB-ConstructionSkills and English Heritage. In 2003 they established the National Heritage Training Group (NHTG) a voluntary organisation tasked with developing traditional construction skills relevant to vapour open building types.

In response to concerns regarding the shortage of skills they produced a 2005 report: *“Traditional Building Craft Skills: Assessing the Need, Meeting the Challenge”* that sought to quantify training and skills gaps within the sector in England (NHTG, 2005).

Associated reports soon followed in Wales (2007), Scotland (2007), and Ireland (2009) whilst there were similar reviews on Contractors (West Midlands 2008), Sector Professionals (2008), a Research Report (England, 2008) along with a 2012 report on the Economic Contribution of the Heritage Sector.

However, despite numerous reports and action plans in relation to improving the level of understanding within mainstream construction is not yet manifest.

*Although under the auspices of the High Speed Rail Act 2017, the Act authorises any necessary works to both listed buildings and ancient monuments (up to and including demolition) without the usual required consents. This applies to other infrastructure projects authorised by Act of Parliament.

Key points arising from this report:

- Five to ten year training plan
- “Statutory duty or other pressing interest” was declared as a prerequisite to ensure the proper preservation of historic building fabric and to ensure that correct materials were used.
- One hundred trades/crafts people would be required each year between 2007 and 2011.
- It suggested in Wales stonemasons and lime plasterers are effectively main trades rather than conservation specialists (which obviously suggests the question of why these skills are not part of mainstream education pathways).
- Further grant schemes to be made available for historic buildings of “outstanding and national importance”.

Whilst the last point is commendable, it does perhaps hint at an exclusivity in theory that is not reflected in practice. The pathology and requirement for carefully considered intervention is just as relevant to a ubiquitous terrace house as it would be for a listed building of national architectural importance. The underlying building physics of vapour permeability and materials used are generally the same and should be treated as such (Edwards, 2017).

Whilst one is assigned protection due to its uniqueness architecturally or historically, the other may equally be important as part of a collective or group that reflects a social or historic importance every bit as important to the community in which they exist. For example the Welsh Streets in Liverpool are an important cultural and historic reference point collectively that one might not determine if looked at individually or in isolation.

This raises issues in relation to factors affecting what is deemed worthy of protection – class, social inclusion, taste, fashion, expert opinion versus more plebeian opinions that unfortunately are unable to be discussed at any depth within the confines of this review but have been covered by a number of other studies:

A YouGov survey of 2009 found that a large majority of respondents (seventy seven percent) expressed a preference for traditional/historic architecture over modern architecture prompting the then President of the Royal Institute of British Architects (RIBA) Ruth Reed, to opine that traditional buildings are “*frequently very expensive and often use unsustainable materials*” (Hopkirk, 2009).

This led Robert Adam (of ADAM Architecture) to respond: “*I don’t know what planet Ruth Reed is on if she thinks that the glass, steel and concrete favoured by modernist architects are more sustainable or cheaper than the natural materials like brick, stone and stucco used by traditionalists, but this knee - jerk negative reaction from the architectural profession is to be expected.*” (ADAM Architecture, 2009)

Whilst to a degree anecdotal, this pointed lack of understanding by the head of a profession integral to the built environment may be a reflection of the lack of conservation training on architecture courses (where it remains a post graduate specialism and still considered niche). This is by no means a modern concern - Sir Bernard Feilden suggested the requirement for a conservation specialist in every architectural office in the UK back in 1975 – with a study by Orbasli and Whitbourn in 2002 suggested a continued lack of conservation understanding/content at undergraduate level (Orbasli & Whitbourn, 2002) (Preston, 2006) – “Conservation education is a later specialisation for most professionals” (Russell, 2017).

This is not just a UK issue: whilst eighty percent of work undertaken by United States (US) architectural practices involved existing buildings, the National Architectural Accrediting Board did not deem knowledge of adaptive re-

use or professional understanding of historic conservation an “essential criteria” (Maxwell, et al., 2012). In Australia, a 2010 heritage training report found a correspondingly insufficient level of training and skills and inadequate frameworks for education and up-skilling operatives and no meaningful instruments for enforcement of standards.

As Maxwell suggests, a core of essential learning criteria including internationally recognised principles of integrity, authenticity reversibility and minimum intervention could be the cornerstone of introduced compulsory syllabi aimed at increasing understanding of the specific requirements of historic buildings and building materials (Maxwell, et al., 2012). Admittedly, this would only apply to new professionals and not those already practising. These would need to upgrade their competencies through structured Continuing Professional Development (CPD).

Any educational developments would need to be supported – for example using procurement registration arrangements for public sector contracts and quality standards schemes for private owners of historic buildings to ensure that both larger contractors as well as Small and Medium Enterprises (SME’s) and sole traders have the necessary understanding and skill sets to engage with the repair, maintenance and improvement of historic buildings.

The 2007 report also suggested:

- Eighty-eight percent of respondents to the survey indicated they were general builders that undertook work on historic buildings rather than conservation specialists, and seventy-five percent of those, indicated that three quarters of their work involved historic buildings in a twenty-mile radius of their base
- Welsh building firms are more likely to use modern materials on historic buildings
- Less than half expressed an interest in developing their historic building skills, and less than a quarter indicated they would be happy to provide such training to their staff
- Contractors were concerned about modern apprenticeships, and in particular with the college-based element, with a third highlighting the importance of on the job training
- A clear framework for progression was declared as important by eighty-nine percent of those interviewed, with more structure than existed at that time
- Heritage Lottery Fund (HLF) Bursary funding only equivalent to five to ten placements in Wales, which was far lower than the estimated requirement for one hundred trainees (NHTG, 2007).

From this a list of recommendations was created:

- Establishment of regional historic building skills Centres of Excellence
- The NHTG was tasked with promoting and expediting a “Train the Trainer” programme for FE colleges in Wales
- FE colleges needed to develop closer links with employers/contractors to facilitate the up-skilling of staff and also using mobile onsite assessment and training (OSAT)
- Welsh Assembly Government (WAG) and Learning Wales to ensure sufficient strategic, statutory and financial support is provided to ensure recommendations remain feasible, with cross sector discussions required between ConstructionSkills and ProSkills to ensure collaboration between manufacturers and suppliers of traditional building materials with end users in the CBE industry.

The findings of the report prompted a set of action plans for each of the recommendations, with one of the most significant in terms of potential outcomes was the proposal to introduce compulsory syllabus content on the understanding of building pathology for historic buildings and the use and performance of materials used in

their construction. The organisations tasked with introducing the curriculum changes were NHTG, CADW (WAG), and CITB ConstructionSkills.

Recognising the larger than average percentage of historic buildings in Wales and the amount of work spent on maintenance and repair and improvement, the report sought to address issues by establishing a number of action plans resulting from the recommendations in the report; one of which is of particular relevance:

<i>Recommendation:</i>	<i>Promote effective conservation, repair and maintenance as part of mainstream construction, and integrate traditional building skills within thinking and delivery of construction courses.</i>
<i>Action:</i>	<i>Built Heritage Skills Sector Agreement between Welsh Assembly Government and ConstructionSkills, and liaise with Design Commission for Wales.</i>
<i>Performance Measure:</i>	<i>2007-2011: Establish and deliver actions within Sector Skills Agreement</i>

Figure 8: Point 1.2.1 - Embedding of skills in mainstream construction courses

(NHTG, 2007)

The above plan was given high priority due to the potential impact it would have for the historic built environment – reflected in the stakeholders involved in its implementation. It was to be lead by Welsh Assembly Government, ConstructionSkills, Design Commission for Wales and the NHTG. As its implementation was classed as medium difficulty a timescale of five years was allocated for resolution (NHTG, 2007).

2011 Pye Tait report for CITB ConstructionSkills

The report highlighted eight critical “specialist” areas requiring increased or improved training interventions, one of which it classed “Heritage”, due to the demand for retrofit and energy efficiency interventions demanded by the Low Carbon Agenda.

However, Interior Wall Insulation (IWI) was listed as a separate ‘specialist’ area as a result of “the ARBED programme for regeneration in Wales” (CITB ConstructionSkills, 2011).

The historic building sector was not at that point covered by any accredited courses in any of the Welsh regions:

Occupations/subject areas	Cross-region	North Wales	Mid Wales	South East Wales	South West Wales
Earth Moving	0	0	0	0	0
Plant	0	10	1	14	4
Heritage/Historic	0	0	0	0	0
Insulation	0	0	0	3	0
Prefabrication	0	0	0	0	0
Scaffolding	0	0	0	1	0
Steeple-jacking	0	0	0	0	0
Street works	0	0	0	0	0

Figure 9 - Number of Accredited Courses Matching Skills Gaps (CITB ConstructionSkills, 2011)

(CITB ConstructionSkills, 2011)

It also recognised the need for new skills and proposed the creation of a new centre of excellence for construction in Wales: although the exact form that the centre would take was fairly evenly divided between three options: A physical centre; a partnership model over designated sites; or the re-training of staff in existing institutions. The votes for the preferred option being listed below:

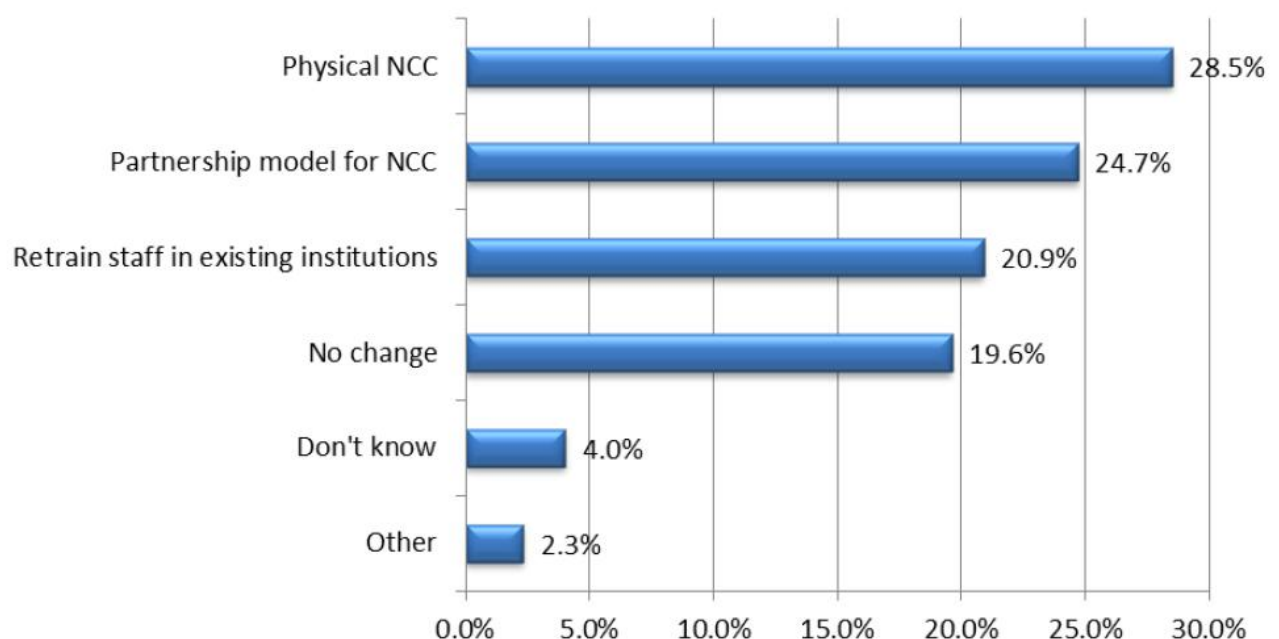


Figure 10 - Options for Transformational Change

(CITB ConstructionSkills, 2011)

Following a 2012 Summit in Caerphilly organised by the Wales Historic Environment Group (HEG) on traditional building crafts, there were repeated calls for them to be included in mainstream construction courses – a view echoed by the STBA twelve months later.

The same year the CITB via WAG funding established the Sustainable Construction Learning Sites Project, the outcome of which was the creation of a (Level 3) CPD module on “Sustainability and Energy Efficiency in pre and post 1919 buildings” available for trainers along with the development of an optional Level one module for learners. The Summit appeared to have strong political support from WAG, with Huw Lewis, Minister for Housing, Regeneration and Heritage stating:

“Without a sufficient supply of traditional building craft expertise, the future of our built heritage in Wales will not be in safe hands.”

(Historic Environment Group (HEG), 2012)

It also celebrated the success of the innovative shared apprenticeship scheme – discussed elsewhere in this review.

2013 CITB Skill Needs Analysis of the CBE Sector in Wales.

In 2013 a skills needs analysis report was produced on maintenance repair and retrofit (English Heritage, 2013). The major findings and recommendation are listed below:

- Demand for skills lower due to economic conditions
- Non-essential work postponed
- Insufficient information available for stockholders on the types of skills and materials that should be used
- Costs seen as a barrier to using traditional materials and contractors
- Perception of diminished grant funding

2013 – CITB Skills Analysis – Headline findings	
1	Economic climate had seen a reduction in output and invariably a skills demands were lower as a result
2	Non-essential work was being postponed (maintenance invariably suffers in these environments)
3	There was insufficient information available for stockholders on the types of skills and materials that should be used
4	Costs were considered a barrier to using appropriate materials
5	There existed a perception of diminished funding available
6	Action was advocated to educate and inform stakeholders of the specific requirements of historic housing
7	Showcase CSCS Heritage Skills Cards to promote competency
8	Improve accessibility to training resources for contractors
9	Create and distribute 'map' of training & qualification pathways
10	Develop up-skilling training programmes
11	Promote maintenance and repair with stockholders as a way of improving energy efficiencies
12	Improve understanding and raise awareness for designers and specifiers
13	Ensure National Occupational Standards are fit for purpose
14	Levels of confidence shown by contractors (for working on historic buildings) was not reflected in the results of the qualitative interviews

Figure 11 - Headline Findings of CITB Skills Needs Analysis 2013

(CITB, 2013)

2015 CITB Study – A Material Issue: Understanding and Responding to the Traditional Building Skills Challenge

CITB then undertook a wide ranging consultation following on from this project and partly in response to government initiatives based around the energy efficiency and low carbon agendas. Undertaken between June and December 2014 the report was released in 2015.

2015 - Headline Findings of: A Material Issue: Understanding and Responding to the Traditional Building Skills Challenge in Wales	
1	94% of businesses surveyed were mainstream construction.
2	The 94% all undertook work on historic and modern buildings.
3	Work undertaken on historic buildings accounted for 45% of firms time.
4	Of the work undertaken on historic buildings: 50% was spent on Maintenance and Repair (M&R); 37% was spent on Restoration and Conservation (R&C); 13% on Retrofit.
5	Retrofit was driven primarily by financial incentives and policy vehicles (Arbed, CESP, ECO etc.).
6	Houses into Homes schemes was another major driver.
7	Despite the considerable financial investment in the schemes themselves, less attention appeared to be assigned to the systems, materials and techniques employed during installation.
8	11% of respondents had undertaken work on historic buildings whilst aware that they had inadequate understanding and skills appropriate for the work
9	87% of professional employers were confident in their staff's ability to advise on historic buildings (including surveying, designing and assessing)
10	In the last five years 33% had undertaken recruitment of an apprentice based on work demand for work on historic buildings whilst 21% suggest they would be likely to recruit within the next year
11	82% were confident of their ability to work with traditional materials yet 80% then went on to state that they had used modern materials on historic buildings
12	23% stated that vernacular materials are never specified in Wales
13	The most common reasons given for not using the materials were: Cost (37%) Availability (15%) They do not meet modern Building Regulations or performance standards (10%)
14	95% of those surveyed stated none of their workforce have a historic building trade or conservation qualification
15	69% of employers felt an historic building skills element in mainstream construction courses (at FE Level) would be valuable
16	The CBE sector has made representations to CITB that the workforce be educated to an equivalent of Level 3
17	Some supervisory content of Level 3 courses to be replaced by with other skills
18	Compulsory sustainability and historic building content to be included in all qualifications in Wales
19	Replies and evidence suggest considerable work is being undertaken on historic buildings by contractors who lack the fundamental skills and understanding for doing so. Given the growth of certain areas of work such as retrofit, driven by government policies, this is likely to increase.
20	The above is exacerbated by a lack of historic building training provision within Wales.
21	Practical components should be integral to the courses as contractors place high value on this element – as a result having sufficient live site capacity was also highlighted as essential to the success of this endeavour

Figure 12 - Headline Findings of 2015 Report.

As was suggested in earlier reports and reviews, there was a repeated recognition that historic building understanding and skills should play a part in mainstream construction courses. Respondents were

overwhelmingly positive about embedding the knowledge required to work on historic buildings with existing construction courses – see table below from the CITB report:

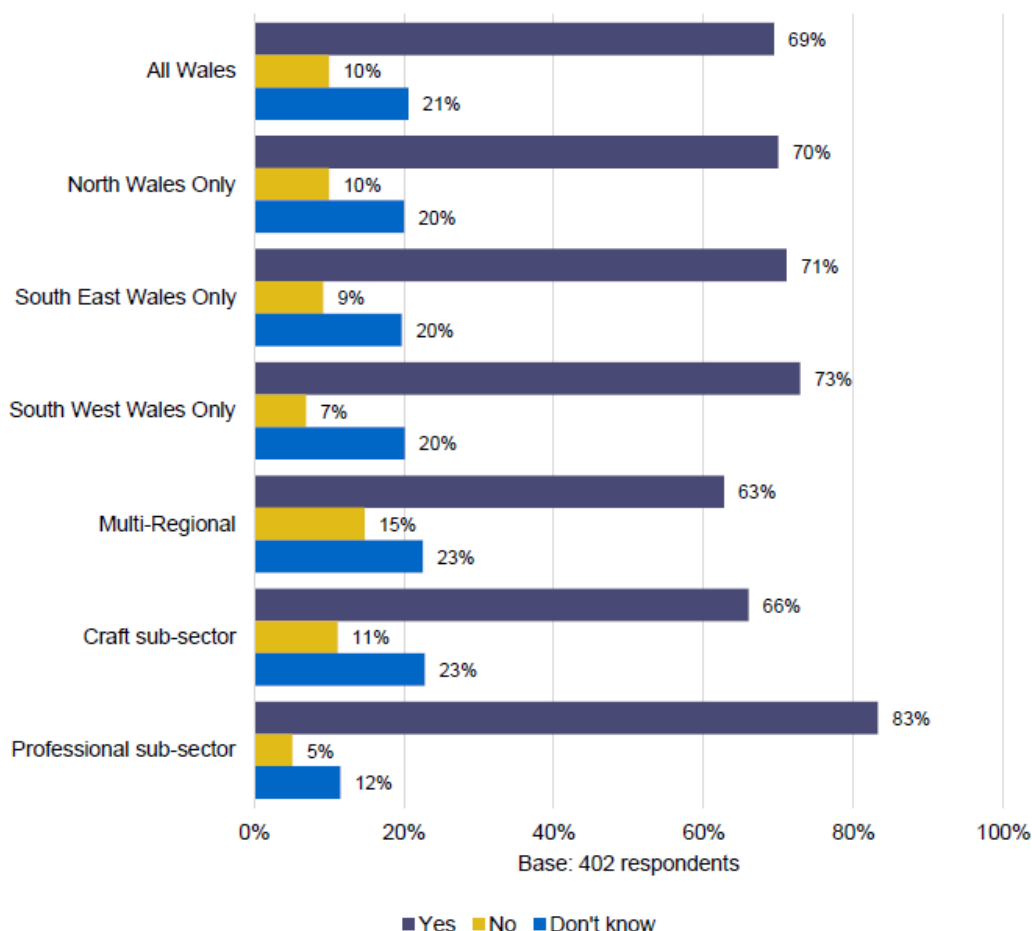


Figure 13 - Would coverage of historic building skills be beneficial?

