Cambridge Centre
for Housing &
Planning Research

Construction and Building Trades: The Skills Horizon

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Foreword: We have a shortage of skills, not innovation – now is the time to act

One tenth of the workforce in England is made up of those working in skilled trades. This comprises bricklayers, roofers and plumbers, to name a few. Their work is crucial in keeping our homes safe, comfortable and warm. They allow communities to thrive.

But we still don't have enough skilled people to deliver. With over 159,000 children living in temporary accommodation and a target to build 1.5 million new homes, one in ten employed in skilled trades won't cut it: there's a crisis. The construction sector already has over 140,000 vacancies and by 2035, we're set to lose more than a third of existing skilled professionals as they retire. Pausing or treading water is not an option, we must accelerate our response and act.

The dwindling skills pool is being made worse by ongoing financial constraints, supply chain challenges and absence of a long-term housing plan in the sector. This in turn has a significant impact on the service we can provide our customers. It ultimately holds us all back on delivering sustainable, thriving communities for people today and in the future.

At Places for People (PfP), we believe in deeds, not words. The UK must address its skills gap for the government to meet its housing targets. It's that simple.

And we must play our part. That's why we invested in PfP Thrive, a training academy. As a larger organisation, we must bear the torch when it comes to innovation and delivery. For sole traders, independent small businesses and smaller housing providers, taking on a single apprentice has much greater financial impact. PfP Thrive will not only support the sector in meeting the rising skills demand, but it will also train the next generation of skilled tradespeople to meet our future housing needs and unlock economic prosperity in our communities.

We commissioned research by the University of Cambridge, which unpacks the scale and historical dimension of the skills problem. The Cambridge Centre for Housing and Planning Research (CCHPR) produced a review of the existing skills landscape, exploring different dimensions of the problem, and highlighting what we can do more of and how. Since the review was completed in January 2024, there have been some changes to the picture: The new Labour government has announced a number of initiatives, including Skills England, which is a body aiming to better understand skills gaps, and to address these gaps through bringing together a number of key partners to identify training needs and to ensure workforces are appropriately skilled. Construction is one of 10 sectors which Skills England is prioritising for

the Growth and Skills Levy (a new version of the Apprenticeship Levy), which enables businesses to provide apprenticeships and training. Further, the Get Britain Working White Paper, published in November 2024, highlights plans to create new jobs in construction through the commitment to deliver 1.5 million new homes. Over 30 Homebuilding Skills Hubs have been announced, which will provide fast-tracked training to apprentices in a range of trade skills (including bricklaying, carpentry and plastering, among others) in areas of the UK which require additional housing.

At PfP, our ambition is to look at how we maximise talent in our communities, giving everyone options and skills to build a secure career. Opportunities are abundant and here for the long-term – in a world of increasing AI, these roles are among those that cannot be fully automated. These skills are skills for life and make a lasting positive impact on local communities across the country.

Where we can, technology has been deployed to alleviate pressures on services. Organisations across the sector are developing amazing partnerships to address their individual skills challenges. The message is clear: collaborations are key in responding to this crisis. However, collaboration must extend further and beyond our sector. Government bodies, academia and industry stakeholders all have roles to play.

We are meeting this challenge head-on. Already we've seen 650 people complete apprenticeships with PfP. We are set to open our doors to more apprentices in Autumn 2025 and we will not stop here. We know that with more incentives for businesses and individuals in place, we can do more.

The research delivered by CCHPR has been highly useful for us in shaping our academy. It offers practical steps for us to contribute to addressing the skills gap in the sector, whilst creating social value. Moreover, it does so in a way that encourages introspection towards our own business practices, as opposed merely hoping for change in the policy and operating environment. For instance, it unpacks different measures to improve diversity and attract talent. This has informed our policy in recruiting people who wish to undertake training in our academy, which prioritises profit over purpose. Women and ethnic minorities were highlighted as groups that needed stronger recruitment. We have embraced this recommendation and aspire to go above and beyond, including other groups of people such as ex-offenders and our customers.

The research has also provided valuable insight on training and apprenticeships, and future skills demand. These have played a pivotal role in our public policy lobbying of government, such as for lower barriers to entry for apprenticeships, and future skills road maps.

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Just as the report from CCHPR has oriented PfP into making business decisions rooted in equity and pragmatism, we hope that others will be able to use the information in a similarly productive manner.

- Places for People, March 2025

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This report was commissioned by Places for People to help inform their approach towards tackling the skills gaps within the house building and housing maintenance sector. The report was produced by CCHPR in January 2024. As highlighted in the foreword to this report, there have been changes in some of the policy and government approaches towards addressing skills needs in the UK over the past year, and the data and statistics cited in the report inevitably predate this. However, the report provides an insight into what the skills landscape looked like at the point in time when Places for People began to shape its approach to the Thrive programme, and highlights some of the key issues which persist today.

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1. Introduction

This report sets out what the availability of trade skills in the workforce looks like across the UK and considers what this means for the future. It brings together information from grey literature produced across the construction industry. Through a consideration of existing evidence about the impacts of various recent developments and trends in the skilled trades sector – including an ageing workforce, gender inequalities in the workforce, Brexit and the Covid-19 pandemic – on the skills landscape, the report highlights potential areas of priority for training. The report also draws together information on geographical variations in skills shortages and capacity in the UK. In addition to setting out important contextual information, which could be useful for Places for People's strategy for delivering training through its skills academy, the report also indicates key gaps in knowledge and understanding which could inform research going forward.

