



The Electrotechnical
Skills Partnership

The Electrotechnical Skills Partnership Labour Market Intelligence Research



Pye Tait Consulting

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Executive Summary

This 2019 Labour Market Intelligence (LMI) report aims to provide a detailed overview of the sector and the skills required to work in the electrotechnical sector, now and in the foreseeable future.

Throughout the document the word “sector” refers to the entirety of the activities which use electrotechnically-skilled people. When referring to the major part of the sector which is concerned with electrical contracting, the word “industry” is used.

The first phase of the research was delivered through stakeholder interviews, a workshop with TESP partners, and desk-based research. These activities ensured a basis of understanding of the sector to support its definition and the job roles deemed to be within the scope of this research.

The second phase involved surveying the electrical contracting industry. The survey was split into two key strands: quantitative data collection, and qualitative in-depth interviews, both taking place during late summer and autumn 2018.

The survey captured the views of 443 unique respondents by nation, region and size of organisation, encompassing large (over 250 employees) as well medium and smaller companies (below 250 employees). It has revealed that, over the last two decades, electrotechnical activities have become even more important – taking a role at the forefront of the so-called digital revolution. Indeed, the continuing trend of technological innovation in the electrotechnical sector as a whole will have profound implications for its future workforce composition and skills requirements.

As of 2019, national statistics point to the sector’s workforce comprising 341,800 people. Of these, the majority work in the electrical contracting industry – around 227,000. Over the next five years, in addition to replacing normal leavers and losses, an additional a total of 8,500-10,000 electricians and 4,000-5,000 new apprentices will be needed to accommodate forecasted economic growth. The sector, in common with many others, faces further pressure due to an ageing workforce and difficulties in recruiting younger people.

Replacement and recruitment are hampered by a growing need for qualified, skilled electricians. In this context, larger companies - which should be more able and likely to recruit larger numbers of apprentices, may be better placed. Nevertheless, they will also continue to face skills shortages.

A SWOT analysis, drawn from survey responses, demonstrates that apprenticeships provide the practical experience and adaptability to new technologies needed for electro-technical businesses to succeed.

To increase the attractiveness and competitiveness of the sector suggestions included a higher first-year wage (although it was unclear whether this is in comparison with the National Minimum Wage or JIB/SJIB rates) and improved cooperation between industry and providers have been identified as

desirable ways forward.

Technological transformation is being influenced by SMART technology, e-mobility and Wi-Fi technology as the top-three named drivers of change. The implications of this are adapted and enhanced training for apprentices and upskilling of existing workers. In this context, digitalisation, automation and the vital underpinning meta-skills such as problem-solving, creativity and collaboration will be of growing importance. In addition, the surveys and interviews revealed pressing needs for improved English and Maths.

Apprenticeships are highly valued across the sector and particularly in the electrical contracting industry. Employers feel that a general prioritisation of academic routes for young people has diminished the pool of suitable candidates for apprenticeships.

The normal age of apprentice entry – sixteen – is regarded as an issue in an industry which is extremely mobile. The frequent need for on-site working and the apprentices' lack of a driving licence are seen as problems. Employers emphasise that practical job training provided to apprenticeships is vital to produce skilled workers. Recruitment barriers persist and, while providers' existing training offer is perceived as satisfactory, there are concerns about the training implications of future technologies.

Employers point to what they see as major barriers to recruitment in candidates' poor attitudes and behaviours as well as low levels of skill in spoken English. There is also a concern over health and safety rules for under 18s.

Employers in the industry favour on-the-job training and are sceptical to some extent of external, non-mandatory training. In addition, the mandatory training was equally perceived as falling short of employer and sector needs, specifically concerning the practical application of theoretical knowledge.

To tackle these challenges and to steer the process of digital transformation, the sector will have to adopt an holistic approach involving the effective anticipation of technological change, tailored training, optimised collaboration with training providers and other stakeholders, and increased efforts to train, recruit and retain talent. This may have to include increasing the attractiveness of the sector to young people and considering improving first-year apprentice wages as was suggested by a few employers¹, and work to underpin the transferability of skills from other related sectors. In designing an action plan, particular account should be given to the preponderance of small and micro businesses in the industry and how such firms might be supported.

¹ Although it is not clear if their reference point for this suggestion was the National Minimum Wage or JIB/SJIB rates.

1. Introduction

1.1 Background, Context and Rationale

When Pye Tait Consulting conducted one of the very first labour-market studies for the electrical industry, back in 1999, the workforce comprised around 350,000 people across the UK². The work was mainly traditional wiring and installation and it was still often referred to as a trade within the construction sector. At that time the cutting edge of technology was the installation of data-cabling for computer systems. Hard-wired networks were becoming common and many electrical firms were beginning to expand into that specialism.

Fast-forward twenty years and the electrotechnical sector is at the very forefront of the new digital revolution. Hard wired network systems are still required but electrotechnical companies are now being asked, more and more, to design, specify and install wireless systems which link to complex electrical supplies and to the equipment they support. Buildings need to be more automated and intuitive, demanding a requirement to integrate these digital solutions.

