**Mind the Gap: Skills Shortage within the UK Construction Industry**

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**Abstract**

The majority of the workforce in the UK Construction Industry is nearing retirement age with 22% over 50 years old and 15% over 60 years, considering the UK’s state pension age currently at 65, a substantial proportion of skilled construction workers will be lost in the next decade (Henson and Asenievich, 2014). Similarly, the rate of retirement is increasing at a disproportionate level to the UK’s population growth. Amid these constraints, the UK’s major infrastructure projects and housebuilding demand are not declining and will instead; demand a reciprocal of the decline in the active workforce. In the wake of the looming Brexit, something must be in place to reduce the effect and counter measures should have begun over a decade ago.

This research adopts a Quantitative approach in analysing the effects of skills shortages in the UK Construction industry. Non-parametric statistical analyses are utilize to scrutinise the extent of the skills gap and its severity. Initiatives necessary to bridge the skills gap are proposed. The study espouses a desire for a critical debate on a holistic approach to recruitment policy and government strategy to attract new entrants in all built environment fields as well as taking necessary steps in fortifying the apprenticeships programmes.

The study is expected to be of benefits to construction industry practitioners and the country as a whole in seeking avenues for improved productivity and the potential ripple effects on the UK economic growth.

**Keywords**: Brexit, Construction Industry, Productivity, Skill shortages, Workforce.

**Introduction**

The Construction Industry is arguably the most important sector in the UK economy; it generates £90 billion annually (6.7% of GDP) and employs in excess of 2.93 million people, the equivalent of 10% of UK employment (Mohammed et al., 2017). The UK construction industry is suffering from skill shortages. With the government’s 2015 pledge to build 250,000 homes a year along with a plethora of large-scale infrastructure development (Lund, 2019), such as the HS2, Cross rail and Hinkley Point C. This makes one to ponder, how such a huge portfolio of work can be delivered in the wake of Britain’s exit from the European Union (Brexit).

Apart from the poor image of the construction industry, which survey findings also revealed that young people have negative images of construction work (CITB, 1988). The work is perceived as being dirty, dangerous, having a low social status and poor career prospects (Agapiou, et. al., 1995). It has also be suggested, that one of the main reasons why young people do not like to work in construction is due to other available white collar and more glamourous jobs in other industry e.g. law, medicine or finance, and the stability and competitiveness of high wages. In 2015, the then Prime Minister (David Cameron), announced plans to increase the number of quality apprenticeships, with a pledge of 3 million apprenticeships created by 2020 in plans to deliver the next generation of skilled workers ([Grenyer](https://nakedelement.co.uk/author/paulgrenyer/%22%20%5Co%20%22Posts%20by%20Paul%20Grenyer), 2015), whilst bridging the gap in skills. As a result, the Apprenticeship Levy was introduced in April 2017. The apprenticeship levy is a new tax. It started in April 2017 and applies to all employers, stating that if annual payroll is more than £3m, the employer will pay 0.5% into the apprenticeship levy each month (Apprenticeship-levy, 2016). This bill is used to fund apprenticeship-training programmes with emphasis on the skills and qualifications necessary for future generations.

Estimate shows that 28% of workers in London comes from European Union countries and 7% from elsewhere (Strauss, 2018), that is more than one in three workers in construction. The UK population is continuing to rise, with major infrastructure projects and housebuilding required to support this increase proportionately, and coinciding in the wake of Brexit. There is the potential that the skills gap will increase even further due to the uncertainty of EU nationals working visa’s, post Brexit also their willingness to come to the UK considering the free movement of EU national to the UK (vis-a-vis) post Brexit. Presently, specific trades’ essential to house building such as bricklaying, carpentry, plastering and roofing are proving difficult to recruit with two-thirds of small and medium-sized construction firms struggling to hire and find professional technicians, e. g. plumbers and electricians- 48%, plasterers- 46% and floorers- 30% (Federation of Master Builders, 2018).

The main purpose of this paper is to examine the current status of the skill shortages in the UK construction industry, investigate the reasons for skill shortages and explore the initiatives which aims to bridge the gap, hence enable the research to recommend the actions the government and the industry should take to lessen the impact of the labour shortfall.