1.1.Skilled trades and the repair and maintenance sector

Skilled trades are one of nine occupational classification groups defined by the government (ONS, 2022a). In England, just over 10% of workers are employed in skilled trades (ibid.). These skilled trades include construction and building trades, such as bricklayers, roofers, plumbers, heating engineers, joiners, glaziers, plasterers, tilers, and painters and decorators (HESA, 2023). Generally, the ONS defines skilled trades as requiring "a substantial period of training, often provided by means of a work based training programme" (ONS, 2020).

In its recent report outlining skills needs in the construction sector, the Construction Industry Training Board (CITB) (2023) further identifies 19 kinds of manual occupations which might reasonably be considered skilled trades. This is in addition to a range of non-manual and professional occupations which are also needed for the smooth running of the sector (ibid.). Meanwhile, given the increased emphasis on modern methods of construction, a range of skills in pre-fabrication and other offsite construction approaches are considered important for the construction industry going forward (see UKCES, 2012).

There are many kinds of trades which are essential to the proper functioning of the construction industry, including those involved in repair and maintenance. While the construction industry encompasses a wide range of trades, repair and maintenance are included within this, and industry reports often include repair and maintenance under the umbrella of 'construction'. Indeed, official statistics on the construction industry include the repair and maintenance sector (ONS, 2023). The official definition of construction in the UK "includes new work, repair, additions and alterations, the erection of prefabricated buildings

or structures on the site and also construction of a temporary nature" (ONS, n.d.). Included under the heading 'repair and maintenance' by the Office for National Statistics is information on repairs and maintenance to a) public housing, b) private housing, and c) non-housing work (ibid.). This report therefore draws upon a range of material documenting trends within the skills landscape in construction in order to capture the current state of the repair and maintenance sector.

1.2. Methods

This report is a review of existing information about skills in the construction industry and repair and maintenance sector. It draws upon a range of grey and academic literature from a variety of sources. The grey literature was found via google searches for key words and phrases related to the topic, including 'repair and maintenance skills', 'construction skills', 'construction skills shortage', and other related searches. The results were then skimmed for relevance, and relevant documents and webpages were read in depth, ready for inclusion in the review. Academic sources were found via similar searches on Google Scholar.

2. The current situation

2.1.Growing demand for repair and maintenance

The repair and maintenance sector is currently faring better than the construction industry more broadly, with figures from September 2023 revealing growth in construction output on the previous month of 2.1% in repair and maintenance, compared with 0.4% for the industry as a whole (ONS, 2023). Much of this growth was in the private housing repair and maintenance sector, in which construction output grew by 3% (ibid.). In non-housing repair and maintenance, construction output grew by 2.2% in September 2023 compared with August 2023, while output in the public housing repair and maintenance sector shrank by 1.1% (ibid.).

This reflects the fact that that in a survey by the Federation of Master Builders in the first quarter of 2023 (FMB, 2023a), 14% of respondents reported an increase in the number of enquiries about new work for the repair and maintenance sector. This is contrasted with a decrease in enquiries across the rest of the construction industry, categorised into 'house building' and 'industrial or commercial' sectors (ibid.).

2.2.The existing workforce

Approximately 2.15 million people work in the construction industry across England, Scotland and Wales (ONS, 2022b). Each year, approximately 190,000 new recruits to construction industry jobs replace those leaving the industry (CITB, 2023a). Importantly, there are not enough workers in this industry to meet demand, and as of July 2023, there were over 140,000 vacancies across the construction sector in the UK (pbctoday.co.uk, 2023).

The UK Skills Trade Index (2023b) highlights that not only is there a skills shortage in the construction sector – in which companies encounter difficulties recruiting people with the right skills to meet their business needs (see Francis-Devine and Buchanan, 2023) – but that this is growing (standing at 55% in the final quarter of 2023, compared with 29% in the first quarter of that year). Some trades are highlighted as being particularly affected by these shortages, including plumbing, bricklaying, carpentry, and electrical trades (UK Skills Trade Index, 2023b). Indeed, over half of the respondents to a survey by the Royal Institute of Chartered Surveyors reported that there were ongoing skills shortages among these trades in 2022, compared with a decade ago, when less than 10% of respondents reported shortages across these trades (Colquhoun et al., 2023).

Further, a recent survey by the Federation of Master Builders (FMB) highlighted that almost 40% of FMB members were encountering challenges in recruiting carpenters, with almost 35% facing difficulties recruiting bricklayers (FMB, 2023b). Similarly, the CITB (2022) identifies vacancies for 'labourers and general operatives', as well as jobs in carpentry and joinery, as being the hardest to recruit for. Data shows that there have been considerable losses of workers across these trades since 2004. In 2019/20, there were 68,000 bricklayers and masons working in the UK, compared with 105,100 in 2004/5, representing a reduction of around 35% (Skills Training Group, 2021). Likewise, there has been a 15% reduction in the number of electrical engineers, a 17% drop in the number of carpenters and joiners, 23% drop in the number of plasterers, and a 4% reduction in the number of plumbers and heating/ventilation engineers over this time period (ibid.).