The CITB 2015 Study “A Material Issue” also placed a great deal of emphasis on industry demand. However, it can be difficult to create “demand” without a level of statutory compunction to mutually support such efforts. If the existing workforce, including industry leaders do not have understanding of historic building physics or are heavily invested in new construction methodology, it can be difficult to create demand with advice and guidance only.

This underlines the previously discussed criticism of the missed opportunities in various industry reviews - such as the Bonfield Report that failed to address vapour open built heritage in its retrofit plans – a fundamental flaw. The foreword by Baroness Neville Rolfe and Gavin Barwell MP salutes the report as one “offering a clear and tangible way forward, led by the industry itself” (Bonfield, 2016). The industry is not however a monolithic block but a broad church of differing and competing priorities and demands and the larger, commercially successful often set the agenda and terms of reference for such studies.

Unfortunately, the Bonfield Report made little mention of heritage buildings, due, it was suggested by John Preston of the IHBC, to the working groups being invited industry insiders that failed to engage with external bodies such as the National Trust and IHBC. As a result of these criticisms and challenges from the IHBC and others, changes in personnel have been instigated with the inclusion of three IHBC members now included on the work streams – Nigel Griffiths on the Standards Group, Sam Allwinkle on Training and Nick Heath on Design and Installation (Preston, 2017)

This neatly illustrates the potential for larger organisations to dominate the market (and perhaps the debate) – as was suggested by participants in the Qualification Wales study (Qualifications Wales, 2018).

2017 CITB Vocational Education and Training Report

There are also risks associated with leaving the European Union and the anticipated downturn in numbers of (mostly) younger workers from other countries along with an ageing domestic workforce and the loss of knowledge, experience and skills that inevitably brings. It is estimated that 36,000 new recruits are required in the UK every year up to 2021 – see Appendices 9 and 10 for country and regional breakdown of forecasted employment requirements and growth estimates.

This goes hand in hand with the somewhat negative image problems construction has to address:

- The demographic image of the workforce - where it is predominantly male (eighty-six percent) and white (ninety-four percent - self designated)
- The perception that vocational educational options are the poor relation of other more “academic” professions, for example ninety-two percent of parents consider apprenticeships to be a positive pathway for achieving certain educational outcomes, but only thirty-two percent consider it the right option for their children
- These negative attitudes establish a self fulfilling feedback loop where the best talent is persuaded to take alternative learning routes or careers, thereby reinforcing the perception of an industry populated by less gifted students and the associated negative image that follows on (Hazleden, et al., 2017).

A further point of note, and one that should be considered for the introduction of historic building skills, is that on leaving college, learners stated the main reason for not finding employment was lack of practical work experience (this problem is mentioned later in the Research Results as a possible barrier to historic building skills introduction).

The CITB white paper suggests that the new T-Level construction courses, would ensure employers needs are met (CITB, 2017) – although this does beg the question of whose needs? As the NHTG skills analysis study 2007 stated, there are a variety of competing needs and requirements dependent on the size of the organisation and the sector they operate in – to satisfy all is almost an impossible task (CITB, 2013).

The report goes on to say that *“Further Education provision must continue to be placed on a sound financial footing, to enable colleges to better respond to the changing training needs of industry”* echoing the call for better funding to put FE on an equal footing with universities by Dame Helena Kennedy in her review of FE in 1997 (Kennedy, 1997).

The Parliamentary Economic Affairs Committee highlighted the continued discrepancies in funding by emphasising that in 2017/18 the 1.5 million HE learners were in receipt of funding equivalent to £11,500 each, whilst 13.5 million FE students were in receipt of funding equivalent to £2,700 each, with FE commissioner Richard Atkins admitting: “the amount of funding ... is modest and therefore I am not sure it will transform the system” (FE Week, 2018).

Where Wales differs slightly (and is likely to even more if the Hazelkorn and Qualifications Wales reviews are both implemented) is that it follows a more traditional “systems” approach to the delivery of further education whilst in England a far more market driven contestability approach is followed – where student (customers) and the market are deemed the most effective mechanism for allocation of resources (Keep, 2018).

Summary

In the last thirteen years there have been a number of major reports on the traditional skills shortages in the construction sector. All have arrived at similar conclusions in relation to the provision of traditional skills at FE level – namely that they should form an integral part of construction courses. However, despite the best endeavours of all parties involved both governmental and non-governmental this has not yet been achieved.

Each of the reports came to similar conclusions, suggesting that there were considerable gaps in training provision, general understanding and trade skills. In particular, it alluded that construction courses in general were overwhelmingly biased towards new construction.

The reasons for focusing on this particular target of the report are based on previous discussions central to this review: that those properties that are listed or exist within conservation areas have at least some level of protection and are more likely through that designation to have construction professionals involved that have at least some understanding of heritage building pathology/materials (notwithstanding consideration of skill gaps and personnel shortages at that level) (Preston, 2006) (Feilden, 1995).

However, there are a large number of non-listed heritage buildings that are not afforded this level of protection or scrutiny and continued to be maintained, repaired, altered and “improved” by trades and construction operatives with little or no understanding of vapour open building pathology and material performance and behaviours.

From the process of this literature review it is apparent that capturing all future members of the construction sector through compulsory curriculum content, at the earliest opportunity, would be the most effective method for improving levels of understanding “at the coalface”.

By ensuring that all sections of the construction sector have a basic understanding of building and material physics for heritage buildings, training at this level could have a profound effect on the sustainability of the widest range of buildings and communities – with symbiotic benefits for social cohesion, health and wellbeing, civic pride, community based regeneration and economic resilience

Most of the aforementioned studies have spent considerable focus on demand and methodologies for increasing demand for traditional skills. Unfortunately, this has not been as successful as anticipated and skills shortages are still acute.

The studies also implied a significant number of contractors over-estimate their ability to work on, and by implication their understanding of, historic buildings, whilst larger companies demand for skills tend to be more biased towards new construction (NHTG, 2005) (NHTG, 2007) (CITB ConstructionSkills, 2011) (CITB, 2013).

This would suggest that the industry is therefore unlikely to demand the syllabus changes (although a significant proportion of SME’s supported change). The simplest and most effective way of bringing about change is the compulsory teaching of historic building skills and understanding on all construction courses at foundation and undergraduate level (as the skills shortages are not just restricted to FE college courses) (Feilden, 1995) (Preston, 2006).

This review may appear to imply criticism of organisations abilities to realise stated objectives in targeted timescales. However, such implications must be tempered by the acknowledgement that many of the bodies mentioned have been at various times been under severe organisational and financial pressures – only recently the CITB announced eight hundred job losses over the next three years. Its 2018-21 Business Plan forecasts a decrease in employees from 1,370 to just 560, partially through the sale of its National Construction Colleges (despite an “outstanding” rating from Ofsted for its apprenticeships programme) and partially through outsourcing of support staff (CITB, 2018).

Other groups such as Further Education Institution’s (FEI’s) have also been under financial pressure, whilst some organisations are voluntary (NHTG) with limited staff and resources.

Even political bodies (WAG) are not immune to fiscal stresses and have ever changing priorities, external pressures and subject to industry lobbying – which has not and will not be discussed in this review, but needs to be acknowledged as an important factor in any political decision making process (and worthy of further study in reference to the content of construction training course content).

7. Construction Education & FE Colleges in Wales

“Education is at the heart of the heritage profession” (Russell, 2017).

2011 The Wolf Report.

The Wolf Report, whilst primarily an English review, highlighted a number of issues which also resonate in the later Hazelkorn Review:

- Fragmented and confused pathways leading to unrealised outcomes
- Confusion over the purpose of Vocational Education and Training (VET)
- Lack of clarity over equivalencies between qualifications
- Significant changes within post compulsory education
- Qualifications not valued in the labour market
- Qualifications denied accreditation or funding by government agencies
- High drop rates and “churning”. (Wolf, 2011).

Whilst there is not sufficient scope within this review to discuss the above they are listed to provide context to the later review and how certain issues continue to be problematic.

Education and training are pivotal in being key drivers for change (Mochizuki & Fadeeva, 2010).

2016 The Hazelkorn Review.

This report commissioned by WAG analysed the post compulsory education sector in Wales, entitled “Towards 2030: A Framework for Building a World Class Post Compulsory Education System for Wales”. It took the opportunity to state that the commissioning of the report was an *“appropriate time to review and align the arrangements for the oversight of governance in and between institutions involved in the provision of post-compulsory education”* (Lewis, 2015), and the report highlighted a number of issues which are relevant to this review:

- *“Accelerating competition within the UK and internationally, alongside changes in HE governance in England, pose challenges but also present opportunities for Wales”*

The implied critique of competition should be noted as it runs counter to the WFG Act - in the spirit if not the letter of the law – which seeks to promote co-operation where possible.

- *“Insufficient strategic thinking by Government or by the institutions, at all levels, leading to insufficient collaboration, lack of critical mass, and too much competition for limited resources with little benefit for Wales”*

Alludes to the fragmentation not just of FEI’s but of the sector as a whole and reflects the criticisms arising from the various skills analysis reports regarding lack of clarity, duplication and inefficiencies of scale in qualifications. By taking a more collegiate and holistic approach (offered by the “Five Ways of Working”) it may be that some of these challenges could be overcome.

- *“Absence of an overall vision for the post-compulsory system aligned to the social, cultural and economic needs of Wales, regionally and nationally, now and in the future”*

Linked to the fragmentation of FEI's, by referencing social, cultural and economic needs of Wales, Hazelkorn is echoing the sustainability ethos of the WFG Act and its methodologies for success. A singular, focused approach from the FEI's would assist in addressing these problems and a more knowledgeable and better equipped construction graduates (via suggested changes to course content to better reflect the building stock of Wales) would facilitate the wider aims highlighted above.

- *Confusion around the overlapping roles, and duplication of resources, between and across different institutions, between further and higher education, and between different agencies;*

With more Higher Education Institution's (HEI's) undertaking technical education, the border between the two systems is becoming amorphous. The Welsh government therefore announced (accepting Hazelkorn's submissions) a White Paper consultation on 20th June 2017, which closed in October and the responses published. Consideration is being undertaken on the creation of a single national body that would have oversight of post compulsory education and training. This would include the oversight and funding of HEI's as well as FEI's.

- *Absence of coherent learning pathways and educational opportunities for students, of all ages, gender and talent, from school, into/through further and higher education, and especially throughout their working lives*

If the proposed changes are implemented as intended they should, along with the Qualification Wales Construction Sector Review, mean more focused, clear learning pathways and objectives. With specific reference to the CBE education and training pathways, with a single body in control of funding, there may be a levelling of the funding playing field that would enable better resourcing of apprenticeships and training the trainer programmes that changes to the construction curriculum will require. It should also facilitate continual learning which would also be beneficial to the intended up-skilling of the construction sector with regards to historic buildings.

- *Overall absence of strategic capacity and joined-up thinking at and between government and institutions.*

By acceptance of the report finding and the issuing of the White Paper, WAG has taken the first step in addressing the issue. By also supporting and ensuring implementation of the Qualification Wales Review synergies for the CBE sector and the wider remit of the WFG Act could be realised. Whilst it offers some optimism for the desired changes in construction courses, the above should be caveated that like all legislative policy it will require continued and long term political and fiscal support.

For example, despite the involvement of WAG, CADW and CITB in the 2007 skills analysis report, the “high priority” embedding of historic building skills and training was not realised and is still only now being suggested as a way forward, with no guarantee that the awarding bodies will accept and implement its findings.

(Hazelkorn, 2016) (WAG, 2017).

Vocational Training in Wales

“In this region, most of the work is retrofit (houses being repaired, modernised). In Wales 80% of the construction industry is retro, 20% is new build. 100% of students in Wales are being trained in that 20% ...none of them are being trained in the 80% of turnover of what the industry is doing in Wales” (Qualifications Wales, 2018).

In Wales, the majority of vocational qualifications offered by the FE establishments range from levels one to three on the National Vocational Framework (although some higher levels, up to and including degrees, are available in most colleges).

The Further and Higher Education (Governance and Communication) (Wales) Act 2014 created the current environment in which they operate (as not-for-profit organisations). It also increased their autonomy from the Welsh Government, with a representative association called ColegauCymru, acting as a leadership body.

As can be seen in the figure below, the majority (nearly eighty percent) of funding comes from the Welsh Assembly Government, although over the last five years the actual amount has decreased, with total expenditure for 2015/16 being £449 million.

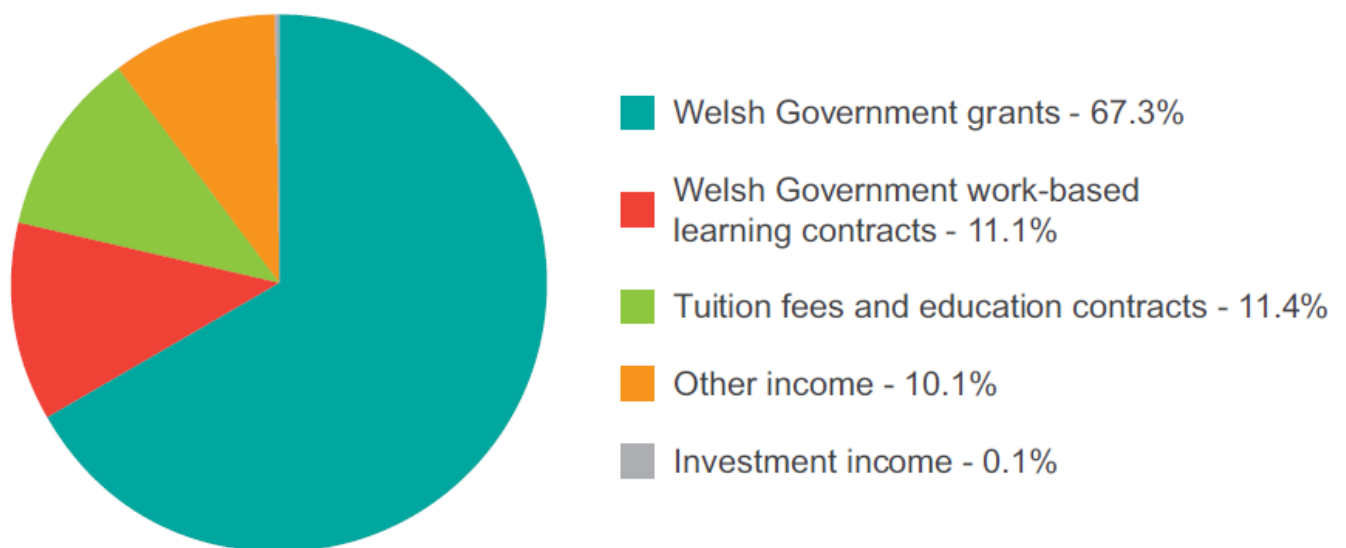


Figure 14 - FE Sector Income Sources 2015-16

(Welsh Audit Office, 2017)

In that same year, the colleges had approximately 130,000 learners enrolled on courses – see below for breakdown:

	2012/13	2013/14	2014/15	2015/16	2016/17
Further Education Institutions (c)					
Full-time learners at FEIs	48,340	48,055	48,935	48,270	46,120
Part-time learners at FEIs	110,080	101,135	85,280	65,345	65,875
WBL provision at FEIs	16,505	18,520	16,010	15,935	16,695
Total at FEIs	174,925	167,715	150,225	129,550	128,690
Work-based learning provision (d)					
All WBL provision	61,255	65,875	57,100	53,735	54,840
Learners pursuing WBL programmes	59,955	64,635	57,005	53,735	54,840
Local Authority Community Learning (e)	31,475	28,050	19,375	14,510	13,910
Total learners at FE Institutions, Local Authority Community Learning and Work-based Learning providers (f)	229,555	223,140	195,700	172,460	172,470

Figure 15 - Trend in Learner Numbers at FEI's (2012 – 2017)

(Welsh Audit Office, 2017)

As can be seen above, Work Based Learning (WBL) and full-time learning numbers have fluctuated slightly whilst part time study has seen a significant reduction (an almost fifty percent reduction).

Cuts to funding have seen a corresponding fall in student numbers, particularly part times courses as this is the area where the shortfall has been felt most. It remains to be seen what effect the WFG Act will have on colleges – whilst they are not bound directly by the Act, as the majority of their funding is provided by WAG the influence the Act may have could be very significant for the FE sector and worthy of further investigation.

Whilst changes to the FE sector have brought greater autonomy to the organisation involved, it has also brought more fragmentation and less clarity:

“There is no unified strategy for the further-education sector or for post-16 education, and although collaboration and joint working are generally sound, relationships between colleges and schools are a concern in some areas”

(Welsh Audit Office, 2017).

The myriad requirements of the various players in the construction education training field has meant a often bewildering number and type of qualifications, with much overlap, many gaps and confusion of educational outcomes (Hazelkorn, 2016).

Previous barriers to change

Reasons for lack of success in introducing compulsory traditional understanding and skills:

- Following a “Demand led” approach to the problem – the industry (as a whole) is unlikely to demand inclusion as it tends to be the larger new build construction companies that are most influential rather than the smaller more diffuse organisations (particularly in Wales) involved in the fifty percent or so of work classed as maintenance repair and improvement (along with retrofit). Waiting for demand to reach a critical mass was never likely to occur without some force majeure compelling colleges to change tack
- Political commitment needs to be fully implemented (as seems likely with the acceptance of the Hazelkorn Review by WAG) and mutually supported with sufficient allocation of resources
- Financial support needs to be consistent and long term – following the NHTG Report funding was provided to establish a “Train the Trainer” scheme for lecturers in FEI’s which was organised via the Neath Port Talbot College (NPTC) Group and delivered by John Edwards (of Edwards Hart). This training ran for less than twelve months due to insufficient funding and was only taken up by approximately twenty-five members of staff from the FEI’s (Edwards, 2017)

There is little doubt that introduction of compulsory historic building skills will require substantial and sustained economic and political commitment. Nevertheless such an investment has the potential to make substantial improvements to the economic and social vitality of Wales (Thomson & Thomas, 2015) (Pattison & Kawall, 2018) (Sovacool, 2015) (Maidment, et al., 2014).

Whilst it is important socially and culturally to protect the warp and weft of our rural and urban environments, it also has fiscal and political benefits.