**Literature Review**

**Shortage of Skilled Workforce**

In 2015, the National Infrastructure Plan published its investment strategy consisting of 564 projects encompassing transport, infrastructure, communications, energy and environmental sectors at an investment cost of £411Billion. It is anticipated that this pipeline of projects in the UK, will create a demand for around 400,000 engineering and construction workers by the year 2020, hence driving the need to recruit and train nearly 100,000 additional workers & retrain and up-skill approximately 250,000 of the existing workforces (HM Treasury, 2015). Whilst these figures may seem incomprehensible, a report from Dutch engineering consultancy Arcadis, describes the shortfall in labour by using the following headline; Britain must recruit one worker every 77 seconds to meet construction needs (Arcadis, 2017). With figures like these, it is clearly apparent that the scarcity of the UK labour supply for an immense variety of skilled trades is a problem for the industry. In particular, the Arcadis report identifies a high demand for the following trades; Electricians and electrical fitters, Plumbing and heating and ventilations engineers, Carpenters and joiners & Construction and building trades. These trades alone make up over half of the annual recruitment of 407,495 necessary for Britain to fulfil and carry out its housebuilding and infrastructure projects between, 2016 to 2021.

Additionally, the Farmer Report (2016), also highlights the disproportion between the pipeline of new workers entering the construction industry and those either retiring or leaving the industry altogether. Again, the 2011 Census data shows us that 30% of the workforce at the time are aged over 50yrs, hence looking forward to ten years (2026) will represent approximately 620,000 people based on the construction classification used, who will have retired from the industry (Farmer, 2016). The 620,000 workers referred to only relates to the house building sector which is extremely alarming as figure 1 leaves you questioning; how the UK can possibly meet the target of building one million homes by 2020 as the pledged by the Government, a target set back in 2015 which is intended to ease the UK’s growing housing crisis.

Another commitment made by the UK Government as previously stated, is the target of 3 million apprentices by 2020. Whilst this pledge does not relate to the construction industry alone, its intention along with the apprenticeship levy was to increase training allowances for employers and increase apprenticeship enrolment in the industry, subsequently increase young people entering the industry whilst increasing the quality of their apprenticeship programmes.

However, a critical look at figure 2, obtained from Construction Industry Training Board (CITB, 2016) indicates the decline of first year trainees/apprentices entering the industry since 2005. Perhaps, the main cause for the lack of new recruits is that; school leavers don’t choose construction as their career choice because of the negative image of the construction industry, described in the Arcadis’ report as a ‘4D industry’ – dirty, dangerous, demeaning and depressing (Arcadis, 2017). Furthermore, from a survey of US’s high school students about the attractiveness of different careers, Construction ranked 498 of 500 occupations, thus reflecting the poor industry image (Ho, 2015). There is also the argument, that the grant provided by the CITB is unlikely to cover the full costs to an organisation, taking a trainee through to becoming a skilled and productive worker (Green, 2015). The average overall net cost to the employer over the training period is £23,932, which increases to £26,074 once the costs of dropout are accounted for (Hogarth, et al., 2012).

With the construction industry being so unpredictably volatile and subject to mass unemployment during financial downturns e.g. the late 2000’s recession. This combined with the high costs to organisations for having to train up new entrants to the industry, and the further risk of not retaining that individual after training. These can potentially lead to organisations importing ‘job-ready’ migrant labour at the expense of training (Green, 2015) which will further increase the labour shortfall as young, unemployed UK nationals could have potentially filled these roles. With profit margins being so low amongst smaller to medium sized construction firms and uncertainty over their future workloads, it is not surprising that many do not take on apprentices or trainees and/or train up current staff due to the risks involved with training and potentially not retaining that investment upon completion of their structured training.