At its simplest, the sector still needs to understand the intricacies of electrical three-phase and single-phase installations but, at the other, businesses need to meet needs for integrated digital communication (both wired and wireless) and to meet the rapidly emerging need for energy conservation and renewable supply. In large offices and factories, the air conditioning systems, the communication systems, and even the minor gadgets such as coffee-machines and fridges can involve interlinkages with the Internet. With the internet-of-Things (IoT) in the early stages of development, the electrotechnical workforce has to understand far more than traditional wires and power supplies. It impacts on how we design, construct and maintain and monitor buildings throughout their lifecycles with processes such as Building Information Modelling (BIM) driving efficiencies.

Today, electricity is at the base of virtually everything we do, and it has long since ceased to be a matter of central generation from fossil-fuelled stations. The modern electrician must understand all forms of generation (from fossil-fuel and nuclear, to wind, tidal, solar and battery) in a wide variety of forms, as well as being able to handle highly digital monitoring, communication and management equipment. There is a strong push on energy efficiency and greater use of electrification such as electric vehicles, improving the charging infrastructure as well as renewable energy and battery storage to meet zero carbon goals. Low wattage LED lighting means we have the ability to power and control these in different ways other than traditional methods.

The very complexity of the industry means that it is highly unlikely that robots will replace human technicians anytime soon and we will continue to need a highly-knowledgeable and deeply-skilled

² National Electrotechnical Training (1999) Report on a Skills & Labour Market Survey on the Electrotechnical Industry

workforce to support that future capability across widely diverse sectors. The modern electrotechnical company must also understand the science and applications of sustainable technology, a bewildering variety of power supplies and configurations, and the environmental implications of everything they do.

The fundamental truth is that the sector's workforce is becoming one of the most important in the modern world. Without its complex array of knowledge and skill, very little is possible in virtually every other sector of the economy. The need will increase, and the sector's scope will widen into such fields as the IoT, electric vehicle charging, integrated digital communications, BIM, and distributed power supply systems. At the same time the pace of change will continue to accelerate, meaning that skill and knowledge will need to be at the top of every employer's priorities.

The Electrotechnical Skills Partnership (TESP) is an industry collaboration which supports electrotechnical employers to develop and drive skills in this vital sector. It consists of leading trade and standards organisations in the electrotechnical industry, including NET (National Electrotechnical Training), ECA (Electrical Contractors' Association), JIB (Joint Industry Board), SELECT and Unite the Union. TESP has three core functions: shaping policy; promoting career opportunities; and raising standards and promoting professionalism. Further details are provided about TESP in Appendix 6.

With the current Labour Market Intelligence (LMI) research, TESP is seeking to develop a detailed understanding of the skills required to work in the electrotechnical sector, both now and in the foreseeable future. As part of that, as it has been some time since up-to-date LMI was gathered, it seeks some key statistics on the current workforce and skills, including the current training provision. As a critical part of that, TESP wants to accurately define and profile the electrotechnical sector and to obtain indicative information on the return on investment for apprenticeships.

1.2 Methodology and Responses

To tackle these targets, Pye Tait Consulting delivered a four-phase approach that aimed to:

- (i) scope the sector,
- (ii) survey the industry for key characteristics and skills concerns,
- (iii) develop an understanding of the apprenticeships including the return on investment for employers, and,
- (iv) analyse and report on findings to inform future skills and funding strategies for TESP partners to meet the industry's needs.