Cultural heritage can have a significant and measurable effect on the foreign direct investment (FDI), tourism and overseas student and professional recruitment on the international stage. Research released in 2017 showed tangible benefits from the “soft power” of a nation’s culture, heritage, cultural/heritage institutions and cultural environment (amongst other factors such as prosperity, connectivity, levels of democracy and overall cultural ranking). The author of the report, Professor J P Singh stated:

“Soft power demonstrably matters. The United Kingdom’s soft power assets bring revenues from international students, tourists and foreign investment, and they enhance the UK’s international political influence. Soft power should be seen as a mainstream part of public policy.” (Singh & MacDonald, 2017)

Whilst built heritage is obviously one amongst a number of factors to be considered, it does nevertheless create the environment, both figuratively and literally, that influences other equally important components of soft power such as prosperity and health and wellbeing.

However despite the benefits, politics, and political decision making (particularly in relation to funding) can also have a profound effect on heritage. Funding shortfalls and politically driven streamlining of local government services have had a noticeable effect on the provision of guidance on the historic built environment.

Conservation officer positions in Local Government have fallen by a third (thirty-three percent) since 2006, with some local authorities unable to supply any posts at all. This has led to much of the work that had previously been carried out by conservation officers being undertaken by in-house planners or out-sourced completely to external consultants. This situation may deteriorate further should the proposed changes to processing of listed building consent be deferred to independent consultation (Russell, 2017). Another issue is the shortage of lecturers (Anon., 2002) with recent industry experience. With the transition of tradespersons from the industry

to the vocational teaching sector it is important to manage the cultural differences from the building site to the classroom (Saucedo & Morales, 2010) (Ness, 2011) (Page, 2013).

Future Strategies

One of the suggested issues for embedding of practical skills within mainstream courses is the lack of live sites, particularly within easy reach of training centres. The Taylor Review (Taylor, 2017) states £1.74 billion has been spent on repair and maintenance of Church of England buildings since 1999. Whilst the scale of the problem is smaller in Wales there are still approximately six thousand places of worship in Wales. With the distribution of these sites fairly widespread there may be opportunities for collaboration between FEI's and those responsible for places of worship, to implement supervised instruction on maintenance and small scale repair for non-specialist crafts.

Similarly, Registered Social Landlords (RSL's) and Local Authorities between them are responsible for just under 230,000 buildings built prior to 1919 not all of which will be occupied. Again opportunities may exist or could be established for local FEI's and RSL's to work in partnership (collaboration being one of the 'Five Ways of Working') utilising this stock when maintenance, repair or retrofit work is required as live site training opportunities for apprentices. This could perhaps utilise the shared apprenticeship schemes pioneered by Cyfle and Y Prentice. This collaborative, integrated approach could bring wider benefits and would be worthy of further study – particularly for measuring performance following responsible deep retrofit using traditional materials.

With regards to educational developments, the introduction of the compulsory historic content could be boosted by use of new technologies to overcome some of the issues highlighted in the Qualifications Wales report. By dividing education of built heritage into two types, direct and indirect – with direct being education and up-skilling of students, teachers and operatives in the industry and indirect being awareness raising of stockholders, stakeholders and the general public.

Learning and professional development could be augmented though more innovative learning processes and digital repositories. Both categories could benefit from advances in digital learning systems: E-learning, Vlogging, remote assessment (Pink, et al., 2016) (Lobovikov-Katz, 2017).

The Design Innovation and Crafts Resource Centre (DICRC) at the Indian Centre for Environmental Planning and Technology (CEPT) University having established a process of recording two and three dimensional plus exploded drawings of the structure, interior architecture and furniture elements of a range of "typical" houses based on construction type and materials used – see digital building mapping system below (Routh & Vyas, 2015):

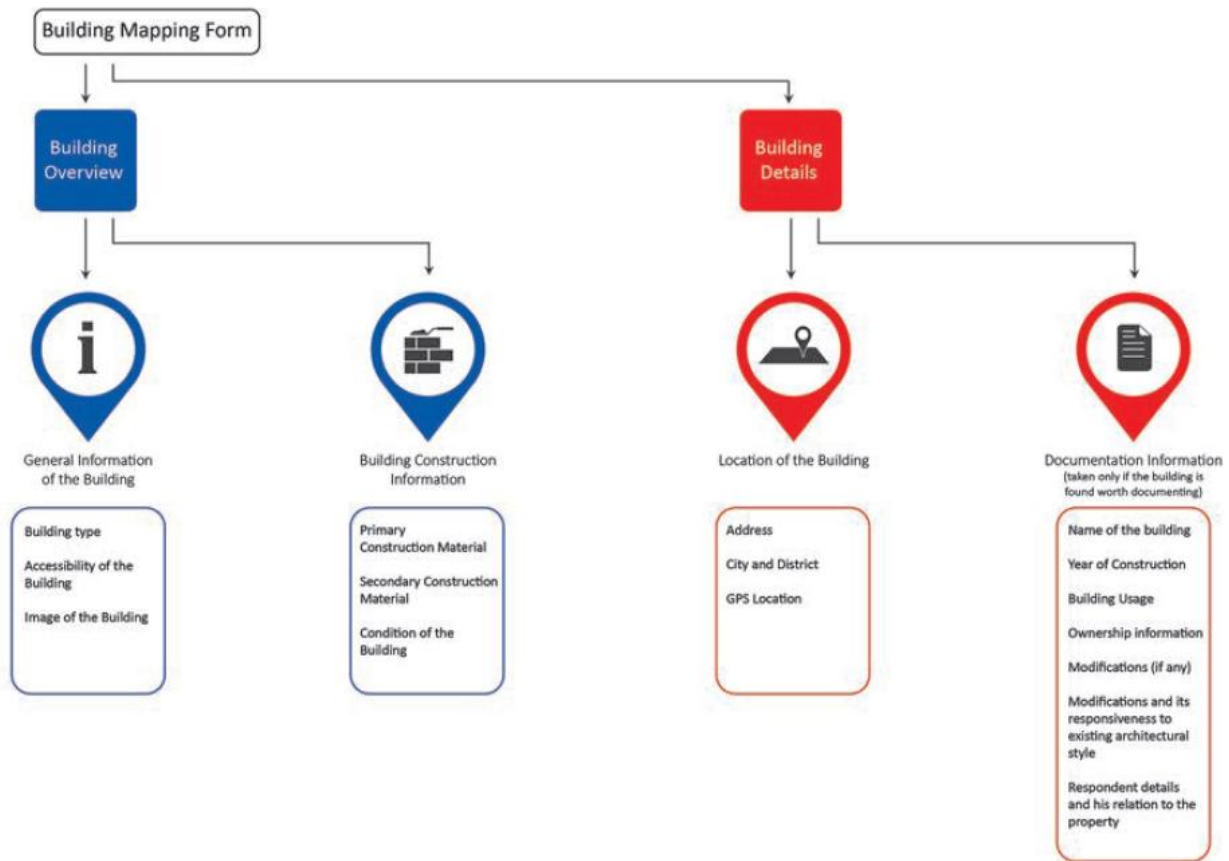


Figure 16 - Digital Mapping Process for Heritage Assets

(Routh & Vyas, 2015)

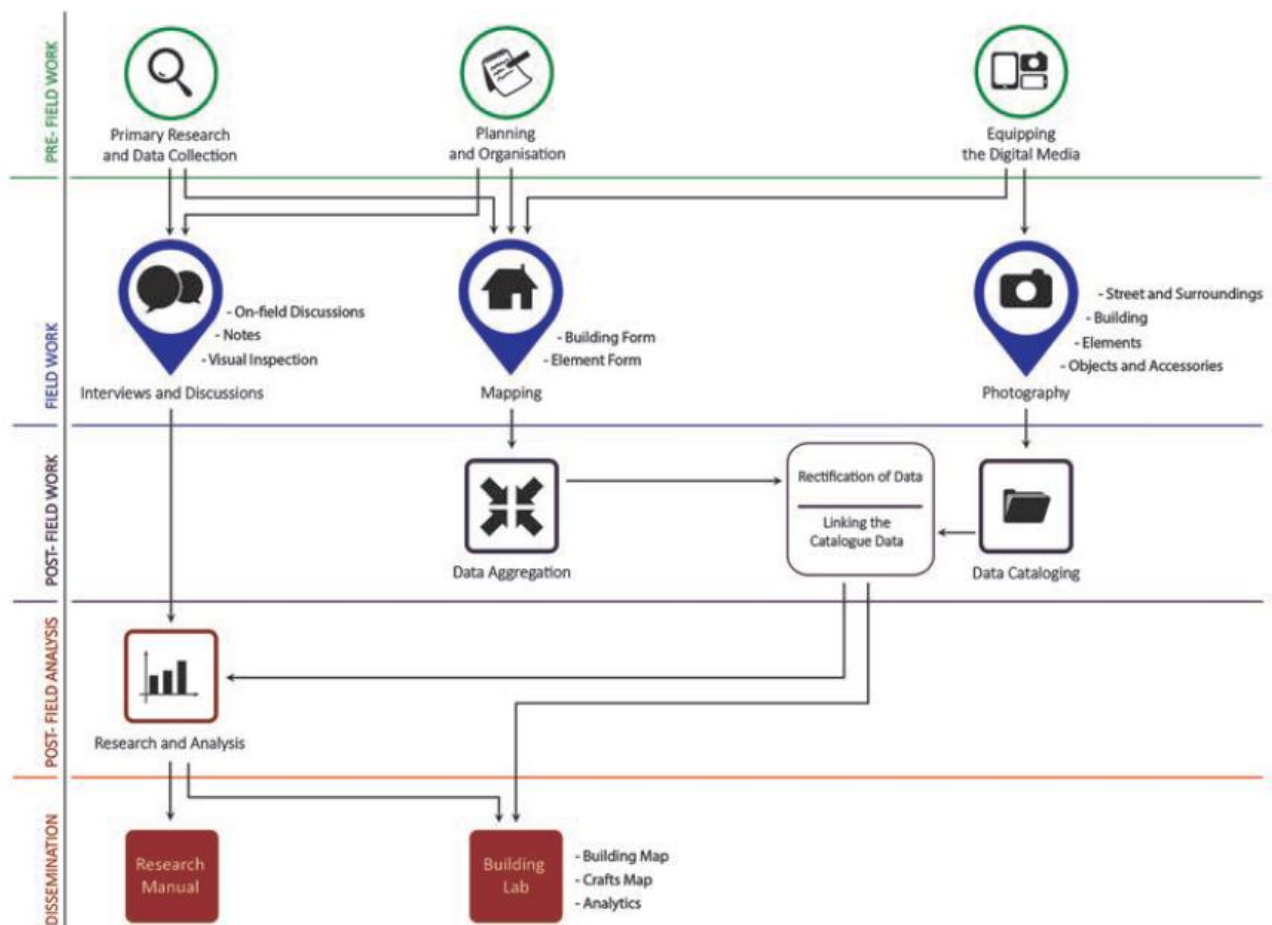


Figure 17 - Digital Mapping of Heritage Assets Part 2

(Routh & Vyas, 2015)

Similar developments like this and through the growth of Heritage Building Information Modelling could improve educational outcomes for construction students in FEI's particularly in Wales where rural locations of students and sites can be problematic. The lack of appropriate sites local to colleges has continually been raised as an issue (NHTG, 2007) (CITB ConstructionSkills, 2011) (Qualifications Wales, 2018).

8. Qualifications Wales – Building The Future Report 2018

“Conferences and meetings, however pleasant, generally attract those who are already converted. Summer courses, except when part of the organized curriculum of a college or university, often achieve only superficial results..”

(National Trust for Historic Preservation, 1968)

The above quote from the US National Trust for Historic Preservation synthesises quite neatly the formulated opinion of this literature review – optional and elective syllabi are more often than not undertaken by those with a pre-existing interest or inclination to do so.

What is apparent from this review is that these individuals are not necessarily the target audience of the proposed changes. To affect the fundamental paradigm shift required to address over one third of Welsh building stock will demand universal and long standing change.

As such, the specificity of a uniquely Welsh approach to educational structure and content provides many benefits as previously discussed. Nevertheless the Qualification Wales Report states quite early on that the forecast for the period up to 2021 proposes a Welsh recruitment requirement of 3.4% (the UK average is 1.4% - see Appendix 9 for total numbers) over current levels. It goes on to suggest that this higher than average rate is primarily a result of migration of Welsh trained personnel to other parts of the UK (CITB - Experian, 2016).

This would imply that there is a danger that with a dual system of training in place, lack of recognition and understanding of the Welsh standard in other parts of the UK could impact on the labour opportunities for Welsh graduates for FEI's.

There are a number of large infrastructure projects on going that would prove attractive to Welsh construction personnel, so it would be prudent to ensure that any changes in structure, content and qualification are considered transferable in other parts of the UK.

It will however, allow courses to be tailored to the requirements of businesses in Wales, where ninety percent of construction companies have seven or fewer employees. As larger companies tend to have the greatest economic output (seventy-seven percent) (Office for National Statistics, 2017) and very few of these companies are based in Wales, using an Anglo-centric system runs the risk of a system dominated by the requirements of the larger firms and less inclined to respond to the needs of smaller enterprises (a concern expressed by the participants of the Qualifications Wales survey) (Qualifications Wales, 2018). As a result, the issue of portability could be addressed by ensuring any newly developed courses are tied and conform to National Occupational Standards (NOS).

The potential Unique Selling Point (USP) for Welsh qualifications and apprenticeships could be the historic building training or understanding element of all courses, particularly if this could be amalgamated with relevant skills training for appropriate trades. Considering the amount of heritage and historic building work discussed previously (WHQS, retrofit, ECO 3, Arbed, the Palace of Westminster, standard maintenance and repair) adding understanding and skills in the treatment of historic buildings to graduate CV's could increase portability for Welsh FE students rather than decrease it.

Another issue raised in the report and stakeholder feedback is the lack of opportunity for gaining relevant experience for apprenticeships – something that is being addressed in South Wales through the Cyfle shared apprenticeship scheme

This flagship scheme offers apprentices opportunities with a number of different employers, sharing risks for both apprentice and contractor alike. It also allows for a range of experiences with different contractors and therefore would be of particular use for experiencing work on historic buildings – as more opportunities would be likely to present themselves rather than with just one employer (Cyfle, 2018).

Bespoke apprenticeships and shared apprenticeships would allow for a mix of experiences: new build, maintenance and repair, retrofit of EEM in historic buildings, adaptive re-use and renovation. This would act as an enabler for apprentices to become more flexible in what they wish to pursue and more resilient in the marketplace. They may not stay in the new build sector but may end up spending fifty percent of their time on maintenance and repair, and the rest on retrofit. It also gives students/apprentices the best and broadest taste of the CBE industry as a whole rather than concentrating almost exclusively on new builds.

Whilst the body of this dissertation has focused on historic and vapour open build systems, it should be noted that there are concerns that more modern mainstream construction skills and understanding could be lost in a similar fashion. The recent Qualifications Wales report highlighted concerns that some materials and skills were no longer taught as they were no longer in use (soldering skills, and older type ‘obsolete’ mineral insulated cables), but which still exist in large numbers in existing buildings and will require repair (Qualifications Wales, 2018).

This reflects the core of the dilemma surrounding teaching of skills: construction is a constantly evolving industry where new materials and new build systems are constantly developed to improve efficiencies and performance. However, training both financially and in terms of time is a finite resource. Difficult decisions often have to be made in relation to content – which will only become more pressing with the advent of modular of site construction and the potential for onsite de-skilling.

Certainly the duration of courses and apprenticeships is open to debate (apprenticeships in the UK are shorter than those in many countries) (Qualifications Wales, 2018) and has been mentioned in the reports. By increasing the scope and depth of construction training in its various iterations one could address a couple of major issues:

- Content could be increased to address gaps in knowledge and skills
- Perceptions of quality (or lack thereof) could be challenged by raising the standards

Ultimately however, for this to take place in any meaningful way, there has to be political engagement and financial commitment of a scale appropriate to the undertaking. It would require massive investment for both up-skilling of existing staff, including the resources to spend periods of time “back on site” to ensure awareness and knowledge of teaching staff keeps pace with development in industry. This could equally apply to students as well – one of the common grievances of employers was that students had little relevant site experience and were poorly equipped for live site environments upon graduation. (Qualifications Wales, 2018)

The Qualification Wales Report highlighted the fact that in other countries such as Germany, Canada and Australia there is greater involvement of contractors/employers in formulation of course content. This is now being reflected in England with the establishment of the new T Level qualification to be introduced in 2020. The Department of Education (DoE) have delivery panels populated by industry experts from the new build sector but very little representation from the heritage sector.

The T level “Onsite Construction Panel” is listed below:

Panel Member	Organisation	Role
Julian Weightman (Chair)	Bordercraft Group	Managing Director
Angela Laycock	British Army	Major
Bruce Boughton	Lovell Partnerships Limited	People Development Manager
Geoffrey Mann	NHBC	Industry Training Manager
Gillian Cain	CITB	Head of Apprenticeships
Guy Poyser	Miller Homes	Regional Technical Co-ordinator
Jason Duncan	Chameleon School of Construction	Operations Director
John Bradbury	Chichester College	Head of Learning for Construction
Paul Sweeney	Countryside Properties	Director
Robert Howard	RHTC Ltd	Director of Tile Association
Sarah Garry	Build UK	Skills Manager
Simon Dixon	National Federation of Roofing Contractors	Training Manager

Figure 18 - Table of Membership T Level Construction Panel

What the report does not make clear is the risks associated with the selection and composition of any focus group. Who decides the make-up of the group? How do you represent the variety and complexity of the industry, and particularly in Wales, reflect the fact that ninety percent of companies in Wales employ seven people or less so invariably have different expectations of the newly trained than larger national companies? Respondents to the Qualification Wales survey felt that course content reflected the requirements of bigger national companies rather than micro and SME’s that are far more prevalent in Wales. (Qualifications Wales, 2018)

There are a number of factors that have meant the action plans of the 2007 Report have not yet been realised. Political and economic expediencies have obviously been influential - funding cuts and re-organisations (there have been four different organisations in charge of funding over the last twenty years) (Belfield, et al., 2017) playing their part.

Although the Communities and Local Government Committee called for “*improvements in further education to address the growing skills gap*” (Communities and Local Government Committee, 2017) it requires greater investment, which could be particularly problematic in Wales where the government has imposed (on average) a six percent cut to funding for colleges (and part time course funding reduced by fifty percent) (The Guardian, 2017).

However, this may be an opportune time for the introduction of historic buildings skills and understanding as it can benefit from mutually supportive legislation like the *HEW Act* and the *WFG Act* with their shared ethos of

sustainability, inclusivity and holistic thinking. The new regulatory landscape may prove fertile ground for the idea of syllabus change at FE level that perhaps was not present previously when similar changes were put forward.

This must be facilitated by WAG, ensuring sufficient political encouragement is applied to the awarding bodies and CITB to fully support the changes which it has to be said are still only recommendations at this point. The language of the Qualification Wales report is illustrative of this point: “urging” and “recommending consideration” but ultimately being unable to do more than advise at this point, as it will be the awarding bodies who will then consult and determine actual content.

Research Results and Discussion

Whilst this study is primarily a literature review on the sustainable conservation of built heritage and the part education plays in that process, some original research has been undertaken to ensure the data in relation to FE training is as contemporaneous as possible.

As a result the Heads of Construction at the fourteen FE colleges in Wales were issued with surveys (see Appendix 13) followed up, where necessary with telephone interviews, to discover whether any changes had occurred in the intervening periods between the 2007, 2013 and 2018 Reports.