Figure 1: House Building Sector: Forecast Workforce vs Required Workforce

Source: Farmer Report (2016)



**Figure 2:** Numbers of Construction and Built Environ. 1st-Year Trainees 1990-2015

**Source:** Construction Industry Training Board (CITB, 2016)

**Brexit**

A further fundamental issue that could worsen the skill shortages in the UK, is the implementation of a ‘Hard-Brexit’ – (the UK’s exit from the European Union without a deal on immigration, border crossing and trade deals). Brexit was first billed for 29th of March 2019, now shifted to end of October 2019, but has been repeatedly delayed by Parliament in order to avoid a ‘No deal’ Brexit and/or a ‘Hard Brexit’, in order to reach a reasonable trade agreement with the EU. Again, The Farmer Review (2016) states that over half the workforce in London comprises migrant labour, without their input the construction industry labour workforce would not be able to deliver its required output. In addition, with no clear guarantee of EU nationals having the rights to remain in the UK post Brexit, the UK could see many of the EU nationals migrating back to their country of origins. This would also lead to a potential reduction in the influx of workers from European Union coming to the UK in search of work and would further have a devastating effect on construction productivity.

Currently in the UK there is a point’s-based system in place for non-EU nationals that wish to work in the UK (Mavroudi and Warren, 2013), this system is based on the Australian system and was launched in February 2008. It splits the applicants into 5 tiers, with each tier needing certain requirements, in order to achieve the sufficient number of points to gain a working visa for new entrants or to receive the rights to remain and work in the UK for current visa holders (Mavroudi and Warren, 2013). The points are based on the following criteria; age, English language ability, qualifications, earnings, UK experience & certificate of sponsorship, with the number of allocated points for each criterion-varying dependant on each of the tiers (Devitt, 2012). As it currently stands, this system highly favours entrepreneurs, investors and skilled workers applying for roles where there is an evident skills shortage in the UK. Post Brexit it is expected that this point’s-based system will be expanded to include EU nationals, depending on the outcome of Brexit. However, as it stands the Home Office have not established how they would deal with the new influx of EU nationals applying for visas. Further to this, at a time where you would expect the UK to welcome an influx of skilled labour migrants from the EU and elsewhere, by ensuring the application processes is simplified and not being used as an immigration deterrent. The government have increased application fees by 4 per cent in addition to the immigration skills surcharge, added to this, is a proposal to double the immigration health surcharge from £200 per year to £400, making the process very expensive (Meadows, 2018). Again, it appears that the UK government are changing the visa application process in a ‘preventive manner’ at a time the processes should be encouraging skilled visa applicants. Especially when there are other nations e.g. Australia, Canada etc. encouraging skilled migrant workers visa applications. This could lead to the United Kingdom losing potential skills to these other nations, if we do not adopt similar approach to their visa applications and processes.

**Construction industries and Skilled labour Shortages in Other Civilized Nations**

Hong Kong faces similar labour and skill shortages, with its construction industry almost replicating the downturn suffered in the UK due to the recession. The Hong Kong government executed plans to stimulate economic growth in the form of ten super infrastructural development projects; capital work expenditure in the public sector rose substantially from HK$21 billion in 2007-2008 to HK$62 billion in 2012-2013 and will increase to over HK$70 billion per year in the next few years (Ho, 2016). Construction in the private sector has also recently picked up due to the rising property price, hence as a result of this sustained high workload, the construction industry is facing the challenges of skill mismatches and an aging workforce (Ho, 2016), a similar situation to the UK. In order to combat this skill shortages, the Hong Kong equivalent of the Construction Industry Training Board (CITB), the Construction Industry Council (CIC) received additional funding from the Hong Kong Government and launched a number of initiatives to recruit skilled workers to work in Hong Kong’s construction industry, including the following; construction manpower training scheme which provides a training allowance to attract new entrants & the contractor cooperative training scheme which utilises contractors by using on-site training under the supervision of the CIC for new entrants (Ho, 2016). Nevertheless, the Hong Kong construction industry still, is struggling to recruit workers in several skilled roles.

Australia is another country which has similar issues with construction labour and skills shortages, the Building and Construction Industry Improvement Bill was implemented in 2003, to address the growing shortages of skilled labour identified in the Cole Royal Commission Report (Watson (2007). The report identified the following as causes, that contributed to Australia’s skills shortages; an ageing workforce and forthcoming retirement rates; changing skills required from various occupations; differences in demand and/or supply of skilled workers as a result of employment arrangements; poor educational qualifications translating into smaller and lower numbers of successful job applicants; inadequate apprenticeship rates and difficulties in attracting and retaining employees.