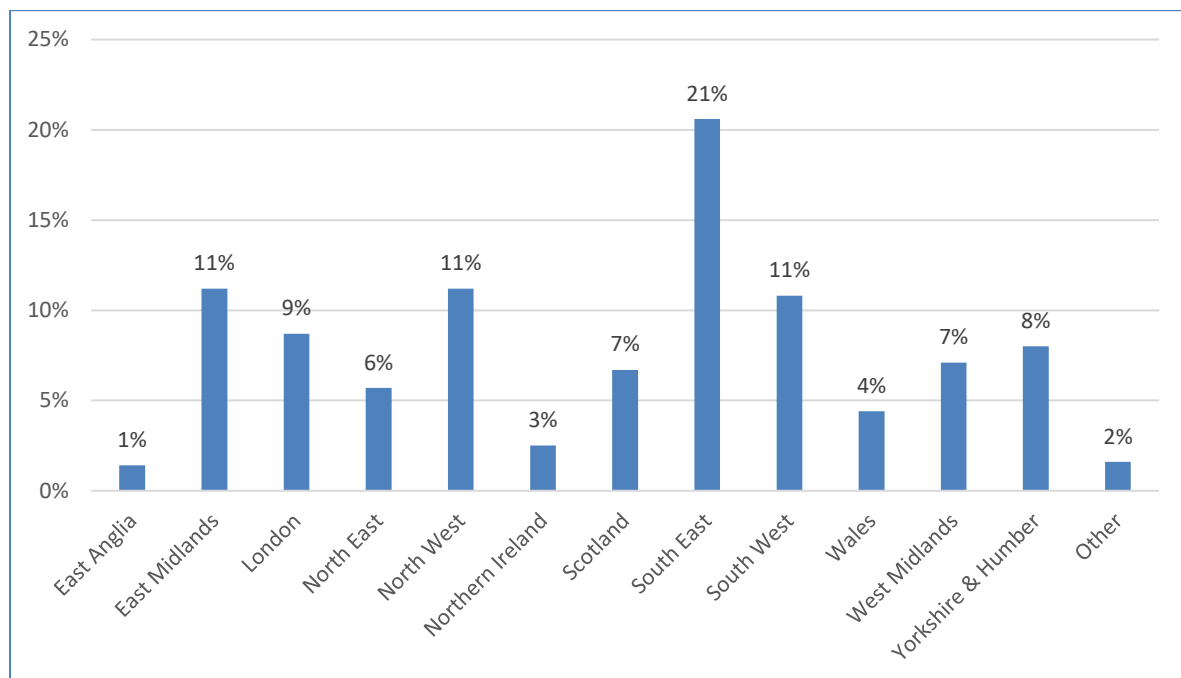
The first phase of the research was delivered through scoping stakeholder interviews, a workshop with TESP partners, and desk-based research. These activities ensured a basis of understanding of the sector to support the definition of the sector and the job roles that were deemed to be within the scope of this research.

The second phase involved surveying the industry. The survey was split into two key strands: quantitative data collection, and qualitative in-depth interviews and took place during late summer and autumn 2018.

This was achieved through the development and piloting of a set of questions (see Appendix 1) that covered the necessary breadth and depth for quantitative and broad qualitative data collection. The survey was designed to facilitate subsequent analysis against the initial objectives. The aim was to define the sector and understand its profile, develop evidence of the sector's workforce, skills and training issues and, critically, understand what impact new technologies might have on the sector in the next decade.

Following piloting, the survey captured the views of 443 unique respondents by nation, region and size of organisation³ as shown in Figure 1 below. Note not every respondent answered every question.

Figure 1 UK Nations and English regions - spread of respondents (rounded)



Base: 436. Pye Tait Survey, 2018.

As part of the survey, respondents were offered the opportunity to contribute their views in more detail through qualitative depth interviews. An extremely positive 63% of respondents were willing to provide their details to take part in later stages of the research. From this total a representative sample of companies from each of the four nations and across the range of company sizes was selected and contacted.

³ Micro (1-9 employees), Small (10-49 employees), Medium (50-250 employees), Large (over 250 employees)

Survey participants were weighted towards the medium and larger companies in order to acquire more information on future technologies. Piloting showed that most micro and small companies are not actively researching or trialling future technologies due to a lack of clarity on the technologies themselves, on costs, and on long term profitability.

The subsequent qualitative data collection was conducted through in-depth telephone interviews with 36 employers. The aim was to delve further into the current and future demands of the sector and whether the skills and training on offer are adequate to meet the growing supply needs.

Another key aspect of this research was to demonstrate whether employers were getting value for money by taking on apprentices. To achieve this, 20 qualitative in-depth telephone interviews were conducted with employers that recruit apprentices to determine an approximate return on investment. This involved a series of questions enabling a cost benefit analysis of apprenticeships to be developed. Desk research findings were added to this to determine whether apprenticeship policy acts as a barrier to apprenticeship uptake or supports it.

The final stage of this research was to analyse the data collected in order to develop a set of findings and draw out conclusions to provide labour market intelligence to TESP and the industry. Towards the end of this report, these are followed by recommendations designed to support future interventions and strategies to ensure that the sector is ready for the future and adaptable to technological change.

2. Electrotechnical Sector Profile

- ❖ Determining the size of the sector is particularly difficult due to evolving technologies and their impact on electrotechnical roles, and to national classification codes that do not necessarily align to the electrotechnical industry⁴.
- ❖ Using the Standard Occupational Classification (SOC) codes, the size of the sector is estimated at c.341,800 employees. Of these, the majority – using the Standard Industrial Classification (SIC) – work in the electrical contracting industry- around 227,000.
- ❖ The sector remains founded in electrical installation, maintenance and repair, with around two-thirds of the sector’s businesses involved in this as their primary function. Almost nine out of ten (85%) businesses deliver these as part of their overall services.
- ❖ The economic climate, impact of Brexit, the energy efficiency agenda, and market demand will strongly dictate the pace of change in the electrotechnical sector. Changes in technology will also influence this but employers believe that not all technologies will be taken up by consumers.
- ❖ The sector will expand its breadth of activities to react to emerging and future technologies, requiring a greater number of skilled electrotechnical professionals. Most organisations say that larger companies are best placed to invest proactively in such technologies.