Indeed, employers in the construction industry have increasingly reported skills gaps over the past few years, with 34% of respondents to a survey by the CITB highlighting this as an issue in 2021, representing a notable increase from the 14% of employers who said they had issues with skills gaps in the workforce in 2018 (CITB, 2022). For those employers which have struggled to recruit for particular vacancies within the construction industry, 48% of participants in the CITB (2022) survey thought that this was due to a deficit in the number of young people undertaking training in construction trades. Notably, employers highlighted that there were challenges in recruitment both due to a lack of trade skills, and a lack of personal skills among job applicants (ibid.). Indeed, in the CITB survey, 25% of respondents who had struggled to fill some of their vacancies said that personal skills, including attitude to work, motivation, and common sense, were hard to find among the field of potential applicants (ibid.).

The skills shortage has a sizable impact on the construction industry, with 50% of those surveyed by the FMB stating that the shortage of workers in construction trades had led to construction jobs being delayed, and a further 12% highlighting that the shortage had resulted in a construction job being cancelled altogether (FMB, 2023b).

2.3.Workforce equality, diversity and inclusion

Within the UK construction sector, there is clear evidence that the workforce lacks diversity, with Black, Asian, and ethnic minority people comprising just 6% of the total number of people working in construction roles (Chartered Institute of Building, n.d.). Indeed, African and Indian ethnic groups have the lowest rates of employment in the skilled trades than any other ethnic group, with 4% of African and 5% of Indian groups being employed in this occupation, compared with 19% of people from White Gypsy/Irish Traveller groups (Catney and Sabater, 2015). Racism is a persistent issue within the construction industry. In a 2013

survey of over 500 people working in the sector, 53% said that racist language had been used in their workplace in the past year (Construction News, 2013). More recently, a survey highlighted that over half of Asian and Asian British workers who responded felt that their protected characteristics (including race, age, sex, and disability, among others) had meant that they were passed over for work (Building, 2020). Further, 68% of Asian or Asian British respondents and 78% of Black or Black British respondents felt that they faced obstacles for career progression on the basis of protected characteristics. This figure was much lower for people from White ethnic groups, at 55% (ibid.).

It is also clear that LGBT workers face discrimination in the construction sector, with many people reporting that they have experienced homophobic remarks and harassment, both from colleagues and customers (Barnard et al., 2017; Wright, 2013). Further, estimates suggest that between 86% and 92% of LGBT workers in the construction industry do not feel able to come out about their sexuality in the workplace (Barnard and Dainty, 2018). Barnard et al. (2017) indicate that LGBT people may feel safer and more included in office spaces, rather than on building sites, which are perceived as 'dominated by hyper-masculine white males' (p.1). Steps towards improving LGBT people's experiences within the sector would include: support networks for LGBT workers within companies; increased visible support of LGBT people in the workplace; promotion of EDI across all parts of the sector; and improved training on fostering an inclusive workplace (ibid.).

Much of the evidence about diversity and inclusion in the construction, house building, and skilled trades sectors focuses on gender inequality. Approximately 85% of the UK construction workforce is comprised of men (UK Trade Skills Index, 2023). Within the skilled trades involved in house building, 99.1% of the workforce is made up of men (NHBC Foundation, 2017). Bridges et al. (2020) highlight that historically, the skilled trades have used informal practices of recruitment, and that these have presented a barrier to women who may not have access to the social networks which facilitate such recruitment. Similarly, in a study of women in the skilled trades in Australia, Wulff et al. (2021) find that the social capital associated with having close personal relationships with people already working in this sector play a key role in women's recruitment to skilled trades, and that possessing this social capital helps women to feel accepted in the workplace.

Further, recent statistics show that while there is a relatively even number of men and women starting apprenticeships across all sectors as a whole, for construction, the picture is very different, with men and boys making up 92% of those starting construction apprenticeships for the year 2021-2022 (Colquhoun et al., 2023). This reflects the fact that women in the house building sector are largely working in office-based roles, including

secretarial, administrative, and professional roles (NHBC Foundation, 2017). Indeed, of the women working in the industry, only 4% work in a skilled trade (ibid.).

Perceptions of house building careers are understood to be broadly negative, with building sites commonly perceived as cold and exposed to the elements, and concerns about access to toilets are prominent (NHBC Foundation, 2017). Anecdotal evidence suggests that women sometimes have to request a key for the toilets from a supervisor, and may not be able to access PPE designed for women at work (Chartered Institute of Building, n.d.). Notably, stereotypes about gender roles have also been highlighted as an obstacle to women's inclusion in the skilled trades, with these jobs often positioned as masculine (Bridges et al., 2020). As a result, women in the skilled trades can feel as though they are under greater scrutiny than their male colleagues and feel a need to work harder to prove themselves (ibid.).

While the proportion of female apprentices in the sector is growing, there have been calls for greater efforts to attract girls to skilled trade careers (ibid.). This may include improving accessibility of information about construction careers and opening doors to work experience and employment opportunities (Construction Leadership Council, 2022). A study by Naoum et al. (2019) additionally found that increased flexibility in working patterns, training for returning to the workplace, and clear criteria for promotions are considered important for attracting and retaining women in the construction workforce. A number of efforts to tackle the lack of diversity in the house building workforce are already underway. Examples include:

- The #notjustforboys initiative run by the Construction Youth Trust, which provides work experience opportunities and attempts to challenge misconceptions about the industry (see NHBC Foundation, 2017)
- Women into Construction, which is a not-for-profit membership organisation, aims to support women looking for employment in the sector. This support includes advice, and access to training and work placements (Women into Construction, n.d.).
- The Fairness, Inclusion and Respect toolkit devised by the CITB provides resources for businesses wanting to improve diversity in their workforce (see NHBC Foundation, 2017).
- She Builds UK is a photography project aiming to highlight women in the construction workforce in order to inspire a new generation of girls to consider working in the sector (She Builds UK, n.d.).