The survey was particularly focused on the number of teaching staff, confidence levels in ability to teach historic buildings/materials skills and understanding, actual levels of formal historic building training, whether current courses provided the relevant skills, whether historic building training should be compulsory, and if so, what should the course content include.

The results below indicate compelling support for the introduction of compulsory historic building elements within mainstream construction courses.

The twelve highlighted FEI's in Wales were issued with a survey – see Appendix 13.

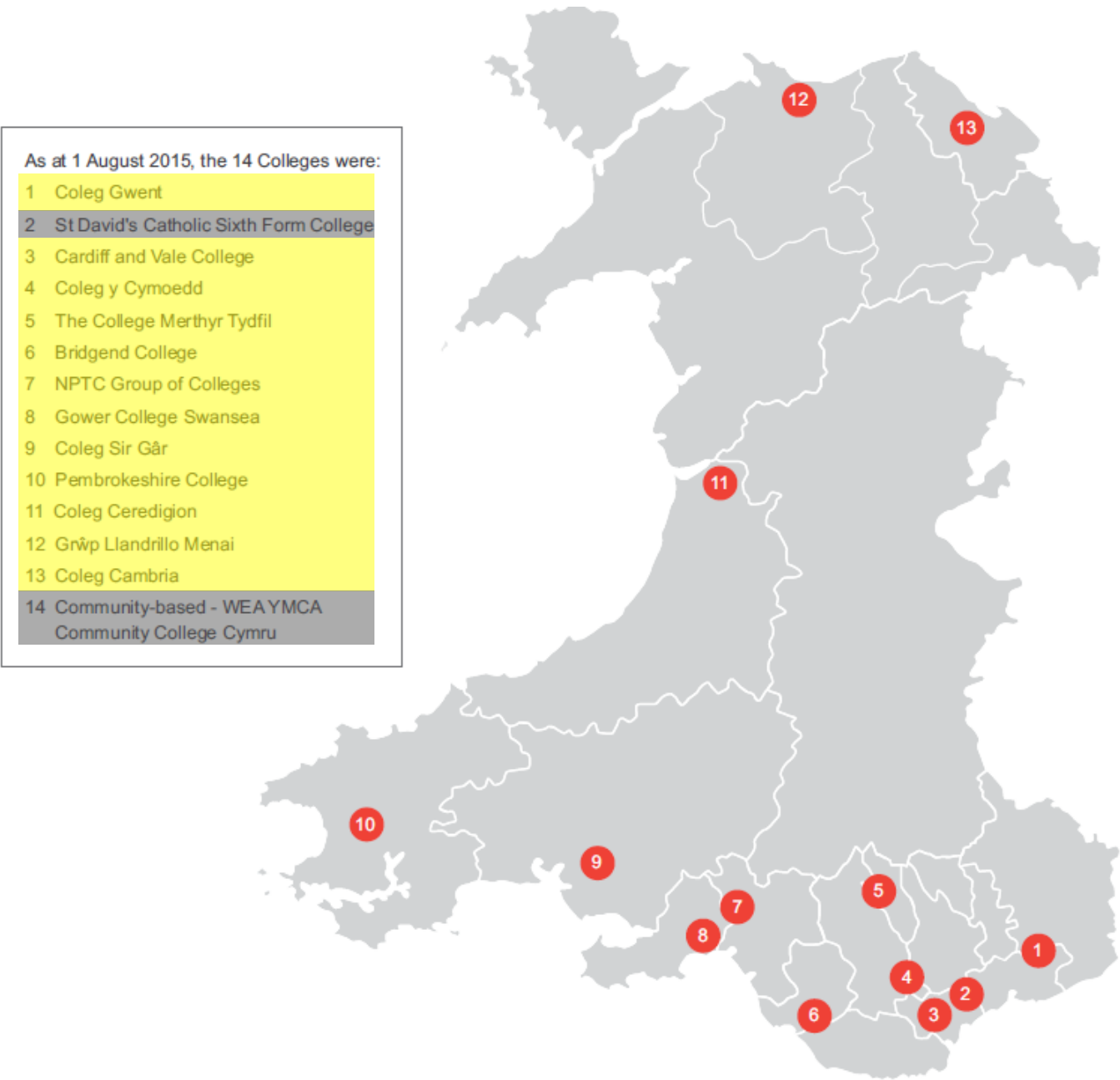


Figure 19 - Map of FEI's in Wales

(Welsh Audit Office, 2017)

Subsequent to email correspondence and follow up telephone calls sixty-seven percent of colleges supplied completed surveys.

During the genesis of the review the focus has evolved to a point where some questions are more deserving of analysis than others. As a result, seven of the questions are included in this section, although all the questions and results are contained in the Appendices for further study if required.

Question 1: Courses Delivered

All of the targeted colleges undertook some form of construction course, with the respondent colleges indicating they delivered:

Wood Trades	100%
Bricklaying	100%
General Construction	100%
Plumbing	75%
Plastering	63%
Painting and Decorating	63%
Roofing	25%
Wall and Floor Tiling	13%
Other (Civil Engineering)	25%

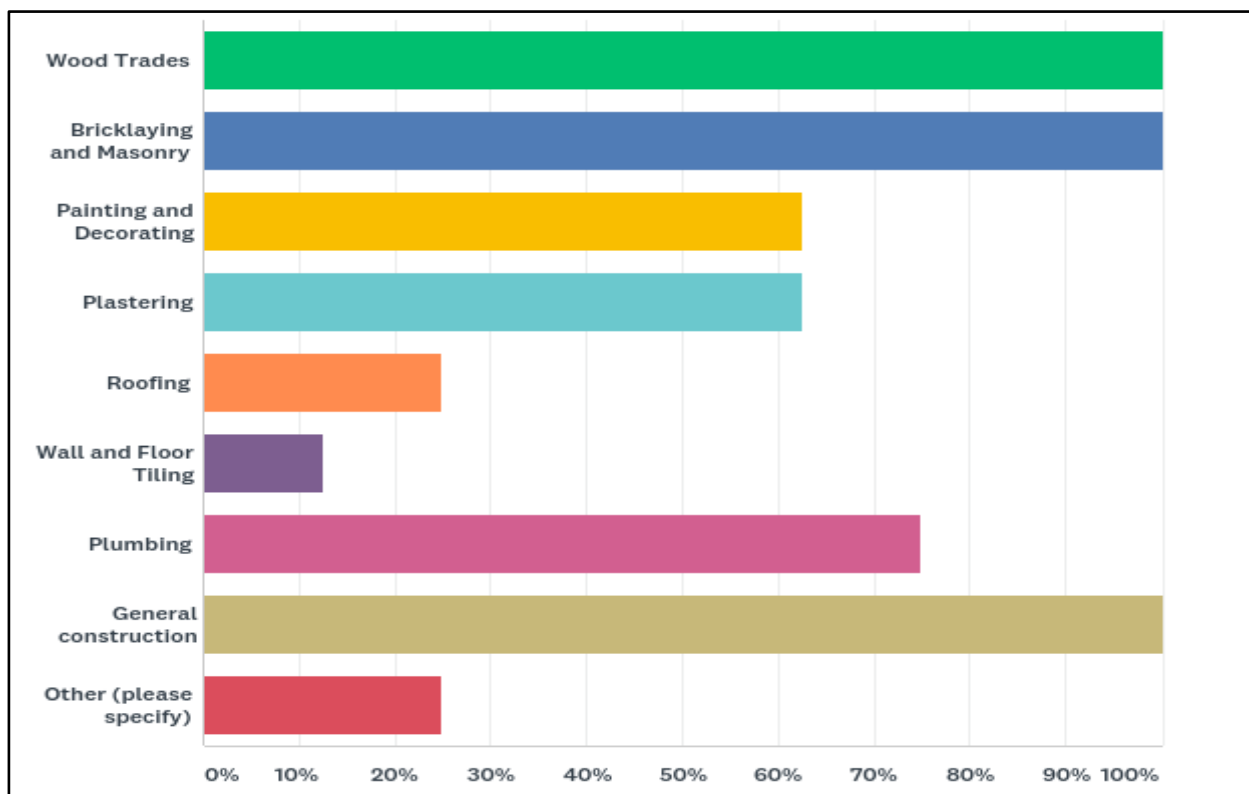


Figure 20 - Question 1: Available Courses

Questions two and three are not being discussed directly here – please see Appendix 13.

Question 4: How many staff have the appropriate knowledge skills for working on historic buildings?

The following lists the number of teaching staff, both full and part time, that have the knowledge and skills to work on historic buildings or teach students to that level.

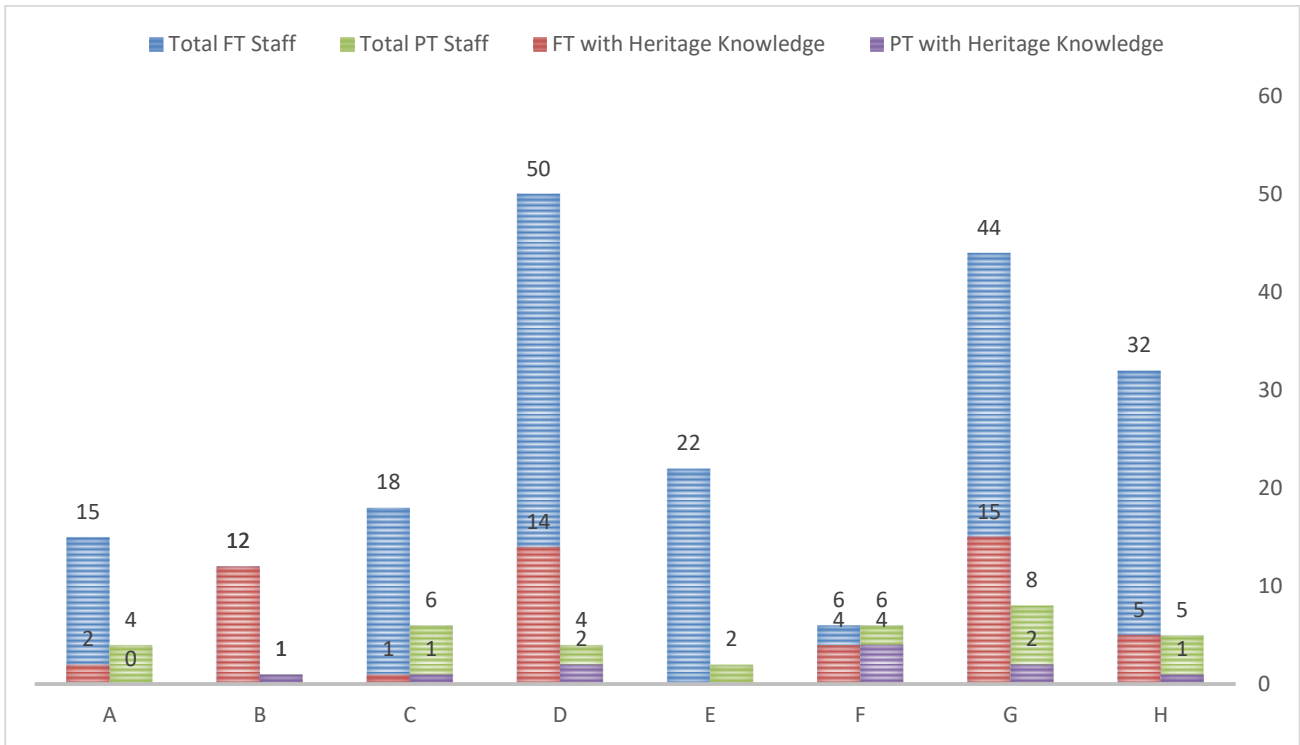


Figure 21 - Number of historic building skills capable staff

Totals (all colleges combined):

	Total	Skilled	%
Fulltime staff:	199	53	27%
Part time staff:	36	11	31%
Total Staff	235	64	27%

Figure 22 - Skills capable staff numbers and percentage

Just over a quarter of teaching staff are considered to possess sufficient skills and knowledge to teach students to a level relevant to working on historic buildings which equates to over a third of Welsh building stock.

Question 5: How many staff have undertaken the CITB ‘Train the trainer’ course?

This training was established following the NHTG and CITB reviews and was delivered by John Edwards on behalf of CITB and NPTC Group. Only two events took place in the first year, and it was withdrawn due to lack of funding.

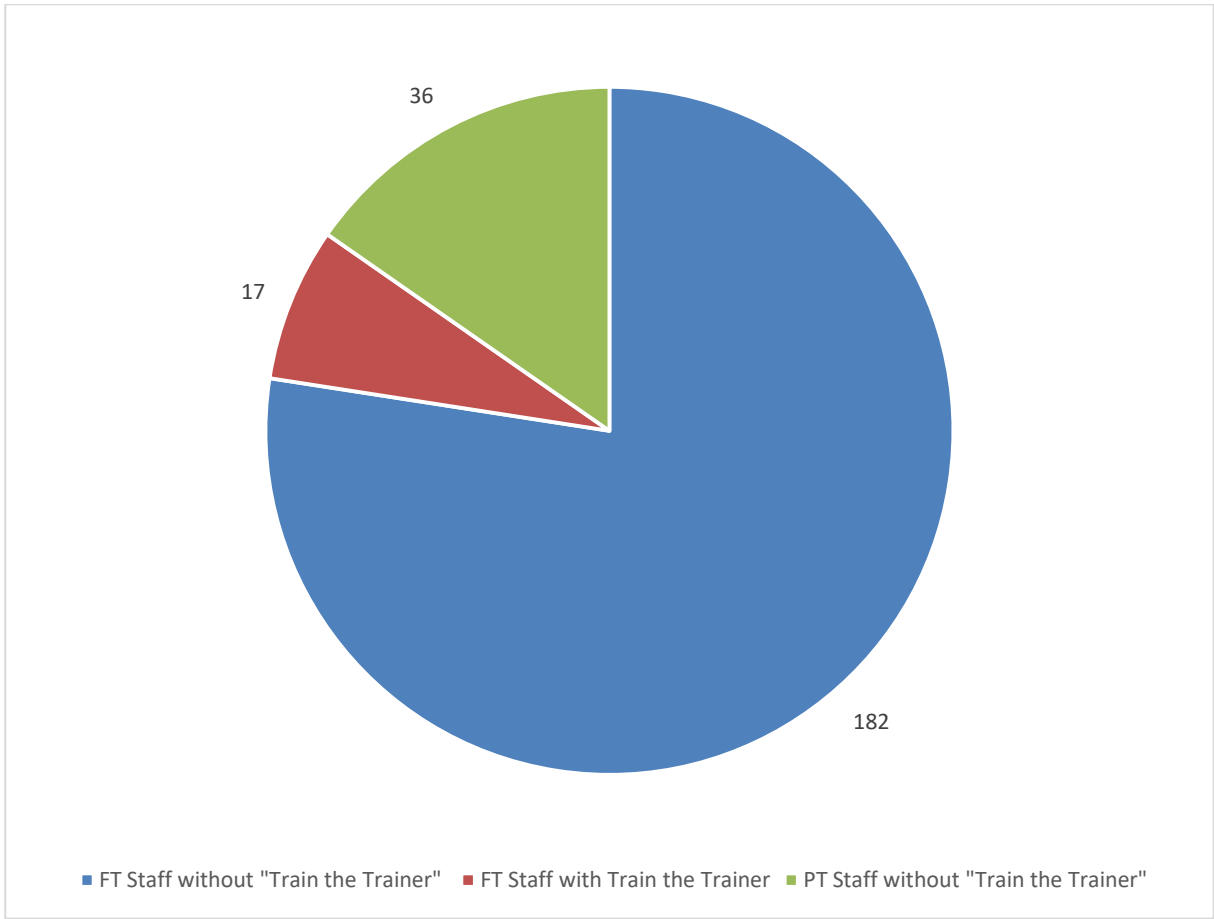


Figure 23 - Train the Trainer attendees

As would be expected, due to the low uptake on the original ‘Train the Trainer’ course and its subsequent withdrawal, staff attendee numbers are very low, with only seven percent of total staff having indicated their attendance.

Full Time Staff	199
Part Time Staff	36
Total Staff	235
Attendees	17
Percentage	7%

Figure 24 - Train the Trainer attendees numbers and percentage

Question 6: How many staff have formal historic/heritage building qualifications?

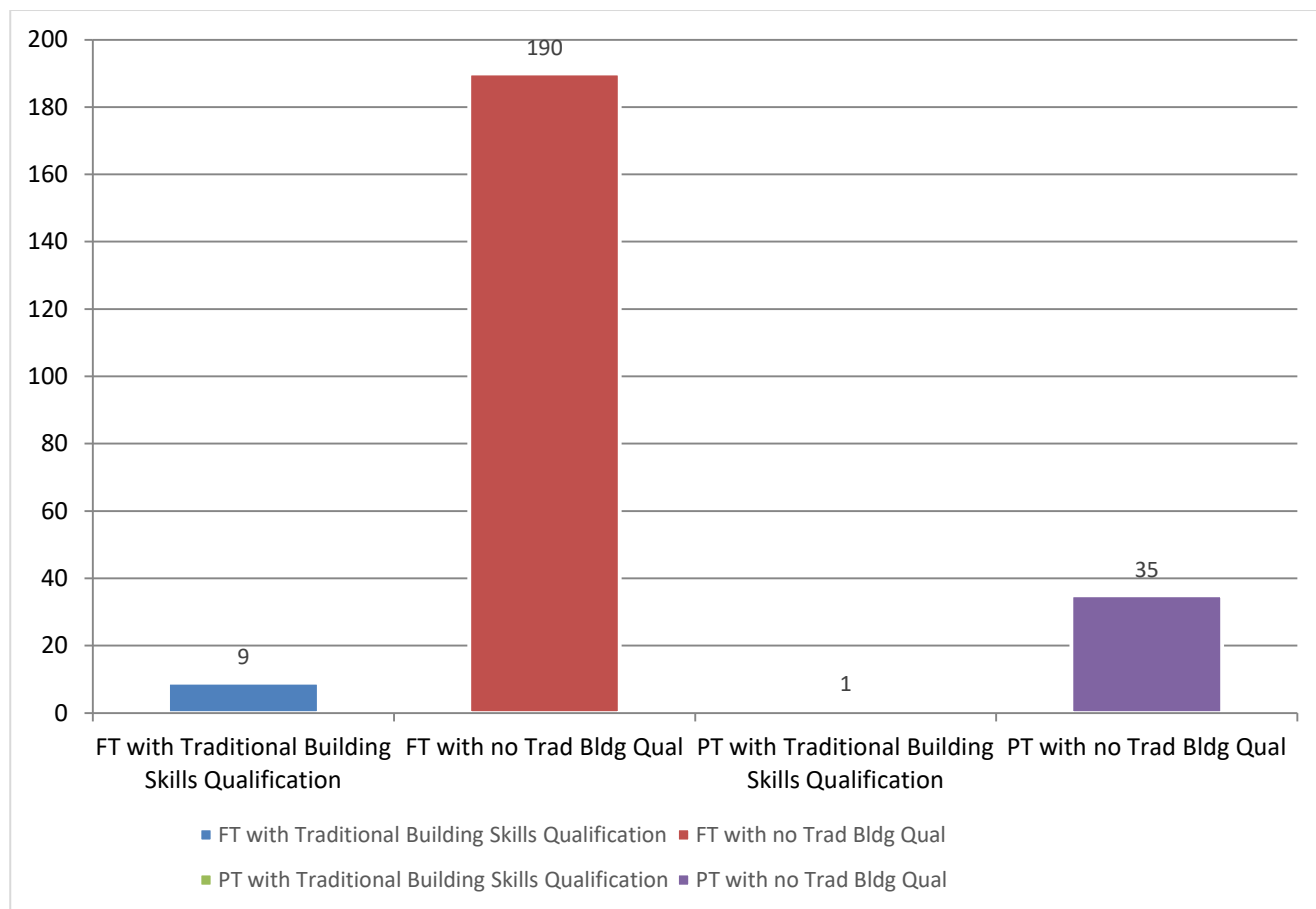


Figure 25 - Formal Qualifications

Full Time Staff	199
Part Time Staff	36
Total Staff	235
Formal Qualification	10
Percentage	4%

Figure 26 - Formal qualification total numbers and percentage

Whilst very few staff have formal qualifications, seventy-five percent of colleges that responded indicated that there was an appetite for up-skilling of existing staff.