2.1 The Electrotechnical Sector in the British Economy

The electrotechnical sector underpins the British economy and is in increasingly high demand. Employers within the sector used terms such as ‘buoyant’, ‘staying strong’, ‘positive’, ‘stable’ and ‘optimistic’ when discussing the sector’s economic outlook over the next three to five years. The driving forces behind this outlook include work such as expanded house building, new transport infrastructure, the building of power stations; growth of technology, ‘buzz networks and communications networks’⁵; investment in non-transport infrastructure; renewables; and, electric cars and charging points.

As this report goes to press the UK is coming to the end of its period of membership of the European Union (the current leaving date is March/April 2019). It was not surprising therefore that Brexit is regarded as influencing the challenges that employers see as facing the sector. This topic is most prevalent among the large companies that rely to some extent on trade with, and workforce from,

⁴ Throughout the document the word “sector” refers to the entirety of the activities which use electrotechnically-skilled people. When referring to the major part of the sector which is concerned with electrical contracting, the word “industry” is used.

⁵ Networks used in telecommunications, for example those used to record calls in marketing.

the European Union. These challenges are mirrored across the whole economy and are not unique to the electrotechnical sector.

However, the issue seems to be more focused on the current uncertainty during the negotiations and the potential for short-term disruption immediately following the leaving date than any long-term, underlying concern about business life outside the EU.

The level of uncertainty currently surrounding the UK economy and the ability to trade with Europe following Brexit are the most commonly cited issues among all respondent types.

Larger companies anticipate that accessing European markets and the current reliance on components from those markets are going to require 'a realignment of supply chains'. It is almost certain that, as a result, companies will face additional costs and additional time to adjust to deals available within the European market and in other markets outside the EU. Large companies are also aware that the need to access new suppliers may have an impact on quality for a limited time.

Medium and large companies expect Brexit to see a reduction in the numbers of available foreign nationals from the EU, which might change the 'labour pool' available to them. Small and micro organisations are expecting to benefit from the reduction in EU workers as this it could reduce local competition for acquiring work.

All the above is moot, however, until such time as the exact details of the exit are finalised. Some employers, for example, mentioned that they see a possibility for higher growth based on new commercial links with the USA, Canada and the wider Commonwealth. At the time of writing it seems likely that worker immigration from the EU will remain fairly free for at least a limited period of time and that imports will be either on current EU free-trade rules or on the global rules of the World Trade organisation.

Whilst there was no economic evidence provided, some businesses suggest that the British economy works to an 8-year recession cycle. Economists are not agreed on this but, if such a cycle exists, it would mean a recession is due shortly after Brexit and possibly exacerbated by that process. At the time of writing there is some evidence of a possible slow-down in the global economy reflected in such evidence as lower US growth in 2017, lower stock markets from China and Japan to London and New York, and reduced inflation pressures in the UK.

2.2 Sector and Industry Size

Estimating the size of the sector and the electrotechnical industry depends fundamentally on the definition of the sector. Such estimations are always fraught with difficulty for three reasons. Firstly, because the sector's workforce is constantly changing and evolving (moving into specialist activities for example). Secondly, because the economic and business components of the sector are almost impossible to fully define. And thirdly because the way in which all economic sectors are officially classified and measured through national statistics is increasingly complex.

Rapid technological change is not simply driving the need for new skills and job roles and the obsolescence of others but is shifting the boundaries of what electrotechnical businesses do. These complications are affecting even the most homogeneous area of the sector – the electrical contracting industry. What used to be the fairly straightforward business of “electrical contracting” has morphed in recent decades into one whose boundaries are much less well-defined, one which overlaps more and more with other, once-discrete, sectors like building services engineering, communications, and security.

The result is that precise definitions are extremely difficult because people and businesses work across the boundaries of once-distinct economic activities. In addition, multi-skilling has created jobs whose titles may not contain the words “electrical” or “electrotechnical” even where electrotechnical qualifications are required, and this has rendered the task of identifying appropriate job-roles extremely difficult.

We will return to the matter of sector size and definition below, but it is possible to say that the core of the electrotechnical sector – the electrical or electrotechnical contracting industry – consists of a few large and many small contractors who operate by undertaking jobs/contracts of varying lengths in different settings. Small and micro businesses and sole traders are now understood to represent an even higher proportion of the total than at the time of our previous study in 1999. The work of electrotechnical contractors is varied:

- some, typically larger organisations, operate only in industrial and commercial settings, providing a wide range of services including fire and security systems, data services, facilities management and other projects that involve electrotechnical work.
- most micro-sized organisations typically operate in domestic settings but may also undertake “commercial” work for small businesses.
- many small to medium-sized organisations manage projects in both commercial and domestic settings.