It appears the biggest issue Australia’s construction industry faces is its inability to ensure apprentices complete there structured training, with numerous drop outs (Eichhorst, et. al., 2015), unlike the UK whom similarly struggle with apprenticeships, but more on the recruitment of new apprentices. With a lack of young people enrolling onto apprenticeship programmes and with enrolment levels declining year on year, but the UK have a much better retention rates for apprenticeships than that of Australia’s (Gow, et. al., 2008). A key difference between the two industries is the infrastructure project portfolios with the UK’s workload greatly exceeding that of Australia’s which would explain the UK’s skills shortage as a result of high demand for such huge projects.

In Canada, there is also a deficit in the number of new entrants entering the industry and the number of workers whom are currently employed and are expected to retire over the next ten years. With more than 1.4 million people working in the construction industry, it is expected that 247,900 of these workers will retire over the next 10 years and only 215,700 new entrants will be available to fill the gap, creating a national deficit of 32,200 workers (Chad Chang et al, 2018).

Unlike the United Kingdom, Canada’s population growth is beginning to plateau and is slowing at a lesser rate The Build Force Canada (2018) report states, the results of this will limit the long-term residential outlook translating into fewer new housing starts, but there will be a steady increase in demand for renovation and maintenance work, and an ongoing need for new skilled workers to replace those retiring (Build Force Canada, 2018). However, when comparing Canada’s shortfall of labour with the United Kingdom, it is clearly evident that the UK’s Construction Industry has a far greater shortfall required to be filled in order to execute and sustain the various infrastructure development plans and major projects planned for the furture. This is with the likelihood being that, if effective initiatives are not implemented swiftly enough to expanding the pool of skilled workers, whom are able to work on such projects, many projects could overun. This will be due to lack of labour availablility and budgets overrun due to the increase in wages for high demand labour roles which firms are struggling to recruit (these would mean, the forces of demand and supply at work).

**Research Methodology**

The use of exploratory research is utilised in this paper along with secondary literature review, to explore comprehensively the skill gaps in the UK construction industry. In order, to address and achieve the research aims and objectives, a qualitative approach of utilising construction industry bodies and endorsed institutions’ journals, articles and existing case studies was adopted.

Exploratory research is utilised as it purely explores the research question, allowing the gathering of multiple sources of literature, whilst allowing supplementary researches around the research question to give a more holistic view and understanding of the research topic. As the nature of exploratory research is to merely explore the research question and does not aim to reach conclusive solution to the research question (Stebbins, 2001), further quantitative research in the form of analysis of secondary data and the use of qualitative research, collating key industry views on the subject, backed up by data to support these views have jointly allowed for the analysis and discussions. Where possible attempt was made to use qualitative data from academic journals to maintain upmost validity with greater accuracy. Additionally, this research applied inductive reasoning in order, to allow for the use of existing literature and theory to articulate the research question to be explored in this paper. Inductive reasoning begins with observations that are specific and limited in scope, and proceeds to a generalized conclusion that is likely, but not certain, in light of accumulated evidence (butte.edu, n.d.). Whereas deductive research is concerned with developing a hypothesis (or hypotheses) based on existing theory, and then designing a research strategy to test the hypothesis (Dudovskiy, 2019), this research opted not to use deductive approach as many factors which contribute to the skills shortage are current and ongoing, e.g. the present political situation in the UK.

Interviews and questionnaires were not exploited, reason being that skill shortages are current and ongoing; hence individual’s opinions and point of views may be subjective and based on political views, affiliations and influences because Brexit is presently a hot political debate. Instead the use of secondary data collection techniques has been adopted for the content analysis, with key focus on industry endorsed research by key industry players and data by recognized regulatory bodies’ specific to the construction industry which critique would could say is also subjective as firms might want to speak for their benefits.

**Findings and Analysis**

Arguably, the most fundamental issue for the United Kingdom currently, is the political situation in the wake of Brexit: what the outcome could be, the impact it will have on the UK’s economy in general. However, this paper is limited to investigating the skills gap shortages and the speculative effect this could have on construction productivity, in addition to the already existing skilled workforce shortages and the now disproportionate population growth ratio with the skilled labour workforces.