Questions seven and eight are not being discussed directly here – please see Appendix 13.

Question 9: Do you think historic building skills should be embedded in mainstream construction courses?

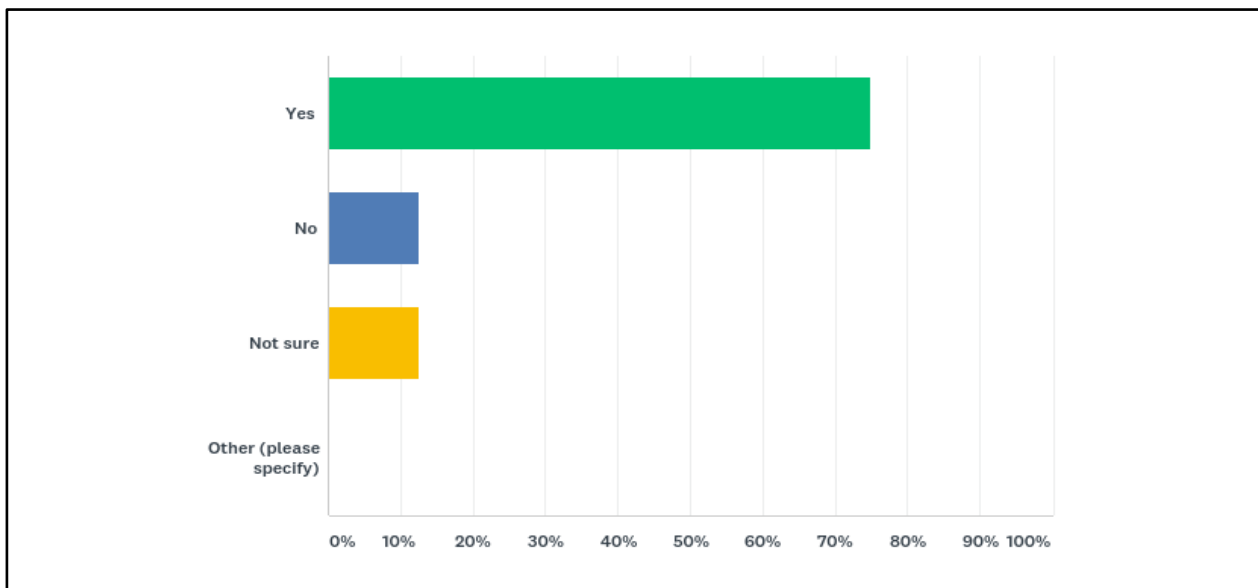


Figure 27 - Embedding of historic building skills

- 75% of respondents felt that understanding and skills appropriate to working on historic buildings should be compulsory elements of mainstream construction courses.
- 12.5% Were not sure.
- 12.5% Did not agree that it should be a compulsory element.

This compares favourably with the 2007 NHTG report where the respondents indicated as follows:

- 40% responded positively to the idea of embedding into mainstream construction courses
- 25% “Neither agreed or disagreed”
- 35% responded negatively to the idea.

This suggests an increased inclination for the changes suggested by Qualifications Wales and other stakeholders.

It also is an improvement on the sixty-nine percent that responded positively to the same question in the CITB 2015 Report.

Of those that responded to question ten, eighty-eight per cent felt that the delivery of the training should be a combination of classroom/college based training and on-site training. Only one college indicated that college based training was sufficient.

Question eleven is not being discussed directly here – please see Appendix 13.

Question 12: What are the potential barriers to implementation?

As can be seen below, there are a number of suggested barriers to implementation

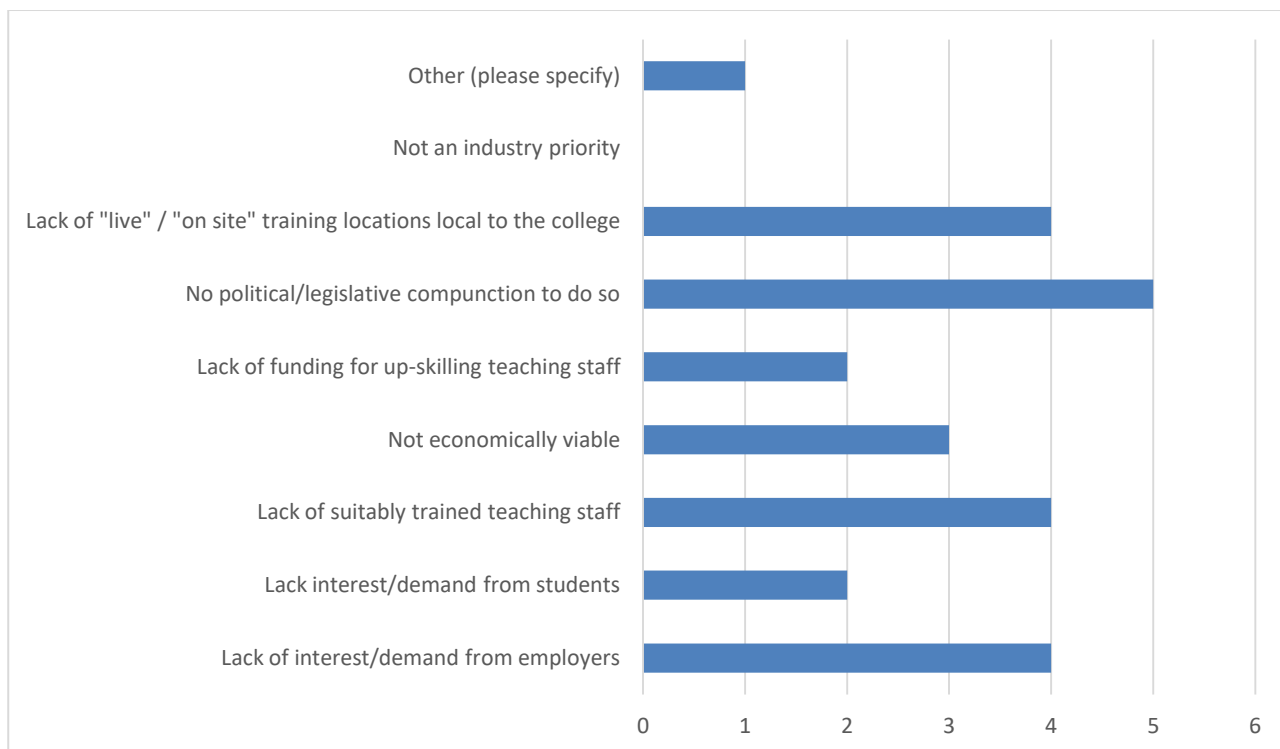


Figure 28 - Barriers to implementation

The most cited barrier to success was the lack of legislative or regulatory compulsion for change.

The next three reasons were:

4. Lack of live sites local to the colleges
5. Lack of suitably trained staff
6. Lack of demand from employers (which doesn't necessarily correspond with largely positive comments regarding the proposals from the majority of SME contractors from the 2007 and subsequent reports)

No political/legislative compunction to do so	63%
Lack of interest/demand from employers	50%
Lack of "live" / "on site" training locations local to the college	50%
Lack of suitably trained teaching staff	50%
Not economically viable	38%
Lack interest/demand from students	25%
Lack of funding for up-skilling teaching staff	25%
Not an industry priority	0%
Other (poor image/lack of marketing)	13%

Figure 29 - Barriers to implementation.

Question thirteen is not being discussed directly here – please see Appendix 13.

Question 14: Preferred topics for inclusion as compulsory content.

There are a number of topics that are of preferred inclusion and the five most requested are listed below:

1. Traditional Building Materials – Characteristics and Performance 100%
2. Practical application of traditional materials 88%
3. Repair and Maintenance in Traditional Buildings 88%
4. Understanding Traditional Building Pathology 63%
5. Retrofitting Energy Efficiency Measures in Traditional Buildings 63%

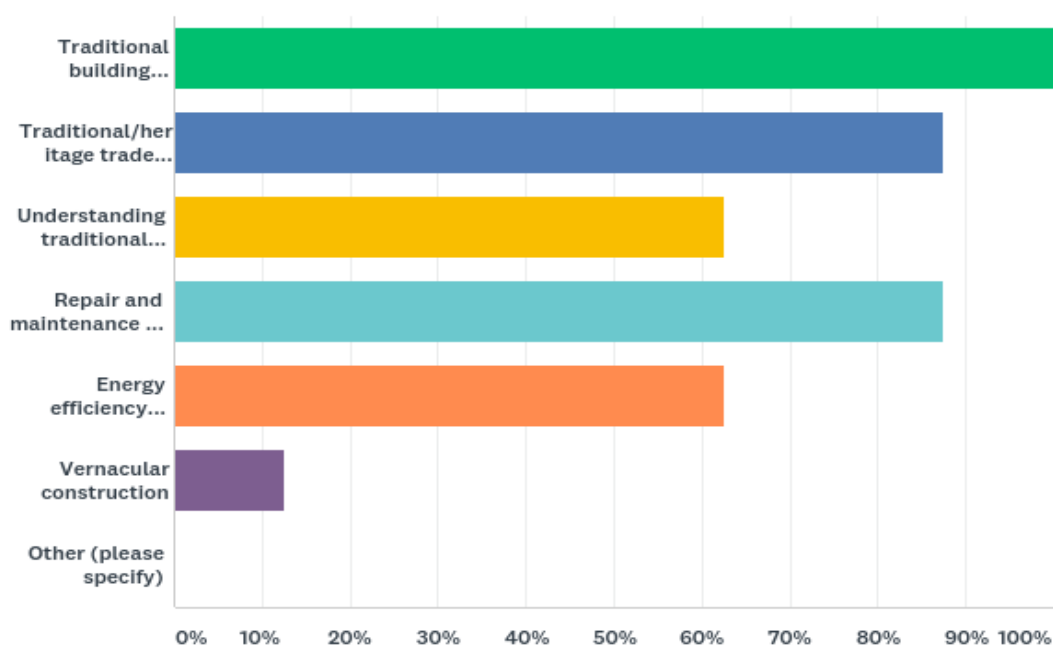


Figure 30 - Proposed content

Traditional building materials - characteristics and performance	100%
Traditional/heritage trade skills using traditional materials	88%
Repair and maintenance in traditional buildings	88%
Understanding traditional building pathology	63%
Energy efficiency measures and retrofit in traditional buildings	63%
Vernacular construction	13%
Other (please specify)	0%

Figure 31 - Percentages of preferred content for compulsory element

75% of the respondents felt that current construction courses do not provide students with sufficient and appropriate skills to work on historic buildings.

12.5% were unsure, whilst 12.5% (one respondent) felt current content was sufficient for working on pre-1919 buildings.

Whilst it is the intention of the Qualification Wales Review to have content for awareness and understanding purposes only to begin with, this would then be followed by the introduction of compulsory trade skills as training resources allow (Taylor, 2018).

Conclusion

This paper has critically reviewed current literature to evaluate the success or otherwise of previous attempts to embed historic building skills in mainstream construction courses, the justification for the changes and suggest possible pathways for future success for such an endeavour. It sought to improve understanding and identify what factors are more likely to engender success, citing the WFG and Historic Environment Act as likely catalysts. These Acts suggests shared goals or at the least sympathetic and facilitatory policy environments that could improve wider outcomes than just raised awareness of vapour open building pathology in the construction industry. Better understanding and skills through syllabus change could lead to better performing buildings, reduced carbon emissions, improved health and well being and more resilient communities.

The quantitative research element was deliberately limited by the scope of the focus group – Further Education Establishments in Wales - and was implemented to give previous studies a contemporary frame of reference. It illustrates how attitudes towards the suggested changes to course content have changed very little and supports the postulation that FEI staff are predominantly supportive of the proposals. The research also identified that FEI's staff share concerns discussed during the course of the review that for the changes to be successful requires regulatory compulsion and support. It also highlighted a positive approach from the colleges to up-skilling and Continued Professional Development, although how this is to be funded has yet to be decided.

This review has also helped illustrate the importance of the next stage of the process which will determine actual content for the compulsory elements. There appears to be a strong consensus for at least four areas of study and the methodology and environments required. The response confirmed a desire for practical application (previously expressed by contractors) of any new knowledge learned, and raises important question in relation to the availability of live site environments. The potential for collaboration between stockholders such as RSL's and Local Authorities and FEI's looking for these operational opportunities is of particular interest to the author and worthy of further research.

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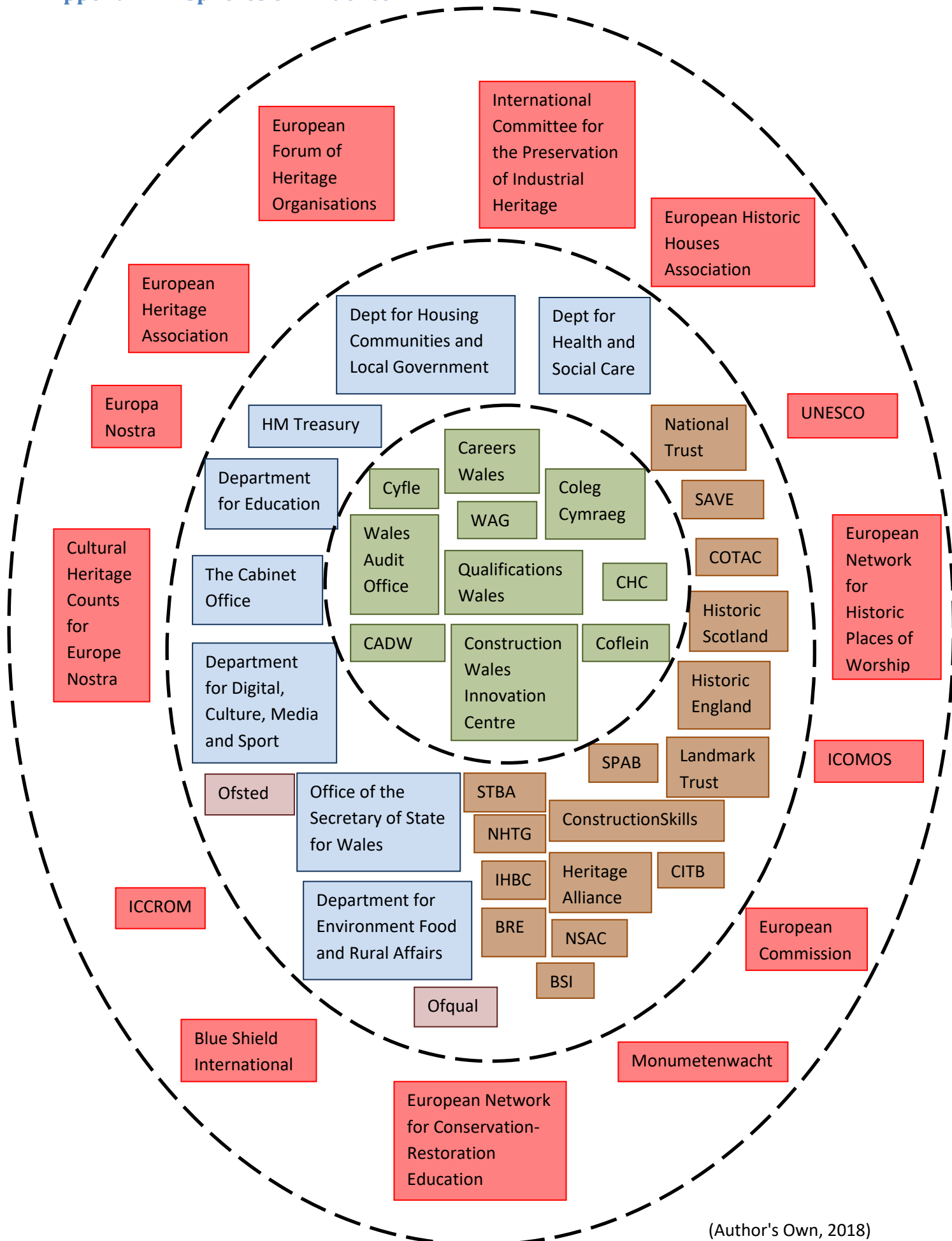
Appendices

Appendix 1 – CQFW Framework 2017



(WAG, 2018)

Appendix 2 – Spheres of Influence



(Author's Own, 2018)

Appendix 3 – Five Ways of Working: Built Heritage and Further Education

Long Term	Integration	Involvement	Collaboration	Prevention
The importance of balancing short-term needs with the needs to safeguard the ability to also meet long-term needs.	Considering how the public body's well-being objectives may impact upon each of the well-being goals, on their objectives, or on the objectives of other public bodies.	The importance of involving people with an interest in achieving the well-being goals, and ensuring that those people reflect the diversity of the area which the body serves.	Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives.	How acting to prevent problems occurring or getting worse may help public bodies meet their objectives.

Long Term

It encompasses the ethos of built environment conservation. Continued, enhanced and adaptive re-use of built assets is sustainable, reduces waste, reduces consumption of new resources, provides long term future for buildings, businesses that support their use and maintenance, communities, town and city centres, and offers opportunities for those appropriately trained in the maintenance repair and improvement of the buildings. It also protects the health and wellbeing of individuals and long term vitality and economic prosperity of communities around Wales.

Integration

Based upon interconnectedness and relationships – a key component of deep ecology and ecological conservation. For regulatory mechanisms to realise their full potential, all stakeholders need to be identified and engaged with. In doing so, chances of successful outcomes increase. By ensuring that new construction personnel have the skills and understanding to work on historic buildings which make up over a third of the built environment in Wales, the “sustainable management” prescribed in the *HEW Act* is made more achievable, and allows for greater integration and shared outcomes between policy vehicles. That is why it is important to think of all vapour open types of buildings as deserving of protection and not just listed properties.

Involvement

Education and training with regards to Welsh built heritage can ensure awareness is raised about its importance, its physical characteristics, and how interventions and improvements can be made without unintended consequences. By properly maintaining and repairing historic building and increasing awareness about it communities are better able to engage with their surroundings and take an active role, rather than having development and improvement imposed upon them in a hierarchical manner. By including all buildings of vapour open pathology you involve a far greater cross section of society and create more inclusion.