2.4.An ageing workforce

According to the UK Trade Skills Index (2023), approximately 35% of people currently working in the construction industry are over 50 years old, and therefore may be set to retire over the next ten years, since in many construction jobs, physical ability to carry out the work may decline as people age. Some estimates predict that three quarters of a million people in the construction industry could be due to retire by 2036, while only around one fifth of the construction workforce is under 30 years old (Watkins and Hochlaf, 2021). The Skills Training Group (2021) highlights that it is 'likely' that the workforce across the declining skilled trades (such as bricklaying, carpentry, and electrical trades) is ageing, as fewer young people train in these trades. This is despite the fact that apprentices in construction are typically younger than apprentices across other sectors, with over half of construction apprentices in 2021-22 aged under 19 years (Colquhoun et al., 2023).

Age can have a bearing on access to training opportunities: According to a study by Canduela et al. (2012), across workplaces in the UK (not just those involved in housing construction, repair and maintenance), men aged over 50 are less likely than other age groups to be provided with additional training by their employers. However, it should be noted that the extent to which age corresponds to access to training opportunities is greater for low-qualified or low-skilled workers (ibid.). Importantly, Maqbool et al. (2024) highlight that an older workforce can have benefits for improving the quality of building projects, since experienced trades people play a critical role in teaching younger workers and sharing their knowledge. As such, while there are concerns that too few young people are taking up roles in the skilled trades to meet demand, older skilled trades people are crucial to the industry.

2.5.Qualifications and apprenticeships

There are a number of types of qualifications for the skilled trades involved in the house building sector. These include diplomas at various levels, NVQs and SVQs, and short courses (Trades Training School, 2022). There are several organisations which offer such qualifications, including the Construction Industry Training Board (CITB, 2023) and Trades Skills (n.d.). Those who are aged over 19 and who do not have a level 3 qualification, or who are over 19 and earn less than the national living wage or are unemployed are also eligible for free training in a number of skills via the National Careers Service (Gov.uk, 2021). This includes skilled trades such as plastering, bricklaying, and electrical installation (ibid.)

Apprenticeships are another route towards becoming qualified in the skilled trades and are generally understood by employers in the construction industry as providing an opportunity both to improve skills in the workforce, and to train new recruits to be able to work within their company in a way which best suits the business (CITB, 2022). 2021/2022 saw more than a 30% increase in people starting apprenticeships in construction compared with 2020/2021 (ibid.). This follows a declining trend, whereby the number of people completing apprenticeships has fallen each year by approximately 11% since 2017 (Colquhoun et al., 2023). However, the UK Trade Skills Index suggests that the recent increase may be short lived, as temporary boosts to incentives to businesses to offer apprenticeships have ended (see Gov.uk, 2021). Importantly, despite the recent increase in construction apprenticeships, the number of level 2+ qualification certificates gained by individuals in the construction industry has decreased over the past few years (CITB, 2022). It is also important to note that fewer than half of apprenticeships in the construction trades are seen through to completion (UK Domestic Trades Skills Index, 2022).

The UK Trade Skills Index suggests that over 240,000 new apprentices will be needed in the construction sector over the next decade, a quarter of which will need to be trained in the home repair and maintenance sector (Colquhoun et al., 2023). In the year 2021-22, some of the most popular construction apprenticeships were in trades facing skills shortages, including electricians (with over 7,000 new apprentices), and carpenters (with over 6000 new apprentices) (ibid.).

While the major political parties in the UK have shown support for apprenticeships and the need for training, there exist differing views on how skills training should be delivered. The current Conservative government has retained the Apprenticeship Levy, which was introduced by a previous Conservative government in 2017. This levy requires large employers to pay 0.5% of their total payroll outgoings into the levy, which funds apprenticeship training, with smaller businesses instead contributing 5% of the overall cost of the training they deliver as part of apprenticeships (Gov.uk, 2023). Meanwhile, Labour has set out its intention to replace the existing levy with a 'Growth and Skills Levy' (Labour, 2023). The idea behind this new levy would be to allow businesses to spend their levy contributions on a wider range of training activities besides apprenticeships, including on 'modular courses in priority areas' (p. 16) with a minimum of half of their contributions being reserved for apprenticeship funding. This is intended to generate more training opportunities and to address the current underspend from the Apprenticeship Levy (ibid.). Likewise, some members of the Conservative Party have called for the Levy to allow for funding of short courses in addition to apprenticeships (see Hansard, 2023).

2.6.Impacts of Brexit on skills

There has been a reduction in the number of migrant workers in the construction sector in the UK. In 2021, 5% of employers who responded to the CITB's survey said that they had migrant workers working directly for them, while this figure stood at 16% in 2018 (CITB, 2022). Similarly, in London – the UK region where construction firms are more likely than firms in other regions to have migrant worker employees – 8% of surveyed firms confirmed that they employed migrant workers, in a notable decrease from the 42% of London construction firms who did so in 2018. This is put down to both an effect of Brexit, and the pandemic (ibid.). Importantly, 44% of migrant workers employed in the construction sector in the UK are 'general labourers and operatives', while another 11% are employed in carpentry or joinery trades, which are among the roles which are most difficult to fill (ibid.). The UK Trade Skills Index (2023) further highlights that the UK's construction sector has lost almost 200,000 EU workers since 2019 as a result of Brexit, contributing to current challenges in recruiting skilled employees.