A sizeable bulk of the London and the South East’s labour force is from the EU, the negative connotations of Brexit will further constrain the skills deficit and may directly or indirectly create obstructions for increasing construction productivity in the years to come.

**Figure 3**; is a summarised and tabulated initiative, potential benefits to the Construction Industry and relevant sources.

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|  | **Initiatives** | **Source of data** | **Potential benefits to Industry** |
| 1 | Central and local government in the UK should seek as public procurers and planning regulators, to secure from developers and construction businesses workable obligations to train and develop local people. | CIOB (2015), CIOB Perspectives: An analysis on migration in the construction sector | Expansion of the pool of workers to fill the skills deficit with a large proportion of unemployed young people in the UK through education or training, targeting these individuals by tailoring training to meet the skills required for the industry especially in technical trades with shortages as being experienced in the Construction Industry. |
| 2 | The industry needs to continue and enhance its outreach work in schools, ensuring the careers advice presents a fair representation of the huge opportunities available at both trade and professional levels within the construction industry. | A greater proportion of young people will be willing to enter the industry if the image of the industry is improved. Currently most young people would see construction as an undesirable career path, but with many opportunities for progression and a vast range of roles available, there is a career path for anyone with aspiration to work in construction; this will further relieve the burden of skill shortages. |
| 3 | Securing the rights forthose currently working in British construction industry post Brexit | Arcadis (2017), Talent Scale, The real extent of Britain’s construction labour crisis | This is fundamental, the UK needs to retain its current EU workforce and look to attract new EU nationals whom may wish to migrate to the UK post Brexit. Government needs to show that the rights of EU nationals remain is a priority in order to attract more migrant workers to fill the skills gap. |
| 4 | Sourcing and Encouraging alternative work source/s e.g. new skilled migrants’ workforce, ethnic minorities and women. | Ho (2016), Labour and skill shortages in Hong Kong’s construction industry, Engineering,Construction and Architectural Management. Vol. 23 Issue: 4, pp.533-550  | Expansion of the pool of potential workers whom can work in the industry, with particular focus on black and minority ethnic (BAME) backgrounds and women. This will enable more entrants into the construction industry to fill the deficit of skill shortages and hence will further relieve and alleviate the burden. |
| 5 | The Construction Industry Training Board (CITB) should be comprehensively reviewed and a reformed programme instituted | Farmer (2016), The Farmer Review of the UK Construction Labour Model, Modernise or Die. | More efficient distribution of levy investment required to support industry wide innovation and modernisation, whilst focussing on the longer-term needs of the government. Also, ensuring recruitment quotas for trades where there is a shortage are met and apprentices/trainees complete their respective programmes with greater retention rates post completion, further relieving the burden on skills shortages. |
| 6 | Adopt new construction technologies and techniques to enhance construction productivity | Ho (2016), Labour and skill shortages in Hong Kong’s construction industry, Engineering,Construction and Architectural Management, Vol. 23 Issue: 4, pp.533-550 | Innovation and technology in construction e.g. offsite construction needs to be re-emphasised, realised and implemented. Example, the use of precast concrete as opposed to in-situ concrete and other construction productivity enhancements reducing the labour numbers required on major projects and infrastructure developments.  |
| 7 | Training and retraining the unemployed and underemployed could be a significant benefit to an industry under significant pressure | Arcadis (2017), Talent Scale, The real extent of Britain’s construction labour crisis | Relieving current shortages and leading to a culture of improvement throughout industry with training incentives for employees to allow them to reach career aspirations |

**Conclusion and Recommendations**

It is recommended in this paper, that the following initiatives to government and industry be adopted in helping to ameliorate and solve the skills gap in the UK construction industry.

There is the need to increase apprenticeship and trainee programme/s enrolment quotas and retention rates (Feng, 2015); as mentioned previously in this research (illustrated in figure 2), the number of persons enrolled onto apprenticeship and trainee programmes has dramatically fallen since 2005 (Eichhorst, et. al., 2015). As a bare minimum, the industry should recruit the same number of individuals anticipated to retire each year from the industry with apprenticeship or trainee programmes. Although this will not solve the skill shortages immediately, it will ensure that there is a pipeline of young skilled professionals entering the industry for years to come, which could help replace those leaving the industry due to retirement. This will also promote a more positive image of the construction industry as one, which develops individuals into skilled professionals with career pathway to work on major projects with transferrable skills and in construction around the world.