Collaboration

The nature of conservation of built heritage encourages collaboration – between trades, between community groups, between individuals and government. It also has the potential to increase collaboration via the WFG Act and its public service boards to engage with communities improving civic pride and democratising the process of urban development, housing provision, tackling fuel poverty and so on.

Prevention

A better educated workforce, with greater understanding of building physics is likely to be more motivated to ensure the correct treatment of and interventions in historic buildings. By understanding material characteristics and building pathology, the construction sector as a whole can ensure prevention of damage through inappropriate upgrades or improvements.

The above ways of working could be equally as effective in a broader context outside the confines of the immediate legislation. Through support of the recommendations of the Qualifications Wales review and the embedding of historic building skills and understanding within all mainstream construction courses there is an opportunity for WAG, CADW the awarding bodies and other stakeholders to facilitate positive outcomes in other regulatory areas, such as the EFG Act and HEW Acts. This has the potential to feed into the work and measurements of the public service boards for each area. The actual mechanics of that relationship is however outside of the scope of this review but is worthy of future research.

Appendix 4 – Number of Historic Dwellings by Country and Tenure.

Region	Number of pre-1919 dwellings	Proportion of pre-1919 dwellings of the total number
Wales	459,000	34.0%
England	4,865,000	27.7%
Northern Ireland	87,700	12.4%
Scotland	455,000	19.3%

Nation	Private sector		Social sector				Total
	Owner occupied	Private rented	Local authority	Housing executive	Registered social landlord	Housing association	
Wales	945,003	182,269	88,723	N/A	133,640	N/A	1,349,635
England	14,860,000	3,706,000	1,801,000	N/A	N/A	2,018,000	22,385,000
Northern Ireland	469,100	125,400	N/A	85,900	N/A	24,800	705,200
Scotland	1,465,000	242,000	374,000	N/A	N/A	276,000	2,357,000
TOTAL	17,739,103	4,255,669	2,263,723	85,900	133,640	2,318,800	26,796,835

(CITB, 2013)

Appendix 5 – Number of Historic Buildings in Wales by Region

Sorted lowest total to highest total

Area Name	Pre 1900	1900 to 1918	Total Pre-1919
Torfaen / Tor-faen	5,680	2,820	8,500
Monmouthshire / Sir Fynwy	7,890	1,210	9,100
Isle of Anglesey / Ynys Môn	8,120	2,060	10,180
Denbighshire / Sir Ddinbych	8,710	1,780	10,490
Flintshire / Sir y Fflint	8,000	2,780	10,780
Merthyr Tydfil / Merthyr Tudful	9,580	2,200	11,780
Wrexham / Wrecsam	10,030	2,330	12,360
Vale of Glamorgan	10,330	2,930	13,260
Blaenau Gwent	11,930	3,290	15,220
Ceredigion	13,090	2,310	15,400
Newport / Casnewydd	10,040	5,520	15,560
Bridgend / Pen-y-bont ar Ogwr	9,030	7,190	16,220
Conwy / Conwy	12,580	4,170	16,750
Pembrokeshire / Sir Benfro	18,010	1,840	19,850
Neath Port Talbot	7,700	12,720	20,420
Powys / Powys ⁴	22,150	1,750	23,900
Caerphilly / Caerffili	16,880	9,350	26,230
Gwynedd / Gwynedd	27,930	1,340	29,270
Swansea / Abertawe	21,640	8,890	30,530
Carmarthenshire / Sir Gaerfyrddin ⁵	21,900	10,710	32,610
Cardiff / Caerdydd	28,880	9,520	38,400
Rhondda Cynon Taf	38,250	16,280	54,530
TOTALS	328,350	112,990	441,340

(Valuation Office Agency (VOA), 2017)

Appendix 6 – Number of Non-Domestic Ratings in Wales

Isle of Anglesey / Ynys Môn	2,960
Gwynedd / Gwynedd	7,590
Conwy / Conwy	5,320
Denbighshire / Sir Ddinbych	4,170
Flintshire / Sir y Fflint	5,340
Wrexham / Wrecsam	4,330
Powys / Powys ⁷	6,900
Ceredigion / Ceredigion	3,800
Pembrokeshire / Sir Benfro	6,720
Carmarthenshire / Sir Gaerfyrddin ⁸	7,170
Swansea / Abertawe	7,810
Neath Port Talbot / Castell-nedd Port Talbot	4,110
Bridgend / Pen-y-bont ar Ogwr	4,320
The Vale of Glamorgan / Bro Morgannwg	3,590
Cardiff / Caerdydd	12,490
Rhondda Cynon Taf / Rhondda Cynon Taf	6,950
Merthyr Tydfil / Merthyr Tudful	1,780
Caerphilly / Caerffili	4,830
Blaenau Gwent / Blaenau Gwent	2,220
Torfaen / Tor-faen	2,780
Monmouthshire / Sir Fynwy	3,230
Newport / Casnewydd	4,710
WALES	113,110

(Valuation Office Agency (VOA), 2017)

Appendix 7 – Welsh Farms – Number and Breakdown

	2016
Cereals	260
General cropping	92
Horticulture	186
Specialist pigs or poultry	118
Dairy	1,628
Cattle and sheep (LFA)	6,510
Cattle and sheep (non-LFA)	1,166
Mixed (a)	398
Other types (b)	174
Very small (c)	13,994
Dormant holdings (d)	12,756
All types	37,282

(WAG, 2017)

Appendix 8 – Historic Non-Domestic Buildings In Wales

Historic Non-Domestic Buildings in Wales		
Shops		28,260
Offices		17,230
Warehouse		12,400
Factories		15,020
Other properties		40,200
Total Non-Domestic Buildings (NBD's)		113,110
Pre-1919 based on estimated 35%		39,588
Chapels		6,426
Farms*		37,382
Agricultural Buildings		186,910
Pre-1919 based on estimated 35%		65,418
Total pre-1919 NDB's		111,432

* This is the number of farms and not farm buildings

England

Farms		218,000*
Agricultural Buildings		1,200,000

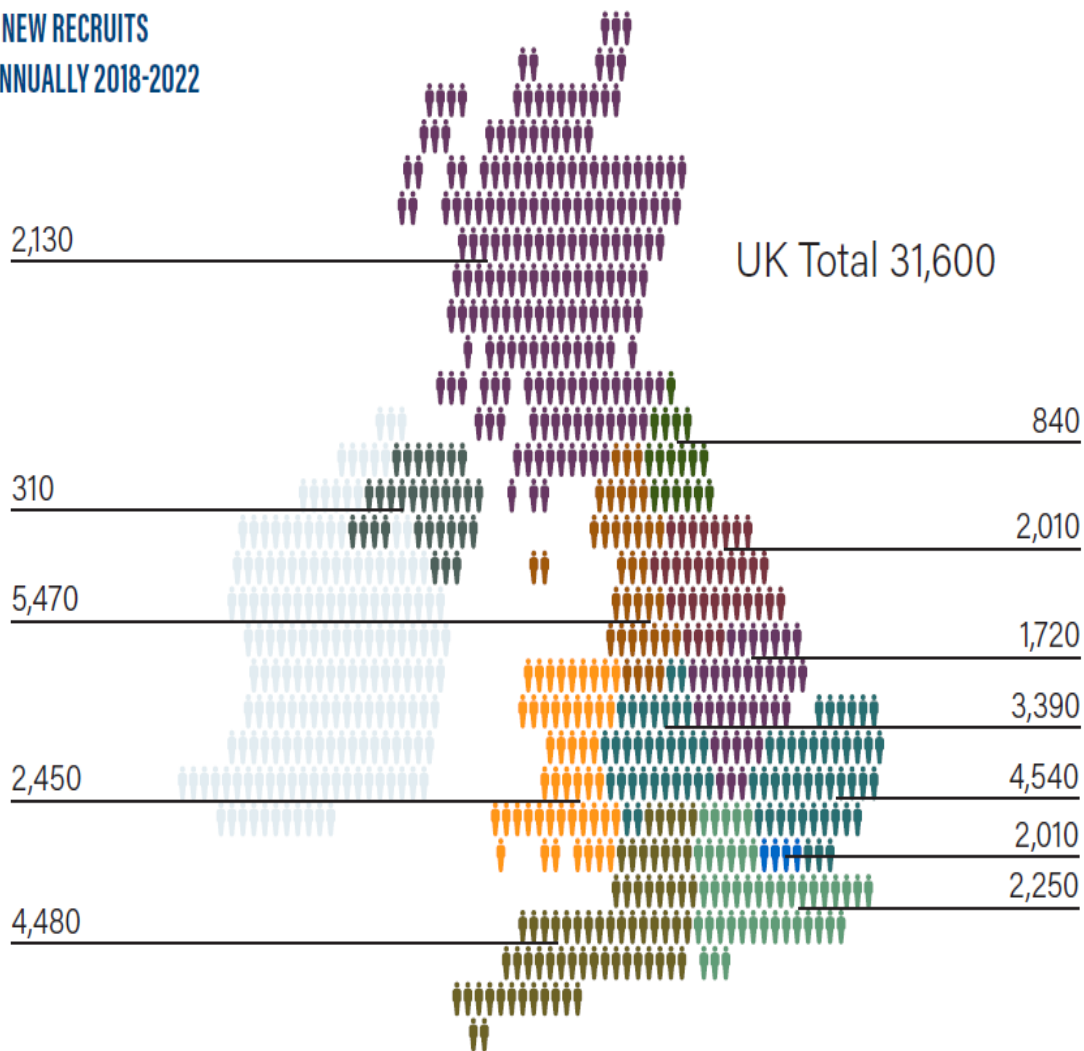
(5.5 Buildings per farm)

*This data is from Gaskell & Owen paper on English Agricultural Buildings (Gaskell & Owen, 2005)

(Valuation Office Agency (VOA), 2017) (HM Passport Office, 2018)

Appendix 9 – New Recruits Forecast

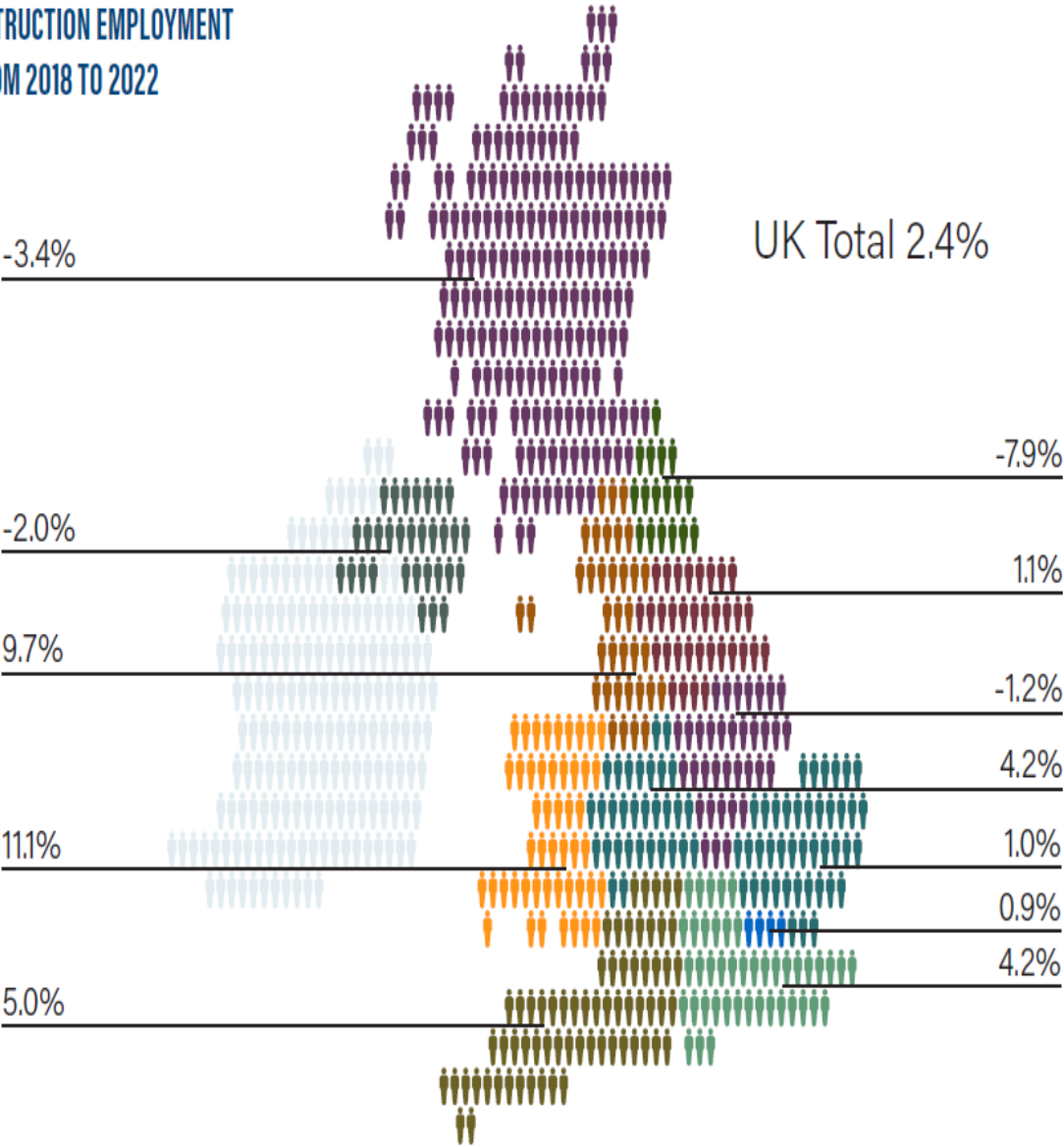
NUMBER OF NEW RECRUITS
REQUIRED ANNUALLY 2018-2022



(CITB, 2018)

Appendix 10 – Employment Growth

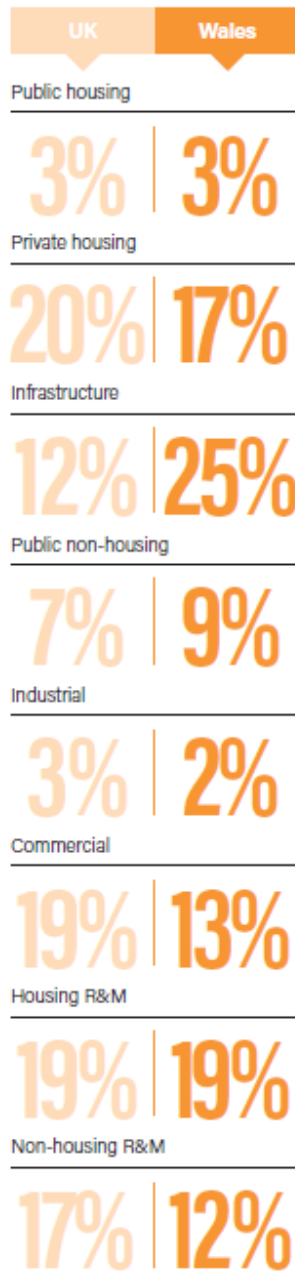
TOTAL CONSTRUCTION EMPLOYMENT
GROWTH FROM 2018 TO 2022



(CITB, 2018)