2.7.Impacts of Covid-19 on skills

While the Covid-19 pandemic had a considerable impact on construction output, which decreased in 2020 by almost 15%, this has since improved, with growth in construction output expected at around 1.5% annually until 2032 (UK Trades Skills Index, 2023). According to the CITB (2022), while some businesses reported experiencing no impact as a result of the pandemic, there has been an effect on skills training. The practice of placing employees on furlough, as well as the pressures placed on businesses during the Covid-19 pandemic, may explain a reduction in the percentage of employers in the construction industry who delivered training to their workforce in 2021 (a total of 42%), compared with the pre-pandemic situation in 2018 (when 67% of employers offered training) (ibid.). This accounts for both 'on the job' training, and training delivered by private contracted providers.

In addition, some businesses highlighted that they were not able to prioritise skills training during the Covid-19 pandemic, or had to deliver their training online (CITB, 2022). While this online training may be cheaper and quicker to deliver, some businesses were concerned that the training delivered in this way would not be as effective (ibid.).

3. Geographies of skills

The distribution of construction firms and the construction workforce across England, Scotland and Wales is not uniform. Indeed, approximately 30% of construction businesses and their employees are located in London and the South East (ONS, 2022b). This is compared to around 4% in Wales, and 3% in the North East of England:

Region	Percentage of construction firms	Percentage of construction employees
London	17.1	14.8
South East	16.9	15.0
North East	2.8	3.0
East of England	12.7	11.8
South West	9.5	8.9
North West	9.2	11.6
West Midlands	7.9	7.6
East Midlands	7.0	6.5
Yorkshire and the Humber	7.0	8.0
Scotland	6.0	8.8
Wales	4.0	3.9

Table 1. The percentage of Great Britain's construction firms and employees based in each region. Data source: ONS (2022b)

The CITB's forecast for 2027 indicates some regional variation in the number of additional employees required to keep pace with expected annual growth in construction outputs (which includes the repair and maintenance sector). Notably, while there is regional variation in this forecast, all areas of the UK are expected to need an increased rate of recruitment annually in order to meet these needs (CITB, 2023).

Region	Number of additional employees needed by 2027
Northern Ireland	4450
Scotland	19550
Wales	9100
East Midlands	17500
East of England	19050
London	22800
North East	7900
North West	25400
South East	17800
South West	38200
West Midlands	25350
Yorkshire and the Humber	17800

Table 2. The number of additional workers required to meet predicted need by 2027. Data source: CITB (2023)

As the CITB (2023) highlights, delivering training locally is essential to ensure that skills needs are met across all areas of the UK. As part of meeting this need for local training delivery, CITB has opened thirteen 'Onsite Experience Hubs' across different regions of the UK to prepare trainees for employment within the construction industry (ibid.). The hubs aim to meet the employment needs of local businesses in their vicinity and intend to make almost 8000 people ready for employment onsite (ibid.).

Meanwhile the government has announced free Skills Bootcamps, which provide adults with training in various skills – including retrofitting, and insulation installation – with the bootcamps designed in collaboration with local companies to help target training towards employment need within particular areas (Gov.uk, 2023).

There is also regional variation in the completion of apprenticeships in construction trades, which is not reflective of the broader geographical trends in construction outlined above. Indeed, in 2021-22, fewer people started construction apprenticeships in London than in any other English region, while the North West hosted the most new construction apprenticeships, followed by Yorkshire and the Humber and the South West (UK Trades Skills Index, 2023). While there is limited evidence on the distribution of skills for individual trades, research shows that the geographical distribution of modern methods of construction is uneven, with many offsite construction factories clustered in areas with easy access to transport networks, and in areas of the North where skills from trades with transferable skills, such as in the caravan industry, are concentrated (Holmes and Burgess, 2022).

4. Going forward

Growth has been forecast for various parts of the construction sector over the next few years to 2027. In the private housing sector, the annual growth rate is expected to be 2.1%, despite a recent reduction in construction output in the private housing sector attributed to the aftermath of the September 2022 mini-budget and its impact on interest rates (CITB, 2023). And while the repair and maintenance sector is currently in a stronger position than the construction industry as a whole, this is not expected to persist. The forecast for annual growth in public housing is 1.1%, while repair and maintenance in the housing sector is expected to grow by just 0.1% per year, largely due to the squeeze being felt by many households owing to a rising cost of living (ibid.).

However, the UK Trade Skills Index (Colquhoun et al., 2023) predicts that the repairs sector will grow 1.5% per year until 2027, and then 1.9% thereafter until 2032, as a result of increased demand from the drive towards decarbonisation and carbon net zero. Additional skills needed for this transition, such as solar panel installation, will also likely be in increasing demand going forward (Still, 2021). It is also anticipated that installations of chargers for electric vehicles will be in demand going forward, and that this will boost the repair and maintenance sector (Colquhoun et al., 2023).

Indeed, according to the UK Government's Net Zero Strategy, approximately 230,000 new skilled workers will be needed in the retrofitting sector in 2030 (HM Government, 2021). Trades such as plumbers and heating engineers, who may be able to work on natural gas boiler installation, and heat pump installation, as well as glaziers who could install improved windows to enhance energy efficiency in homes, may also be in demand as part of this transition (UK Trades Skills Index, 2023). Indeed, the government has set out a target to install 600,000 heat pumps annually, and in order to achieve this aim, over 30,000 new workers qualified to do this will be required over the coming seven years (HM Government, 2021).