Ensuring that the UK have access to EU labour market post Brexit and retain current EU nationals working in industry (Sumption, 2017); it is vital that the UK government ensures that the deal reached with the EU in the Brexit negotiations will ensure current EU nationals working in the UK construction industry are giving the rights to remain as a priority. Additionally, the government should actively seek not to deter new applicants from the EU whom could fill key skilled roles by making the work visa application process as user friendly and reasonably priced as possible. With over a third of London’s construction workforce coming from Europe, it is vital we attract these individuals to stay and any new application process imposed on EU nationals should not act as a deterrent and should appeal to invite skilled individuals to fill key industry shortage roles.

Increase pool of talent which the recruitment of skilled construction labour can be drawn from; the industry should actively look to encourage the recruitment of diverse social groups, encourage and attract females to enrol onto programmes as well as tailoring training and apprenticeship programs for minority ethnic groups. Industry image can act as a deterrent, particularly to females as the industry is seen as macho and male dominated, this stereotype needs to be addressed, perhaps by using school engagement programs to attract females from young age to look at construction as a viable career path. The industry should encourage minority ethnic group’s enrolment onto training programs by employing native speakers to carry out tailored made training programs, to fill specific skills required in the construction industry with the aim to alleviate skill shortages. Another approach could be looking to attract ex-offenders onto training programmes, which provide a fast track route into employment, further promoting a positive outlook for the construction industry whilst expanding the pool of workers, which employers can draw from to fill key skill shortages.

Impose quotas on significant government contracts that require contractors and their subcontractors to ensure a proportion of their workforce are apprentices; this recommendation has already been implemented on large scale projects like the Thames Tideway project where [contractors](https://www.designingbuildings.co.uk/wiki/Contractors) are being asked to ensure 1 in 50 [places](https://www.designingbuildings.co.uk/wiki/Place) are filled by apprentices from [London](https://www.designingbuildings.co.uk/wiki/London) and the wider Thames [Water](https://www.designingbuildings.co.uk/wiki/Water) region (KLH Sustainability, 2019). This study acknowledges there is a great deal of room for improvement and quotas like this should be embedded into the government’s house building targets. Also, rooted in the heart of the infrastructure contracts to promote a client and contractor culture of employing apprenticeships and ensuring their development is imperative to securing high profile contracts that brings an abundance of work. This cultural change should promote the recruitment of apprentices and trainees to ensure firms keep growing whilst providing sustainable career paths for the young and unemployed.

These recommendations require complete change in the culture of the UK construction industry, and it is vital to address the issues of skills gap and shortages as discussed in this paper and ensure implementations as recommended.

**References**

Agapiou, A., Price, A.D. and McCaffer, R. (1995). Planning future construction skill requirements: understanding labour resource issues. *Construction Management and Economics*, *13*(2), pp.149-161.

[Apprenticeship Levy | Helping employers with planning, costs ...](http://www.apprenticeship-levy.co.uk/) Available from: [www.apprenticeship-levy.co.uk](http://www.apprenticeship-levy.co.uk) (accessed 15/05/2019)

Arcadis (2017). Talent Scale - The real extent of Britain's construction labour crisis, London: s.n.

Build Force Canada (2018). Construction & Maintenance Looking Forward. National Summary, 14 January, pp. 1-12.

Chad Chang, C. M. &. C. A. (2018). Addressing labour shortages in construction — Why diversity is key. Chartered Proffesional Accountants British Columbia - Industry Update, 18 September, p. 1.

Construction Industry Training Board (CITB, 2016). Training and the Built Environment 2016, London: Construction Industry Training Board (CITB).

Deductive, Inductive and Abductive reasoning **(n.d.). Available from:** <https://www.butte.edu/departments/cas/tipsheets/thinking/reasoning.html> (accessed 12/05/2019)

Devitt, C. (2012). Labour migration governance in contemporary Europe. The UK Case. *LAB-MIG-GOV*.