From a skills point of view, however, the sector is much larger than the workforce employed by core electrotechnical companies. Electricians with electrotechnical skills are required by firms operating in many different industries as parts of their overall workforce. They carry out electrical installation, maintenance and other electrotechnical roles across the private and public sectors, working for firms in the construction industry, retail, aerospace, manufacturing, health care trusts, and local authorities, to name but a few. And to add to the complexity, more and more industries require electrotechnical specialists to be multi-skilled. This is particularly true of the renewables market, which is still in its infancy, but which often uses electrotechnical skills alongside such skills as air-conditioning, plumbing, and construction.

All of which means that electrical skills can be found in companies in many activities outwith the electrotechnical contracting industry.

The main focus for this research, and therefore this report, was agreed by the steering group as

being primarily the core electrotechnical contracting industry, which employs the bulk of those who require electrotechnical skills. Electrotechnically-skilled people who work in other settings such as local authorities are also considered from a skills standpoint but their composition and numbers might be enumerated in a separate exercise at another time.

There are several ways of building up a picture of the size of the electrotechnical sector. Each has its strengths and weaknesses:

1. National statistics;
2. Commercial mailing lists;
3. Research reports and surveys from other sources;
4. Certification Bodies/Trade association membership.

National statistics are regularly gathered and are reasonably comprehensive but they use fairly rigid classifications which often do not fit the needs of employment and skills research. Commercial mailing lists are less constrained by rigid categories but can suffer from inaccuracies and misclassifications. The use of other research and reports is extremely valuable but may suffer from being dated or may use incompatible definitions. Finally, the lists maintained by certification bodies and trade associations can be limited by being voluntary and are often restricted in terms of usage by modern privacy systems.

The most important source of data is national statistics. These are gathered on two main bases: industries – using the Standard Industrial Classification (SIC)⁶, and occupations – using the Standard Occupational Classification (SOC). We have detailed below the main datasets as described through the lens of ‘industries’ and ‘occupations’ i.e. those in working in a particular industry and those working in a particular occupation. Further on we present some data that show those working in an occupation within a range of industries.

SIC and SOC codes – monitored and managed by the Office of National Statistics (ONS)

All official statistics are gathered by means of an established set of classifications. These are: the standard industrial classification (SIC), and the occupational equivalent, standard occupational classification (SOC) codes. There are also internationally-agreed comparable codes.

The codes are commonly used for the purposes of economic analysis, national research for calculating trends in employment, gender, age, housing, accommodation and ethnic data to inform policies and investment decisions by Government departments, arm’s length organisations and non-departmental public bodies, research agencies, as just some examples.

The data that are fed into the SIC and SOC codes is sourced from the ten-yearly census of the United Kingdom and then updated with quarterly household Labour Force Survey results. Employment information broken down by occupation can only be produced from the Labour Force Survey (LFS),

⁶<https://www.ons.gov.uk/methodology/classificationsandstandards/ukstandardindustrialclassificationofeconomicactivities/uksic2007>

which is a survey of households, collecting detailed information about industry and occupation from individuals interviewed for the survey. Other surveys such as the Business Register and Employment Study (BRES), formerly the Annual Business Inquiry is the official source of employee and employment estimates by detailed geography and industry.

SIC and SOC major and sub-codes are subject to periodic reviews, with SOC revisions happening more frequently than revisions to SIC codes, to reflect industrial and occupational change. ONS themselves explain this is because of technological developments, innovation, new products, the use of new materials, improved methods of production or delivery of services⁷.

As we have noted in the 2018 survey undertaken for this research, advances in technology have had the effect of polarising the work of the electrotechnical sector between traditional electrical wiring and fitting, and the increasingly important additional operations required for newer applications such as the design and installation of intelligent wi-fi-driven systems (e.g. communications, security, fire, air conditioning, and home services). In terms of job titles/roles, whereas a *maintenance electrician* may well have been the norm in the past, for example, a stakeholder for this research suggested that *maintenance engineer* is now the more usual term; this latter being based on the levels of complexity and skill now required and having implications for SOC codes which work on the basis of being classified into groups according to the concept of 'skill level' and 'skill specialisation'.

The classification codings are by no means perfect measures, therefore, and it may be in time as the electrotechnical sector evolves through embracing advances in technology, the Internet of Things (IoT), digitisation and other disruptive technologies, that TESP chooses to become more actively involved in further revisions of SIC and particularly SOC codes to ensure these reflect their sector and occupations more accurately.