Further, the UK Trades Skills Index (2023) suggests that almost 30% of jobs in the construction industry would need to undergo upskilling in order to keep pace with the demands of the net zero transition. There is also increasing emphasis on a range of skills which are in addition to trade-specific skills, including management skills and digital skills, as well as skills in mental health management (Construction Leadership Council, 2022). Further, Killip (2020) argues that learning and training within the construction industry is often narrowly focused on the individual's specific area of specialisation, and that this will need to be broadened in order to deliver net-zero building projects. Indeed, he suggests that while a plasterer may be skilled in the particular tasks involved with plastering, training in this trade

often does not provide plasterers with an understanding of how their role fits into the overall performance of the building, or its energy efficiency (ibid.).

As the construction industry modernises, including through offsite construction – whereby many tasks traditionally carried out onsite are instead done in factories (Oti-Sarpong et al., 2022) – the skills needed in the sector are also set to evolve. While there are already difficulties in hiring people with the required personal skills (see section 2.2.), Ginigaddara et al. (2019) assert that personal skills are important for the effective management of offsite construction, given the changes to the process of construction and associated impacts on stakeholder relationships that offsite construction entails. Nonetheless, in addition to new skills, existing skilled trades will be relevant for modern methods of construction (Dunlop-Taylor, 2022). Furthermore, the improved conditions of work associated with offsite construction factories compared with outdoor building sites may be advantageous for delivering training in controlled environments (ibid.), and so this shift could provide more opportunities for upskilling the workforce. However, as Zhang et al. (2019) highlight, a shortage of skilled workers is again a key challenge limiting the growth of the offsite construction sector.

Another increasingly important skillset in the construction sector (including the repair and maintenance sector) is digital skills. As McAuley et al. (2021) contend, Building Information Modelling, whereby digital models of buildings are used to aid construction and maintenance, requires trained people to operate BIM systems, and hiring people with the necessary skills presents a challenge to construction firms. Within individual construction firms, there may be considerable variation in the workforce's digital skills, and so upskilling the workforce to be able to use BIM will require training to be tailored to employees' existing digital literacy levels (see Shojaei et al., 2022). In addition to digital skills, Shojaei et al. (2022) note that soft skills, including communication skills, are also crucial for the use of BIM in practice, but that these skills often do not form part of formal skills training.

The overall picture is one of growth of approximately 1.5% across the construction sector as a whole, and it is therefore likely that there will continue to be job vacancies across the sector (CITB, 2023). The UK Trade Skills Index (2023a) projects that almost 1 million additional workers will be required in the construction sector in the UK by 2032. They term this skills gap 'the missing million' and indicate that almost a quarter of a million new apprentices in skilled construction trades will be needed in order to tackle this issue (ibid.) In order to meet this level of new trained apprentices, a 34% increase in the number of people completing their apprenticeships will be needed (UK Trade Skills Index, 2023b). Meanwhile, the CITB (2023) estimates that there is a need for almost a quarter of a million additional workers by 2027. This represents an annual recruitment of almost 45,000 workers and is a decrease from the CITB's previous forecast of just over 53,000 additional workers, reflecting changes in the economy more broadly.

Some of the trades which are expected to require the most growth in order to meet demand over the coming years are those which already have among the most serious shortages in the industry. Over the next decade, an increase of approximately 11% is needed in the carpentry workforce, around 9% in the electrician workforce, and 11.5% in the plumbing sector (Colquhoun et al., 2023).

4.1.1. Artificial Intelligence and skills in the house building, repair and maintenance sectors

In addition to the expected shifts in the skills required for house building, repair and maintenance as part of the increased emphasis on net-zero, and as part of a shift towards modern methods of construction, there are also questions around how increased use of artificial intelligence (AI) will affect the sector. Indeed, Sacks et al. (2020) highlight that AI has potential to be useful for Building Information Modelling, as algorithms could be put to use in improving BIM models and in identifying notable patterns in data. To make this possible, a number of barriers would first need to be overcome, including the fact that information in BIM models is often incomplete, and reliant on human insight to make interpretations (ibid.). In the construction sector more broadly, Abioye et al. (2021) identify a wide range of potential uses of AI going forward, including improved waste management through the use of AI-driven analysis of data on waste, improved scheduling and estimation of time needed for various tasks, improved analysis of various aspects of the home environment feeding into smart home applications (such as for managing energy usage), and the use of blockchain for managing supply chains and assessing risk in the supply chain.

When asked how artificial intelligence might affect the skills needed in house building, repair and maintenance going forward, Chat GPT provided the following suggestions:

> "**Automated Design and Planning:**
> The utilization of AI in housing design and planning processes will demand architects and planners to acquire skills in AI-assisted design tools. This involves optimizing housing plans for resource efficiency and innovative design.
>
> **Precision Construction with Robotics:**
> The introduction of AI-powered robotics in construction tasks, such as bricklaying and welding, will necessitate skilled technicians and engineers. These professionals will be responsible for the operation and maintenance of these robotic systems, requiring a blend of construction expertise and AI technology proficiency.