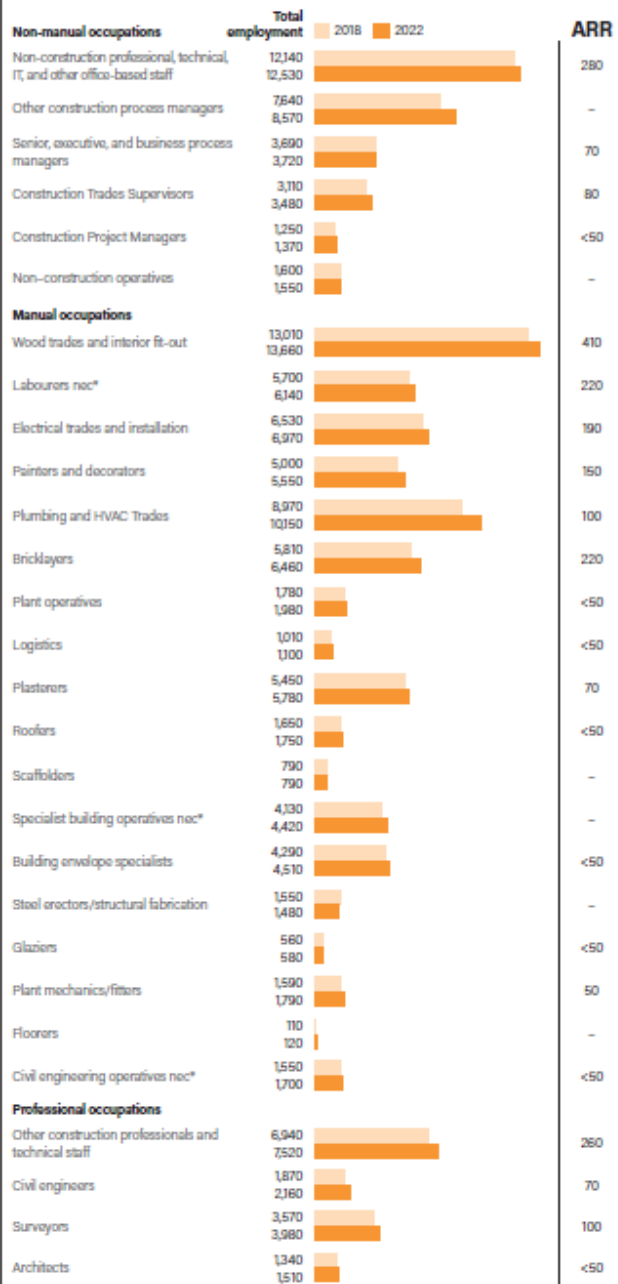
Appendix 11 – Employment By Occupation

CONSTRUCTION INDUSTRY STRUCTURE 2017



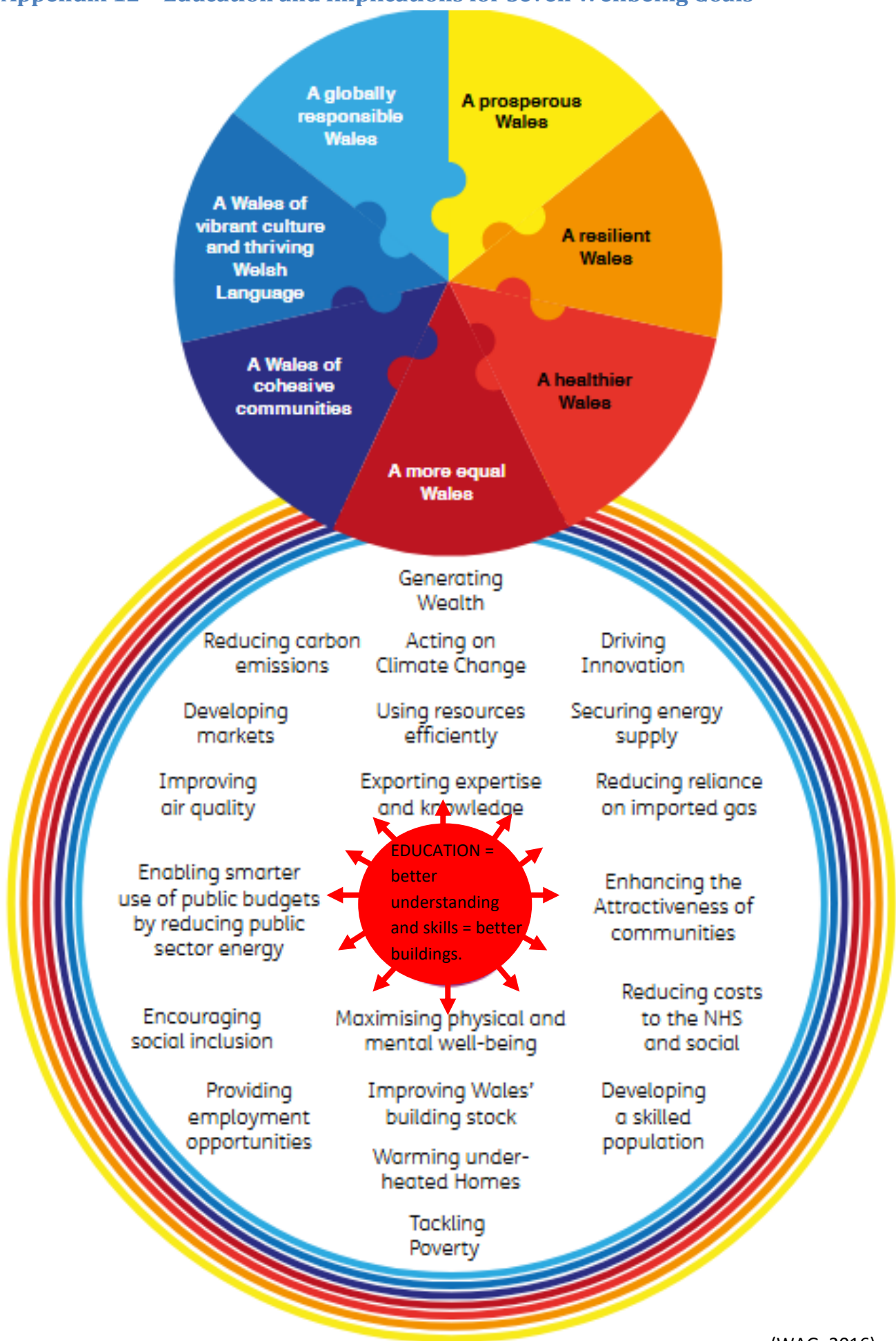
TOTAL EMPLOYMENT BY OCCUPATION – WALES

Annual recruitment requirement (ARR) by occupation



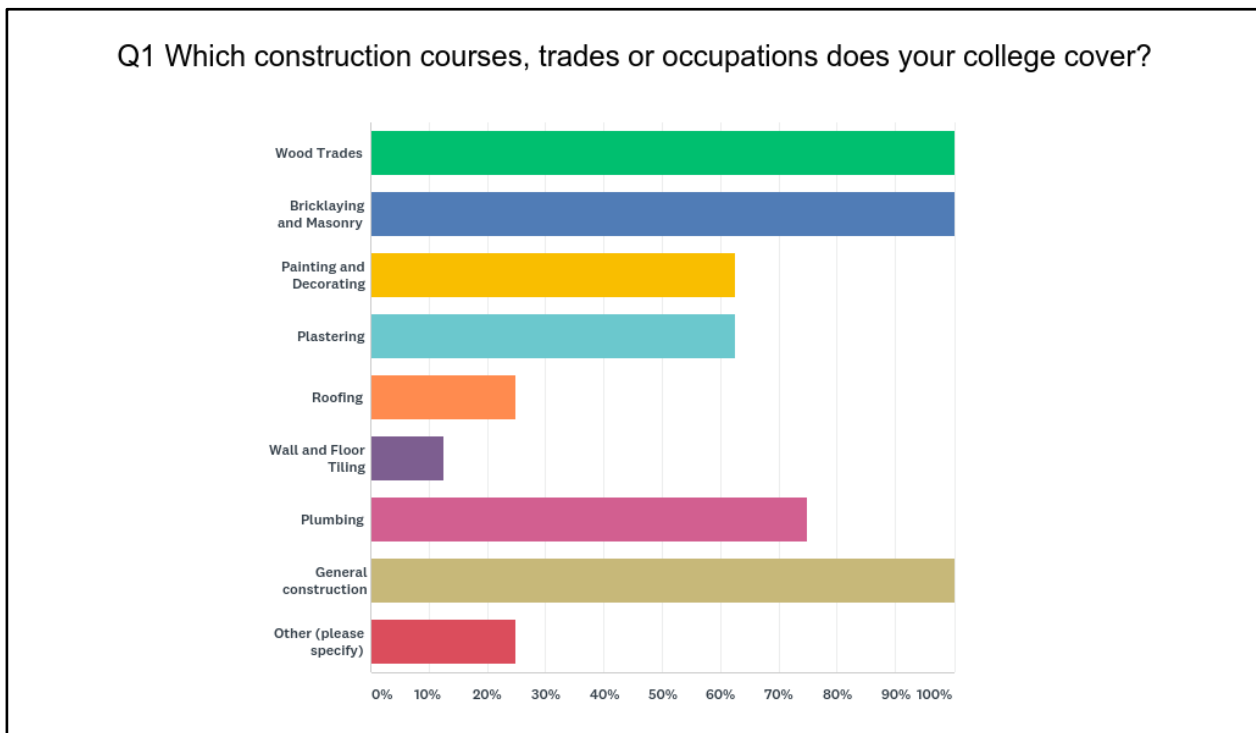
(CITB, 2018)

Appendix 12 – Education and Implications for Seven Wellbeing Goals



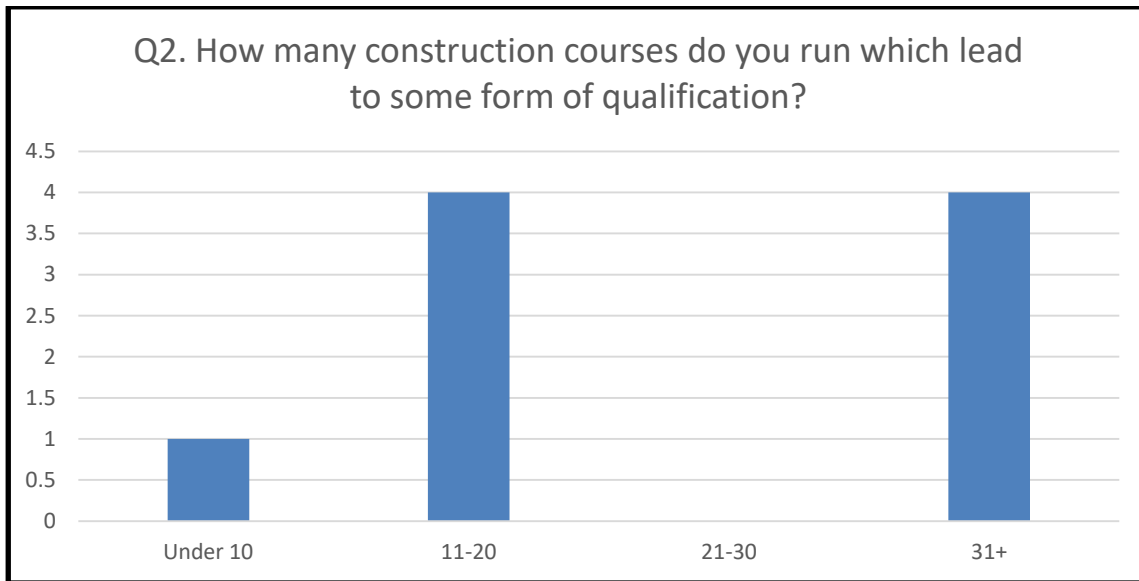
Appendix 13 – Research Questions to FEI's

Question 1- Which construction courses, trades or occupations does your college cover?



Wood Trades	8	100%	
Bricklaying and Masonry	8	100%	
Painting and Decorating	5	63%	
Plastering	5	63%	
Roofing	2	25%	
Wall and Floor Tiling	1	13%	
Plumbing	6	75%	
General construction	8	100%	
Other (please specify) (Civil Engineering)	2	25%	
Total	8		

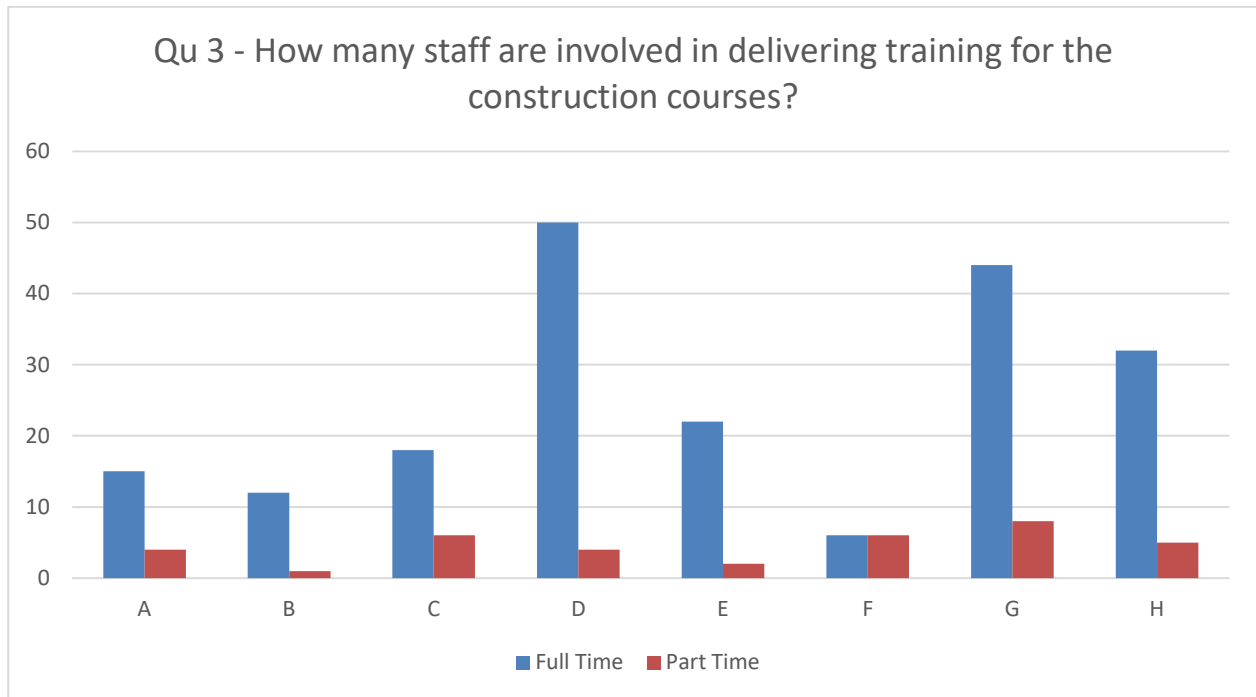
Question 2- How many construction courses do you run, which lead to some form of qualification?



Respondent	
A	18
B	13
C	30+
D	30-40
E	20
F	7
G	Probably around forty courses FE, plus apprentices, FCR etc
H	15+

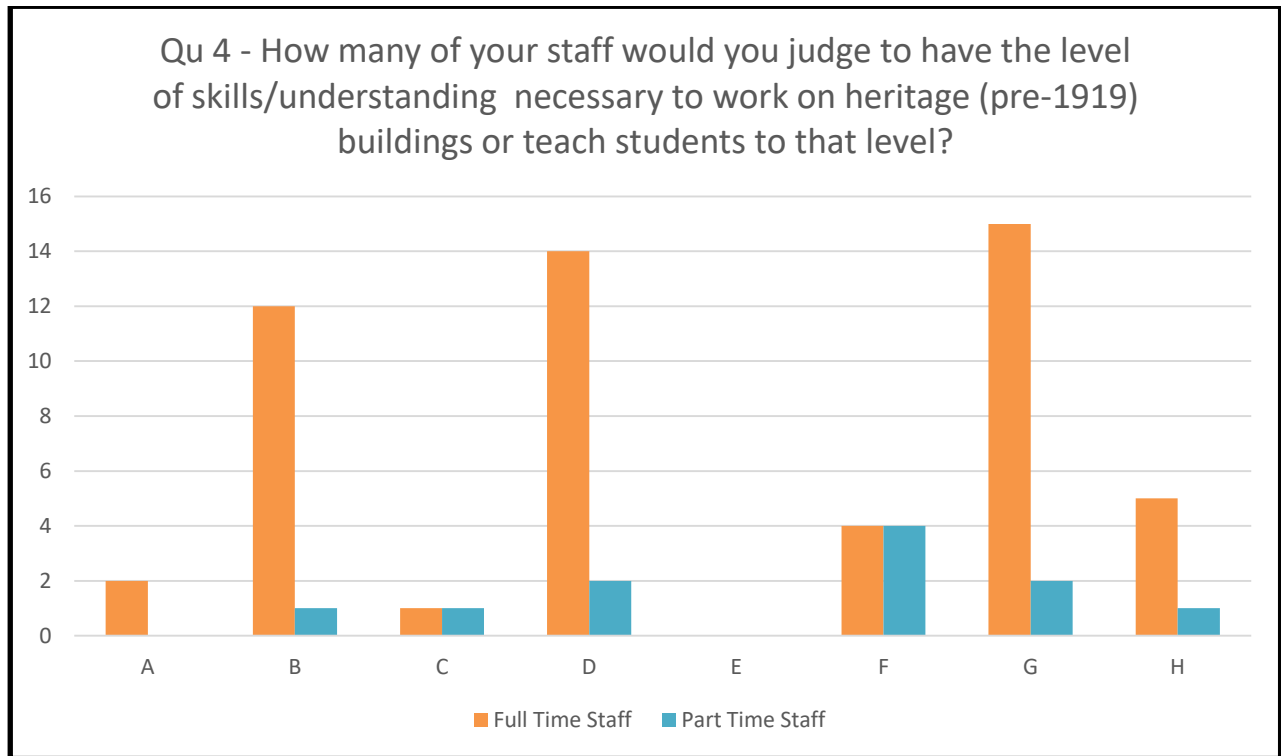
Analysis	
Under 10	1
11-20	4
21-30	0
31+	4

Question 3- How many staff are involved in delivering training for the construction courses?



Respondent	Full Time	Part Time
A	15	4
B	12	1
C	18	6
D	50	4
E	22	2
F	6	6
G	44	8
H	32	5
TOTAL	199	36

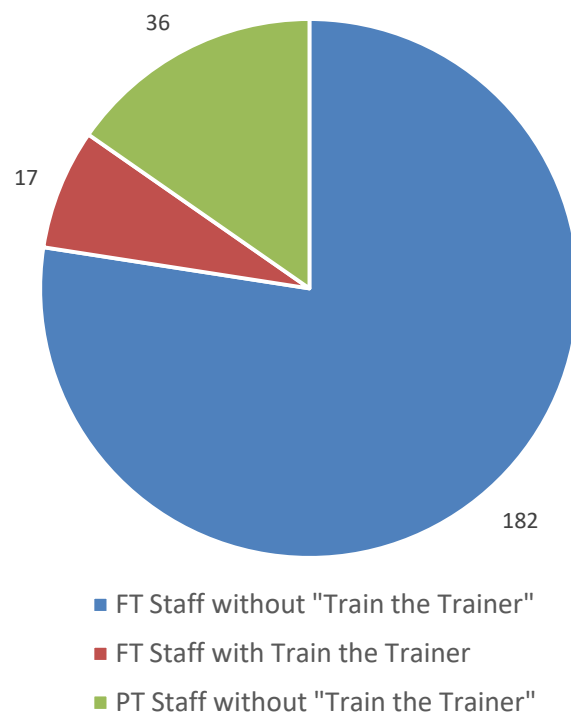
Question 4 - How many of your staff would you judge to have the level of skills/understanding necessary to work on heritage (pre-1919) buildings or teach students to that level?



Respondent	Full Time Staff	Part Time Staff
A	2	0
B	12	1
C	1	1
D	14	2
E		
F	4	4
G	15	2
H	5	1
TOTAL	53	11

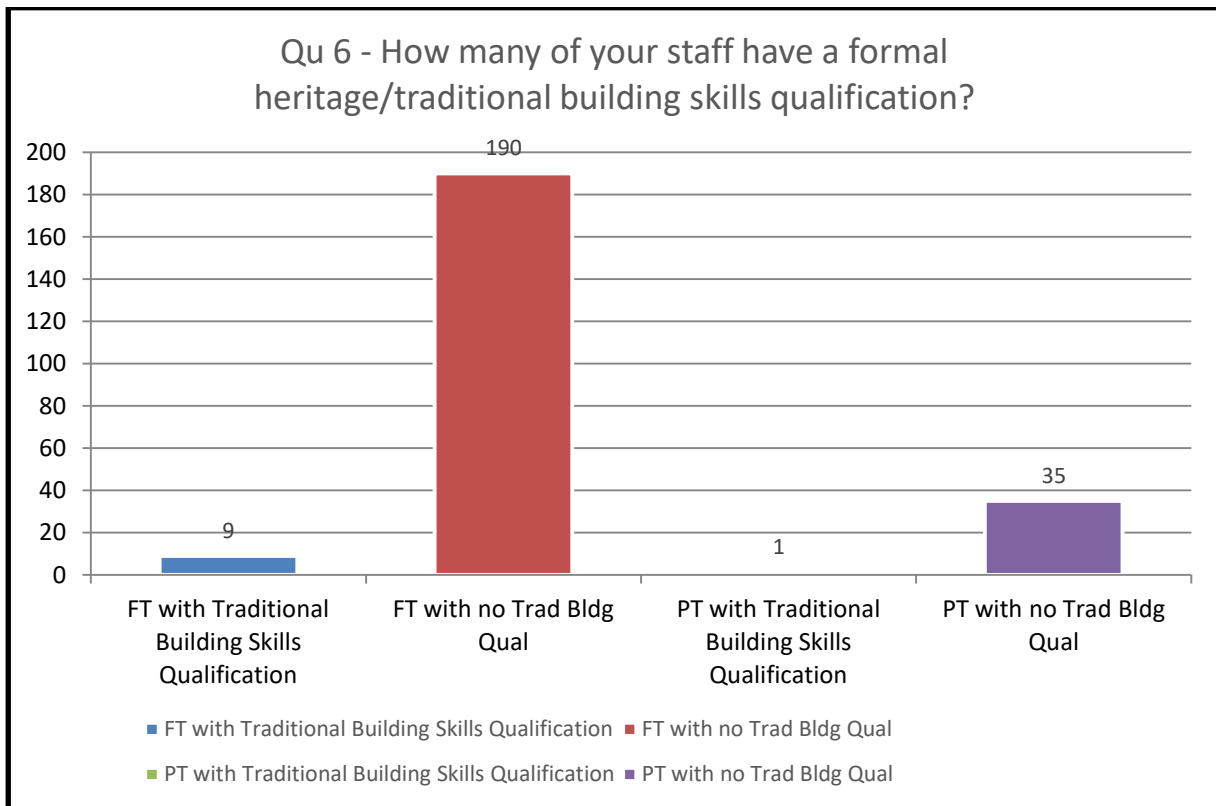
Question 5 - Historically, how many of your staff have undertaken the "Train the Trainer" course offered by CITB/NPT College Group on traditional/heritage building skills?