SOC codes (2010) and data available on total employment by occupation

Currently, electricians and electrical workers reside within the SOC 2010 code group:

524 Electrical and Electronic Trades

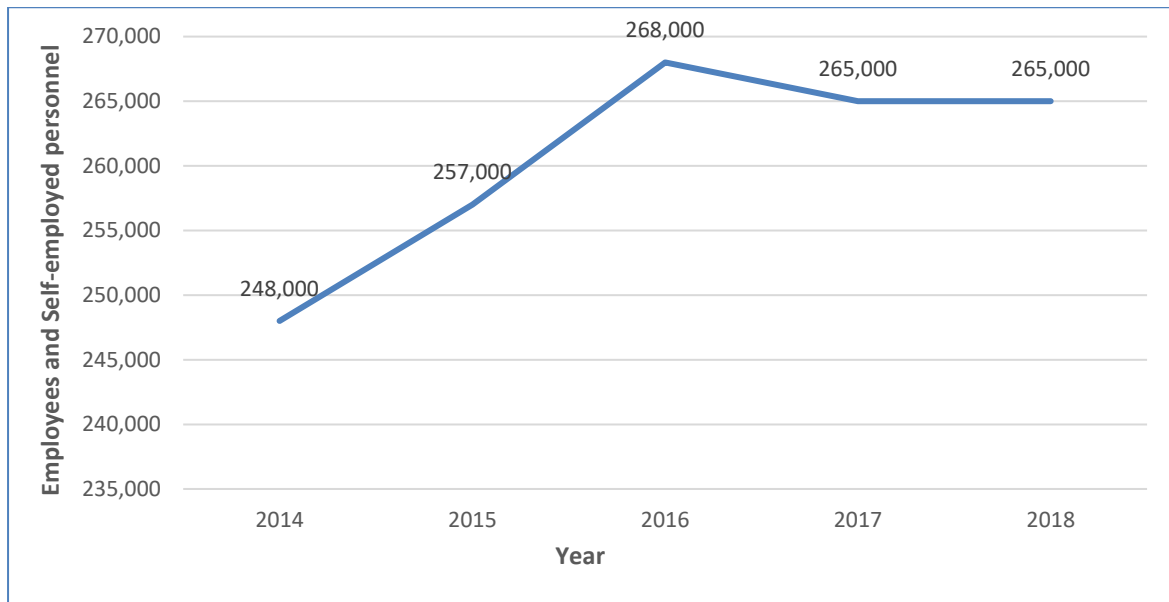
And within this group there lies a sub-group which distinguishes electricians from, for example, Telecommunication engineers and TV, video and audio engineers. The relevant code here is:

5241 Electricians and electrical fitters (also includes 'foremen', testers)

ONS labour force data puts the workforce size for 5241 at 265,000 in (Qtr 2) 2018⁸.

⁷<https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010/soc2010volume1structureanddescriptionsofunitgroups#updating-soc>

⁸ As of January 2019, this volume mean that electricians and electrical fitters were ranked at 22nd of a list of 362 occupations in terms of total employment numbers.

Figure 2 Total workforce in SOC code 5241 electricians and electrical fitters (to nearest 1,000)

Source: ONS employment on SOC code 5241, April-Jun 2018 (accessed in 2019)

Interestingly, the national workforce statistic does not seem to have changed that much in the past twenty years. In 1999 – for the first skills and labour market intelligence study conducted for NET as the National Training Organisation⁹ – SOC 90 code at the three-digit code level (521) to which the 2010 code links back - indicated a total employment for electrotechnical occupations of 267,300.

The equivalent figure ten years ago was recorded as 249,000. Note: the Labour Force Survey is taken quarterly and the figures for this code appear to fluctuate by 10,000 or more during the year, but after 2019 employment figures aligned to SOC codes will be drawn from a different source.^{10 11}.

It is important to note that those coded to 5241 will be people in this occupation at this level regardless of which sector – i.e. they could work in electrical contracting firms or work for a company in another sector entirely.

The figure of 265,000 includes the employed and self-employed (177,000 to 87,000 respectively).

To this figure of 265,000 it is necessary to add a proportion of other occupational codes that are relevant to electrical contracting to attempt to bring together an aggregate figure. Table 1 shows the calculations for this group of SOC codes and the resulting estimated total of “electrotechnical” workers.

⁹ A report on a Skills and Labour Market Survey of the Electrotechnical Industry, NET, 1999, Pye Tait.

¹⁰ <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/employmentbyoccupati onemp04>

¹¹ This figure going forward from 2019 will be sourced from the Business Register and Employment Survey rather than from the Labour Force Survey, breaking continuity of more than 10+ years and, although queried with the ONS, the SOC code figures look smaller as a consequence.

Table 1: Other relevant SOC codes and their total employment (2018)

SOC code 2010	Description	Gross – ALL INDUSTRIES	Possible %	Electro-technical employment
1122	Owner/Manager in construction (<i>includes electrical contracting</i>)	208,000	10	20,800
1259	Managers and other proprietors not elsewhere classified (n.e.c) <i>includes owner/managers of security installations</i>	204,000	5	10,200
2123	Electrical engineers (engineering and includes professional)	49,000	5	2,450
3112	Electronic and Electrical technicians	31,000	50	15,500
5249	Electrical and Electronic trades n.e.c (<i>includes fitter of alarms</i>)	91,000	25	22,750
5250	Skilled metal, electrical and electronic trades supervisors (includes engineers of installations in a range of industries <i>including electrical contracting</i>)	34,000	15	5,100
	Totals	617,000		76,800

The combined employment estimate for electricians and electrical fitters plus electro-technically skilled people from other – related – SOC codes (totalling est.76,800) is **341,800**. The equivalent table calculated in 1999 suggested a workforce with a level of electrotechnical skills of 350,000.