Dudovskiy, J. (2019). Research Methodology - Deductive Approach (Deductive Reasoning). Available from: <https://research-methodology.net/research-methodology/research-approach/deductive-approach-2/#_ftn1> [Accessed 6 April 2019].

Eichhorst, W., Rodríguez-Planas, N., Schmidl, R. and Zimmermann, K.F. (2015). A road map to vocational education and training in industrialized countries. *ILR Review*, *68*(2), pp.314-33

Farmer, M. (2016). The Farmer Review of The UK Construction Labour Model, London: Construction Leadership Council (CLC).

Federation of Master Builders (2018). Two-thirds of construction bosses can’t find a bricky or chippy. Available at: <https://www.fmb.org.uk/about-the-fmb/newsroom/two-thirds-of-construction-bosses-can-t-find-a-bricky-or-chippy/> (Accessed 13 February 2019).

Feng, G., Mizintseva, M.F. and Sardaryan, A.R. (2015). The Main Vectors of Educational Programs in Improving the Quality of Human Resources in People’s Republic of China. *European Journal of Economic Studies*, (4), pp.206-211.

Gow, K., Warren, C., Anthony, D. and Hinschen, C. (2008). Retention and intentions to quit among Australian male apprentices. *Education+ Training*, *50*(3), pp.216-230.

Green, B. (2015). CIOB Perspectives: An Analysis on Migration In The Construction Sector, London: The Chartered Institute of Building.

Henson, K. and Asenievich, K. (2014). Mind the Gap: Tackling the Construction Skills Shortage. Available at: <http://www.klhsustainability.com/media/thought-leadership?start=3> (Accessed 7/05/2019)

HM Treasury (2015). National Infrastructure Plan for Skills, London: HM Treasury

Ho, P.H., (2016). Labour and skill shortages in Hong Kong’s construction industry. *Engineering, Construction and Architectural Management*, *23*(4), pp.533-550.

Hogarth, T., Gambin, L. and Hasluck, C. (2012). Apprenticeships in England: what next? *Journal of Vocational Education & Training*, *64*(1), pp.41-55.

Lund, B. (2019). Increasing New House Supply. In *Housing in the United Kingdom* (pp. 217-258). Palgrave Macmillan, Cham.

Mavroudi, E. and Warren, A. (2013). Highly skilled migration and the negotiation of immigration policy: Non-EEA postgraduate students and academic staff at English universities. *Geoforum*, *44*, pp.261-270.

Meadows, R. (2018). The UK's deeply flawed immigration system urgently needs an overhaul before Brexit or businesses will suffer. Independent - News - Business - Comment, 16 May, p.1.

Mohammed, M., Pärn, E.A. and Edwards, D.J. (2017). Brexit: measuring the impact upon skilled labour in the UK construction industry. *International Journal of Building Pathology and Adaptation*, *35*(3), pp.264-279

Policy paper on Apprenticeship Levy (2016). Likely costs, benefits and impacts of the measure. Available from: <https://www.gov.uk/government/publications/apprenticeship-levy/apprenticeship-levy> (accessed 15/05/2019)

Rowe, L., Perrin, D. and Wall, T. (2016). The chartered manager degree apprenticeship: trials and tribulations. *Higher Education, Skills and Work-Based Learning*, *6*(4), pp.357-369.

Stebbins, R.A. (2001). *Exploratory research in the social sciences* (Vol. 48). Sage.

Strauss, D. (2018). UK Immigration - London reliant on EU for 28% of building workers as Brexit looms. Available from: <https://app.ft.com/content/bc94676c-73af-11e8-b6ad-3823e4384287> (Accessed 14/04/2019).

Sumption, M. (2017). Labour immigration after Brexit: questions and trade-offs in designing a work permit system for EU citizens. *Oxford Review of Economic Policy*, *33*(suppl\_1), pp. S45-S53.

Watson, M. (2007). Concerns for Skills Shortages in the 21st Century: A Review into the. The Australian Journal of Construction Economics and Building, Volume 7(no 1), pp. 45-54.