AI-Enabled Maintenance:
Predictive maintenance, facilitated by AI, will become integral to housing repair and maintenance. Maintenance professionals will need to adapt to AI-driven diagnostic tools and predictive analytics to ensure timely and proactive interventions, enhancing the efficiency of repair processes.

Data Analysis and Smart Home Integration:
With the rise of smart homes, professionals across the housing sector will need to develop skills in data analysis. This is crucial for the seamless integration of AI-driven technologies, such as smart HVAC systems and energy management solutions, into housing infrastructure.

Digital Literacy and Collaboration:
Enhanced digital literacy will be paramount for professionals in project management, construction, and maintenance roles. Effective collaboration with AI systems requires a workforce that is adept at utilizing digital tools and platforms.

New Roles in AI Implementation:
The widespread adoption of AI will lead to the emergence of new job roles. This includes AI implementation specialists and data scientists specializing in housing analytics. These roles will bridge the gap between AI technology and the specific needs of the housing sector.

Customer Interaction and Communication Skills: As smart home technologies become more prevalent, maintenance professionals will increasingly interact with homeowners to explain system functionalities, address concerns, and provide guidance on optimizing performance. Effective communication skills and the ability to educate users about AI-driven technologies will be crucial.

Cybersecurity for Smart Homes: With the increase in interconnected devices, cybersecurity becomes paramount. Maintenance professionals will need to be well-versed in cybersecurity practices to ensure the protection of smart home systems against potential cyber threats. This includes knowledge of encryption methods, network security, and the ability to implement security protocols.

Integration and Troubleshooting of Smart Systems: Maintenance roles will evolve to encompass the integration and troubleshooting of complex smart systems. Professionals will need expertise in connecting various IoT devices, configuring software interfaces, and addressing compatibility issues. This requires a blend of technical knowledge and problem-solving skills.

Remote Diagnostics and Predictive Maintenance: AI-powered systems embedded in smart homes enable remote diagnostics of appliances and systems. Maintenance professionals will increasingly rely on data analytics and machine learning algorithms to predict potential issues before they escalate. This shift towards predictive maintenance demands skills in data analysis, interpretation of AI-generated insights, and proficiency in using diagnostic tools."

5. Conclusion

Evidently, the skills gaps in the construction industry – including in the skilled trades involved in the repair and maintenance sector – are considerable, and concerted efforts to address them will be required if the size and skill levels of the workforce are to keep up with demand in the coming years. This report has provided an overview of the current situation and has indicated where the industry is heading. It has highlighted that the repair and maintenance sector is currently experiencing stronger growth than the construction industry as a whole, but that many skilled trades are experiencing shortages. It indicates that a lack of diversity in the workforce, as well as an ageing workforce, and barriers presented by Brexit and the Covid-19 pandemic, all contribute to this situation.

The spatial distribution of employment in the construction industry is not even, and there is regional variation in forecasts of growth, meaning different regions will need to reach different targets in terms of employment in order to meet demand going forward. By delivering training locally, skills development can be appropriately tailored to local needs.

It is clear that in the coming years, demand for construction, including repair and maintenance, is set to grow, and that extensive training will be needed to ensure there is a suitably skilled workforce in place to respond to this. As focus on carbon net zero building and delivering energy efficient homes heightens, demand for skilled trades which can contribute to these goals is set to increase. And as construction practices change, shifting towards offsite methods, and as digital technologies become increasingly important in both construction and the monitoring of buildings throughout their lifecycle, it is expected that new skillsets will be required to equip the workforce with the capabilities to deliver and maintain efficient and sustainable buildings. Further work will be required to understand the various barriers and opportunities for upskilling and retaining the existing workforce.

5.1. Recommendations

It is clear that there are several serious challenges facing the house building, repair and maintenance sector. In order to meet demand going forward, and to improve working conditions and attract people to the construction workforce in order to plug the skills gap, a number of recommendations have been made in recent years:

5.1.1. Improving diversity and attracting talent

There is a need to improve diversity in the house building sector, including through attracting women and ethnic minority groups to construction roles. The NHBC Foundation (2017) suggests that making the general public more aware of the roles available in the

sector could attract further talent and help to address the gender imbalance in the workforce:

- Efforts should be made to promote the wide range of job roles needed within the house building, repair and maintenance sector, in order to attract more people, including more women, into the sector (ibid.).
- People should be supported by companies to retrain into skilled trades from other roles within the company. This might include women in existing non-trade roles (ibid.).
- Investment should be made in providing guidance to young people about their career options, so that awareness of the opportunities within the house building sector is improved.
- Efforts should be made to make role models for young women visible within the construction industry. Industry publications should ensure women and other under-represented groups working in the skilled trades are given opportunities to be featured in communications, as part of attempts to avoid and reject stereotyping.
- Companies should ensure that women are given opportunities for promotion into more senior roles in order to recognise success, inspire younger women, and attract more women into the sector.

The Chartered Institute of Building (CIOB) (n.d.) highlights the role of procurement and leadership in improving EDI, to make the sector more attractive and supportive for women, ethnic minorities, disabled employees, and the LGBT+ community:

- Commissioners and clients should set out their EDI requirements at the stage of procurement in order to make expectations clear and improve inclusivity in the workplace (ibid.).
- Leaders in the construction sector should place emphasis on inclusivity and support for all staff in the workforce, and should ensure that EDI training is delivered to improve awareness (ibid.).
- The CIOB has also created an EDI charter, which employers in the industry can sign up to, and which aims to support EDI improvements across the industry by sharing best practice, and setting out tangible actions for improvement (ibid.).