The SOC figures above exclude those in the sector in administrative roles or other business functions in support of those with electrotechnical skills.

SIC codes (2007) and data available on the industry

The industry SIC code and its associated employment figures is always worth reviewing because it provides a vertical sense of all those who work in a particular industry at all levels, as opposed to the horizontal look at those with certain skills (via SOC). The particular challenge with *the industrial classification* (SIC) which causes frustration for many industries is what is often seen as the unsatisfactory allocation of industries to codes. Since its introduction in 1948 the classification system has been reviewed 6 times with no apparent notification of the next iteration beyond the current of 2007. For the electrotechnical sector the most frustrating aspect of it is that it has always been included within the construction grouping, albeit as a specialised activity.

As SIC codes are self-assigned by companies when they register (companies can select one or more

and give any code as their main business) the system can miss numbers of companies which classify themselves outside the construction group.

The nearest code with relevance to the electrotechnical industry is:

Group	Class
43 Specialised construction activities	43.21 Electrical Installation

The more granular code – at the five-digit level (43210) - clarifies a large range of activities within the industry from aerial erection (domestic), connecting of electric appliances and household equipment, to installing security alarms, local authority street lighting and sign (electric) erection and maintenance.

The latest SIC code data at the five-digit level for 43210 (ONS/NOMIS¹²) show that there were 197,000 employees in 2018 in the UK but 206,000 including working proprietors. Added to this are those who work in the industry of repair of lighting/motors, etc. (21,000) which brings the total to 227,000.

NOMIS state there are 45,400 businesses in the electrical installation industry.

As a further check on industry employees, the most recent version of the Construction Skills Network (issued by CITB and Experian) on employment and growth figures in construction looks forward four years to 2023 from 2019¹³. It notes 2019 as having 188,760 employees working in electrical trades and installation in the construction industry, a small increase on their predicted employment figure for 2018.

The national industry figures have changed somewhat in the past twenty years. Looking back to that early skills and labour market intelligence study conducted for NET as the National Training Organisation in 1999, the Annual Employment Survey (a predecessor for the current Business Register and Employment Study) indicated total employment for the electrical installation industry was 116,700. That figure covered only those in employment and excluded the self-employed and proprietors of small businesses who do not draw a salary (via PAYE). At that time a figure for the industry of repair and maintenance of electrical lighting, electric motors (armatures and electric motors etc) was added.

Commercial Mailing Lists

Where these once proved useful to ascertain a good idea of numbers in industries or occupations, nowadays there are so many means by which businesses and individuals can choose not to have their phone number, contact details, or financial details registered, these mailing lists have become a

¹² A service from the ONS on labour market statistics. 2018

¹³ Construction Skills Network, 2019-2023, Experian-CITB

very clear underestimate source.

The national databases such as FAME or MINT that are run on the basis of regular updating and are linked to other sources, such as Companies House, are more reliable sources but also rely on SIC codes to classify businesses. MINT currently holds 47,000 businesses registered to SIC code 43210 – (the specialised activity sub-set of Construction).

Other research reports/surveys

Other data that potentially provide some further indications of the sector size include the Construction Industry Training Board (CITB) 2016 report on employment in the construction industry¹⁴. In grossing up the figures from a survey conducted in 2015, they estimated some 140,700 electrotechnical workers *within construction*, including employees, self-employed and trainee staff.

Other reports include the one mentioned earlier which was the first skills and labour market intelligence study conducted for NET as the National Training Organisation. Figures reported in that report were calculated with great difficulty in the same way as those for the current study. They are referenced in the relevant places in this section. SummitSkills¹⁵ reports will have utilised data from national surveys such as the National Employer Surveys and would have generally reported findings for a combination of electrotechnical, plumbing, heating and others within the mechanical and electrical sectors. Consequently, these have not been useful against the needs of the current work.

Certification Bodies/Trade association membership

The Electrotechnical Certification Scheme (ECS)¹⁶ has 160,926 valid cards in circulation which may suggest a penetration of around 80% of those working in electrical installation companies or 47% of electrotechnical operatives working in all sectors.

Statistics from certification bodies or trade associations present a number of problems:

1. They are incomplete in coverage terms;
2. Membership statistics across trade associations may involve duplication to an unknown extent;
3. Some of the databases may be dated and difficult to combine figures for different years.

The 1999 broad estimate of 350,000¹⁷ in the overall electrical contracting industry is close to the estimate in this report of 341,800 in the 2018 electro-technical sector. It would seem likely that considerable contraction in traditional industries such as steel, coal and other fossil-fuel energy plus continued contraction in manufacturing has been replaced by employment in newer areas of the

¹⁴ https://www.citb.co.uk/documents/research/employment_in_construction_industry_2016_final_report.pdf

¹⁵ The former Sector Skills Council which closed down in 2015.