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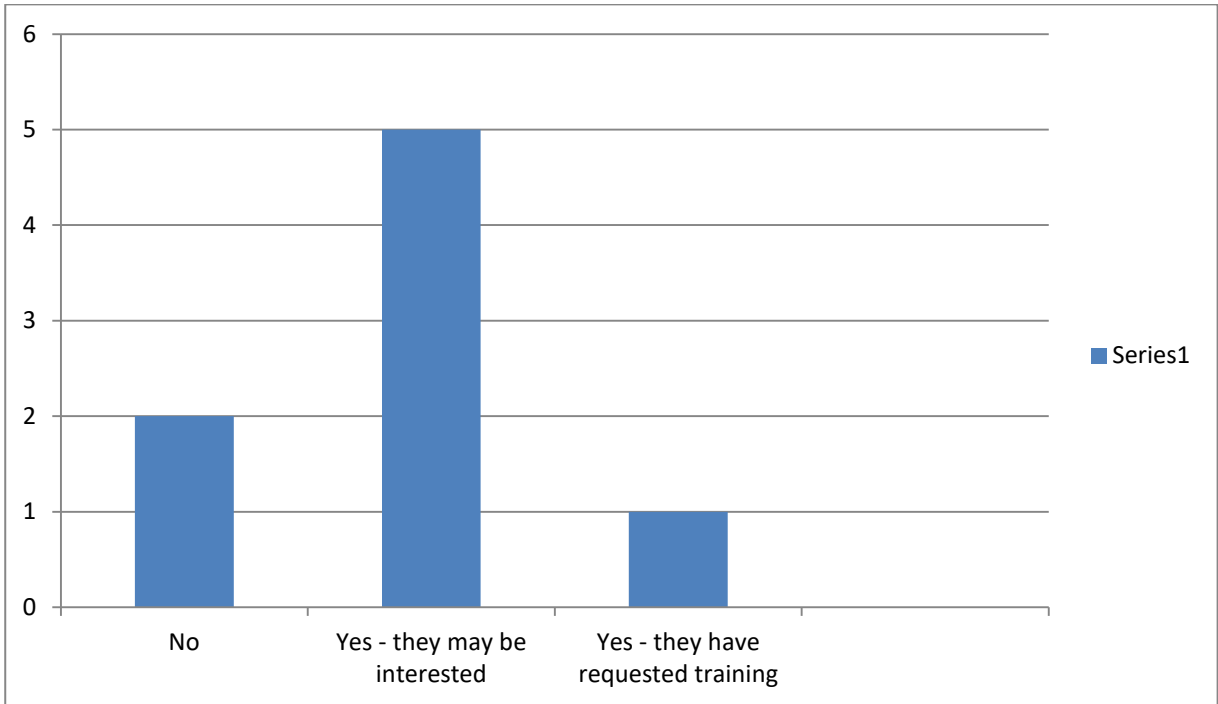
Respondent	Full Time Staff	Part Time Staff
A	0	
B	0	0
C	0	0
D	15	
E	2	0
F	0	0
G	0	
H	0	0
TOTAL	17	0

Question 6 - How many of your staff have a formal heritage/traditional building skills qualification?



RESPONDENT	FULL TIME	PART TIME	TOTAL
A	0		
B	0	0	
C	1	1	
D	3		
E	1	0	
F	0	0	
G	4		
H	0	0	
TOTAL	9	1	10

Question 7 - Do you think there is interest/demand for additional training for your staff in traditional/heritage skills?

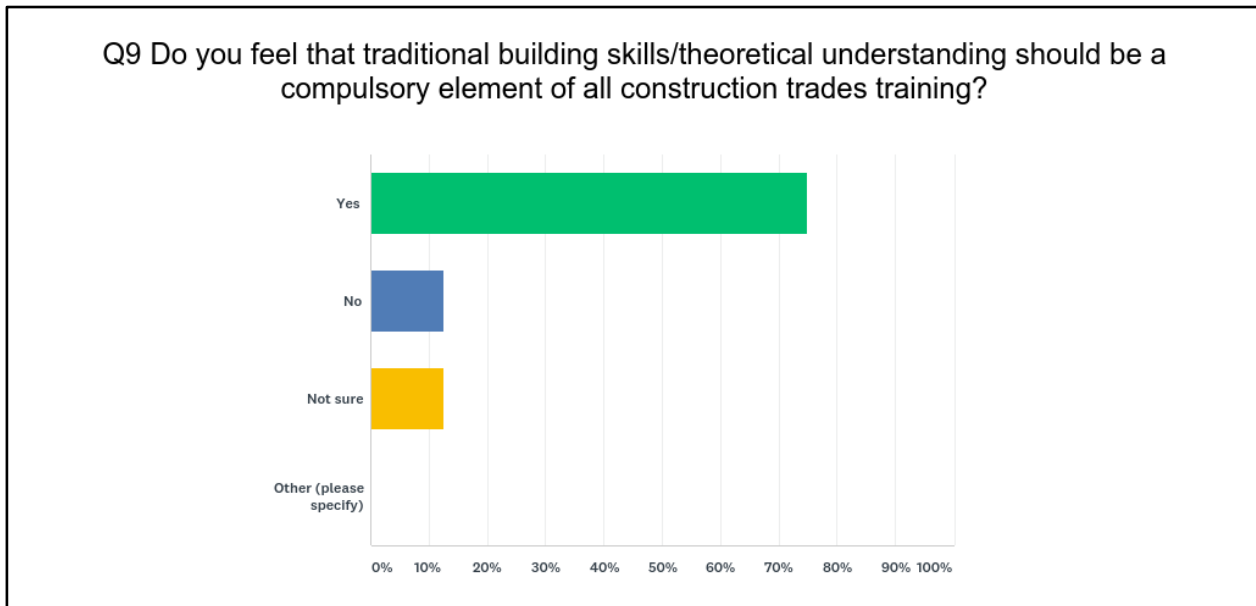


RESPONDENT	Yes - interested	Yes - requested	No
A			X
B		X	
C			X
D	X		
E	X		
F	X		
G	X		
H	X		
TOTAL			

Question 8 - How many of your staff would be interested in undertaking such training?

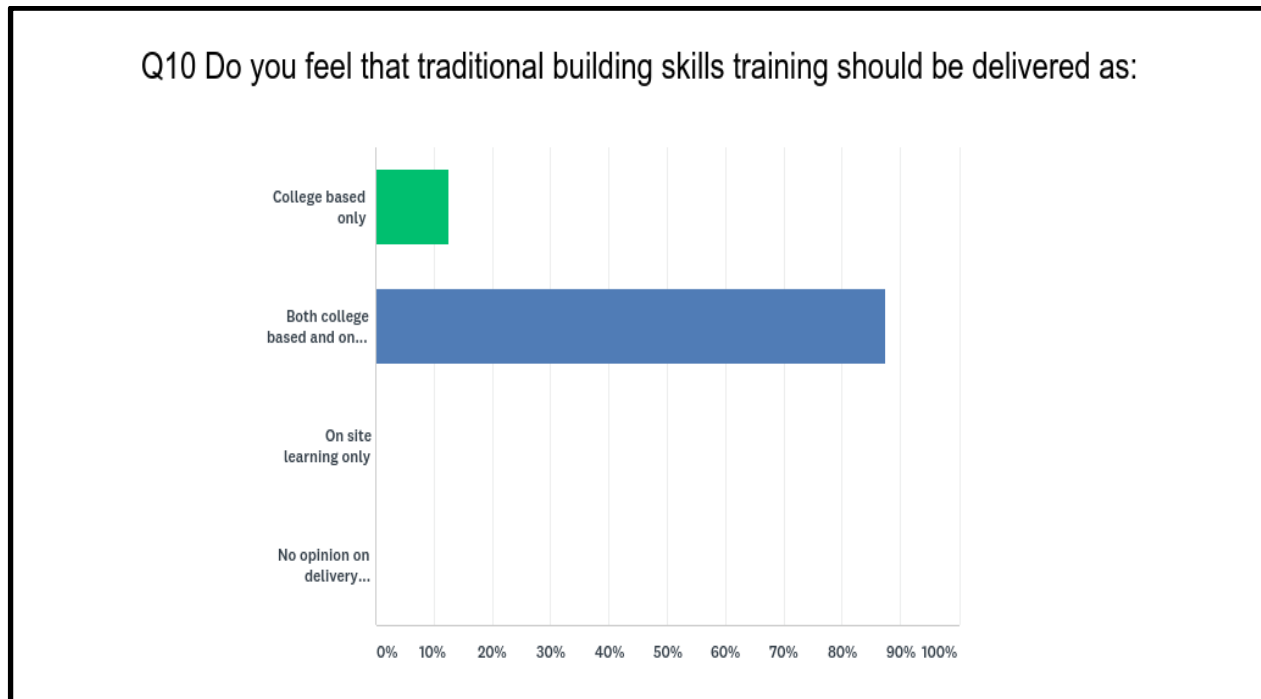
RESPONDENT	Full Time Staff	Part Time Staff	TOTAL
A	1		
B	8	1	
C	3	3	
D	10-15		
E	4 or 5	0	
F	5	5	
G	12-14	Unsure	
H	50%	0	
TOTALS			

Question 9 - Do you feel that traditional building skills/theoretical understanding should be a compulsory element of all construction trades training?



Respondent	Response
A	Yes
B	Yes
C	Not sure
D	Yes
E	Yes
F	Yes
G	No
H	Yes

Question 10 - Do you feel that traditional building skills training should be delivered as:



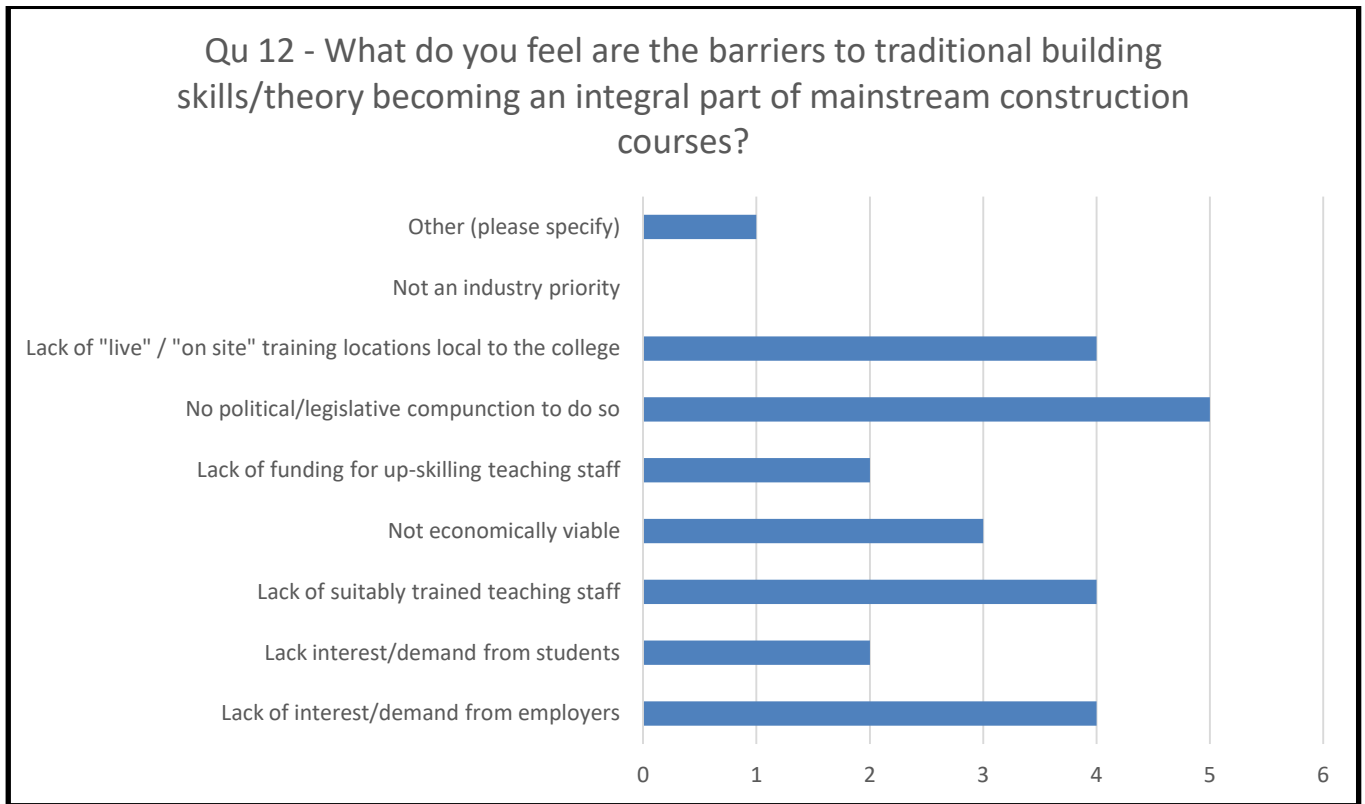
College based only	1
Both college based and on site learning	7
On-site learning Only	0
No opinion on delivery	0

Respondent	
A	College based only
B	Both college based and on site learning
C	Both college based and on site learning
D	Both college based and on site learning
E	Both college based and on site learning
F	Both college based and on site learning
G	Both college based and on site learning
H	Both college based and on site learning

Question 11 - Does your college currently offer traditional/heritage skills and training as a compulsory part of any of your construction courses?

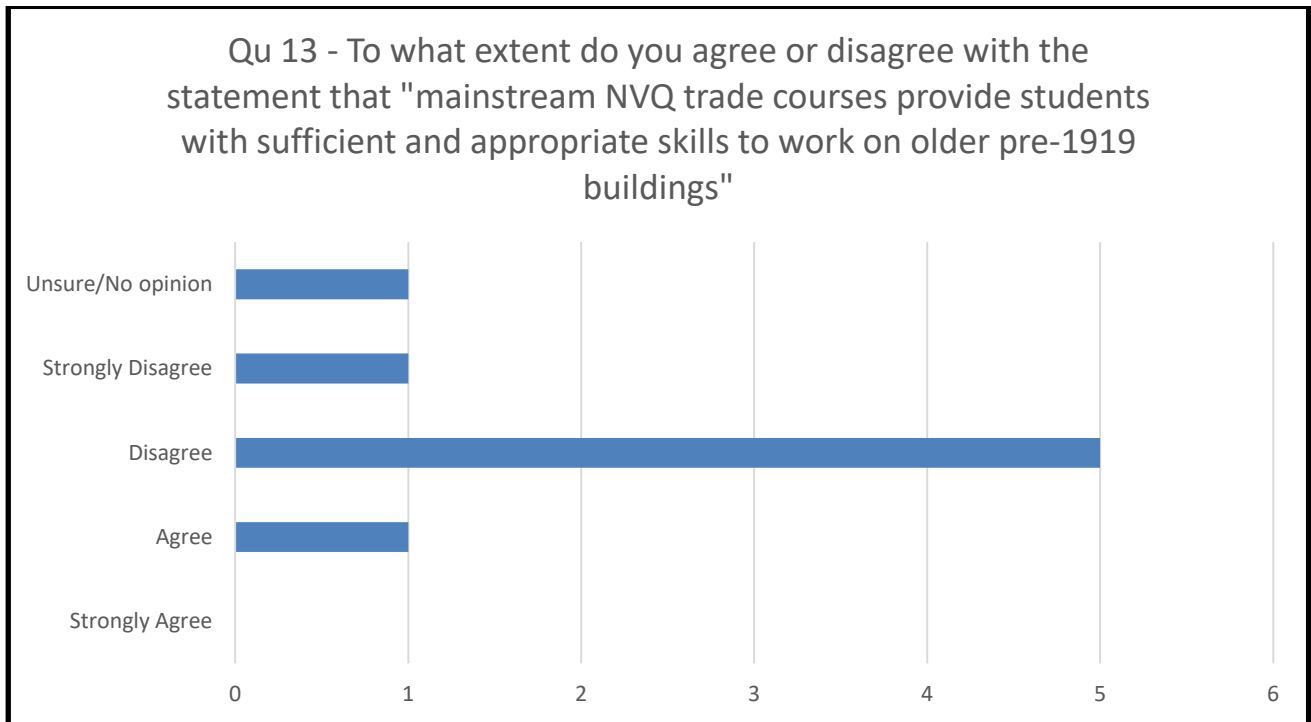
Yes	0
No	8
Don't Know	0

Question 12 - What do you feel are the barriers to traditional building skills/theory becoming an integral part of mainstream construction courses?



Lack of interest/demand from employers	4	50%
Lack interest/demand from students	2	25%
Lack of suitably trained teaching staff	4	50%
Not economically viable	3	38%
Lack of funding for up-skilling teaching staff	2	25%
No political/legislative compunction to do so	5	63%
Lack of "live" / "on site" training locations local to the college	4	50%
Not an industry priority	0	0%
Other (please specify) – see below	1	13%
There is a generally poor perception regarding the image of the construction industry, poor career advice and not enough government input marketing all aspects of construction, heritage included.		
Total Responses	8	

Question 13 - To what extent do you agree or disagree with the statement that "mainstream NVQ trade courses provide students with sufficient and appropriate skills to work on older pre-1919 buildings"

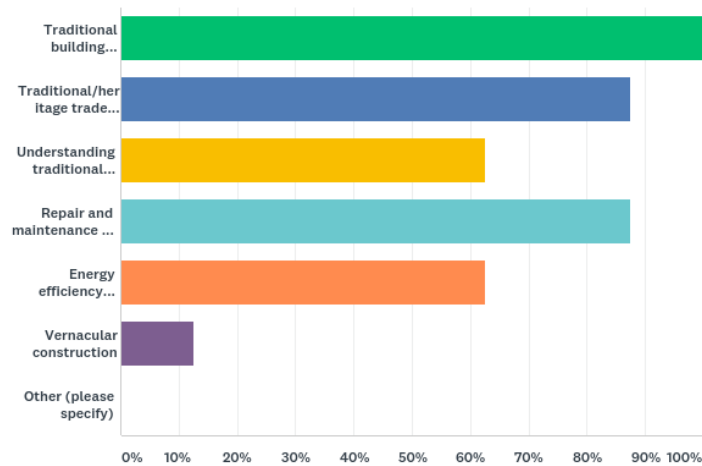


Strongly Agree	0
Agree	1
Unsure/No opinion	1
Disagree	5
Strongly Disagree	1

Respondent	Response
A	Agree
B	Strongly Disagree
C	Disagree
D	Disagree
E	Disagree
F	Disagree
G	Disagree
H	Unsure/No opinion

Question 14 - If mainstream construction courses contained content on traditional/heritage skills/theory, what do you think should be included?

Q14 If mainstream construction courses contained content on traditional/heritage skills/theory, what do you think should be included?



Traditional building materials - characteristics and performance	8	100%
Traditional/heritage trade skills using traditional materials	7	88%
Repair and maintenance in traditional buildings	7	88%
Understanding traditional building pathology	5	63%
Energy efficiency measures and retrofit in traditional buildings	5	63%
Vernacular construction	1	13%
Other (please specify)	0	0%