The Construction Leadership Council (2022) makes further recommendations along these lines:

- Make work experience placements more accessible, and increase the number of opportunities for gaining this experience. The Construction Leadership Council has

set a target to deliver 28,000 taster sessions in construction work experience by 2025 (ibid.).

Catney and Sabater (2015) make a number of recommendations for improving the inclusion of ethnic minorities in the UK labour market as a whole. While the majority of these recommendations are focused at the level of national policy-making, many are also relevant to the construction industry. The recommendations include:

- Displaying sensitivity to cultural norms and traditions, including family and caring responsibilities by, for instance, enabling flexible working arrangements (ibid.).
- Prioritising employment targets in policy, with a focus on ethnic minority groups who are currently underrepresented in the labour market (ibid.).
- Targeting outreach and information about jobs and career paths to ethnic minority groups, including both economically inactive or unemployed adults and young people (ibid.).

As Maslova et al. (2021) indicate, supporting the shift towards increased uptake of new building technologies can also be beneficial for attracting women to the workforce:

- Modern methods of construction, including offsite construction – where much of the work traditionally done onsite is instead completed in a factory before building units are transported to their final location – can result in improved working environments and less unsociable working hours compared with traditional building sites, attracting a wider range of potential workers.

5.1.2. Training and apprenticeships

A recent government debate (Hansard, 2023) on the Apprenticeship Levy yielded several suggestions for improving access to training opportunities. Although these are contested, suggestions include:

- Improving ease of access to the Levy for SMEs and MSEs (ibid.)
- Increasing the flexibility of the Apprenticeship Levy, to enable it to be spent on a range of different training opportunities, including short-term courses (ibid.).

The Construction Leadership Council (2022) suggests that there is a need for an increase in the number of people starting apprenticeships in the construction sector, but also that efforts will need to be made to improve the completion rate of apprenticeships in the industry. Recommendations for delivering on this include the following:

- Ensure that employers have improved awareness of the need for flexibility in apprenticeships, enabling more candidates to undertake accelerated apprenticeships which are shorter than usual on account of recognising apprentices' previous skills and experience (ibid.)
- Improve employers' awareness of T levels in construction, with the aim of improving access to work placements as part of students' learning (ibid.).
- Enable more people to undertake occupational traineeships, including expanding access to Bricklaying occupational traineeships, and developing opportunities to undertake this form of qualification in carpentry and joinery, painting and decorating, and drylining (ibid.).

5.1.3. Meeting future skills demand

Killip (2020) highlights that changes will be needed in order to substantially scale up delivery of net-zero buildings, and suggests that there is a need for learning from individual projects to be retained and ingrained in company practices:

- Companies should focus not only on skills-based learning for their employees, but also on carrying learning on the effectiveness of business practices and processes forward from project to project, including paying attention to organisational governance (ibid.).

The Construction Leadership Council (2022) further highlights that there is still a need to better understand the skills which will be needed for the construction industry in the future. In recognition of this, recommendations include:

- Create 'future skills route maps' for key areas within the sector. The areas identified by the CLC as benefiting from these route maps – which will set out which new jobs might be needed, and indicate how the required skills can be gained – are 'net zero, digitalisation, smart construction, and RMI'. Work on these is underway, with a target set for completion of the route-maps by 2025 (ibid.).

As previously discussed, new skills will likely be needed to manage the digitalisation of elements of building work, and Shojaei et al. (2023), who focus on BIM, make some recommendations around how companies can adapt to this:

- Companies should tailor training programmes to their staff's existing digital skill levels, with adjustments made for different levels of existing competence (ibid.).

- Companies should ensure that the skills expected for all job levels are clearly stated in role descriptions, making staff aware of progression opportunities and encouraging learning the digital skills needed for such career progression (ibid.).

Additionally, given the need for skilled tradespeople who are able to work with new technologies, such as heat source pumps, as part of the transition to net zero, the Heating and Hotwater Industry Council (HHIC) (2023) makes some recommendations around re-skilling existing personnel:

- Financial support should be put in place to enable existing tradespeople to retrain. Specifically, the HHIC suggests that existing heat and gas engineers should be supported to gain new skills in installing and maintaining new heating technologies (ibid.)
- Minimum standards for trade skills should be reviewed. In the case of heating engineers, this means ensuring that modern heating systems are required knowledge for new tradespeople entering this line of work, and are included on refresher training courses for existing workers (ibid.)

Investment is also highlighted by the NHBC Foundation (2017) as crucial to ensuring a skilled workforce going forward:

- Investment by government and house builders should be sustained over time, even when economic conditions are more challenging, to ensure people have confidence in ongoing demand for skilled workers and are encouraged to train for construction roles (ibid.).

Burgess et al. (2023) also show that ESG (environmental, social and governance) frameworks have a role to play in closing the skills gap within the house building sector:

- As companies increasingly embed ESG frameworks into their operations, emphasising skills development as a key component of this could also contribute to addressing the skills shortage. ESG frameworks which recognise value for employees could increase the number of days allocated for staff training on order to offer improved skills development and progression for staff.

Taken together, these recommendations provide opportunities for addressing the existing skills shortage in the house building and repair and maintenance sector, both through making the industry more attractive to and supportive of a wider pool of potential talent, and through training for new and existing tradespeople. They also make suggestions for how

the industry might rise to the challenge of meeting demand for new skills and creating new job roles in the future.

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