¹⁶ ECS is owned by JIB/SJIB which accredit qualifications and experience of workers in this sector. The card is taken up by individuals.

¹⁷ “The contracting industry directly employs around 190,000 people and an estimated 160,000 more work in closely associated fields”. NET Labour Market Assessment, 1998-99; Pye Tait Consulting

sector including renewables, building services, digital installations, and even the provision and support of electric car charging facilities.

To summarise, 2018 official statistics provide differing estimates but for different populations and categories.

1. SOC tells us that there are 265,000 electricians and electrical fitters. Added to this total we have included an estimated proportion (Table 1) of those with electro-technical skills who may operate at different skill levels to electricians and electrical fitters e.g. owners, managers, supervisors, technicians and electrical engineers. Taking into account estimated proportions, the overall total of all electro-technically skilled employees is **341,800**. It must be recognised, however, that relatively small adjustments in the estimates in Table 1 – especially of owners and managers – could add 20,000 to 30,000 to this total either way.
2. SIC figures indicate a total employment in “electrical installation and some associated businesses” of around **227,000** but this total excludes numbers of electro-technically-skilled people working in other major sectors (e.g. manufacturing or healthcare) as indicated by the SOC codes.

The electro-technical sector in 2018, therefore comprises a core “contracting” element of some 227,000 electro-technical-skilled workers, to which must be added around 115,000 people who possess electro-technical skills but work outside the core contracting industry.

This equates to a total workforce with electro-technical skills of around 342,000.

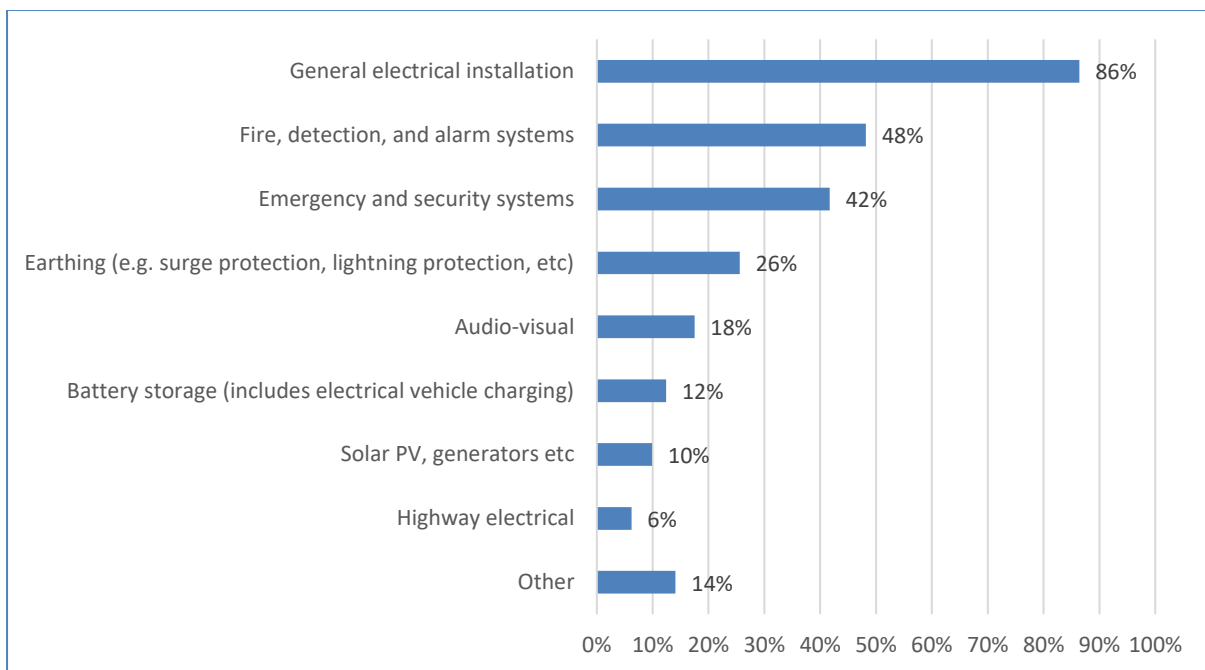
<p>Occupations (equates to “sector”) – skilled electricians and related semi-skilled individuals working across all industries not just electrical contracting.</p> <p>Employment est. 341,800 Includes: electricians, electrical foremen/testers + a proportion of supervisors, owner/managers, technicians etc who work in electrotechnical trades including security.</p>	<p>Industry (classed as a subset of electrical contracting within Construction)</p> <p>(excludes electrotechnical workers operating in other sectors)</p> <p>227,000 employment</p>
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2.3 Defining electrotechnical work

Over four-fifths of electrotechnical companies describe their work as general installation. This proportion is lower where large companies (those with over 250 employees) are concerned. These are more likely to also offer other types of activity including, for example, solar PV and emergency and security systems.

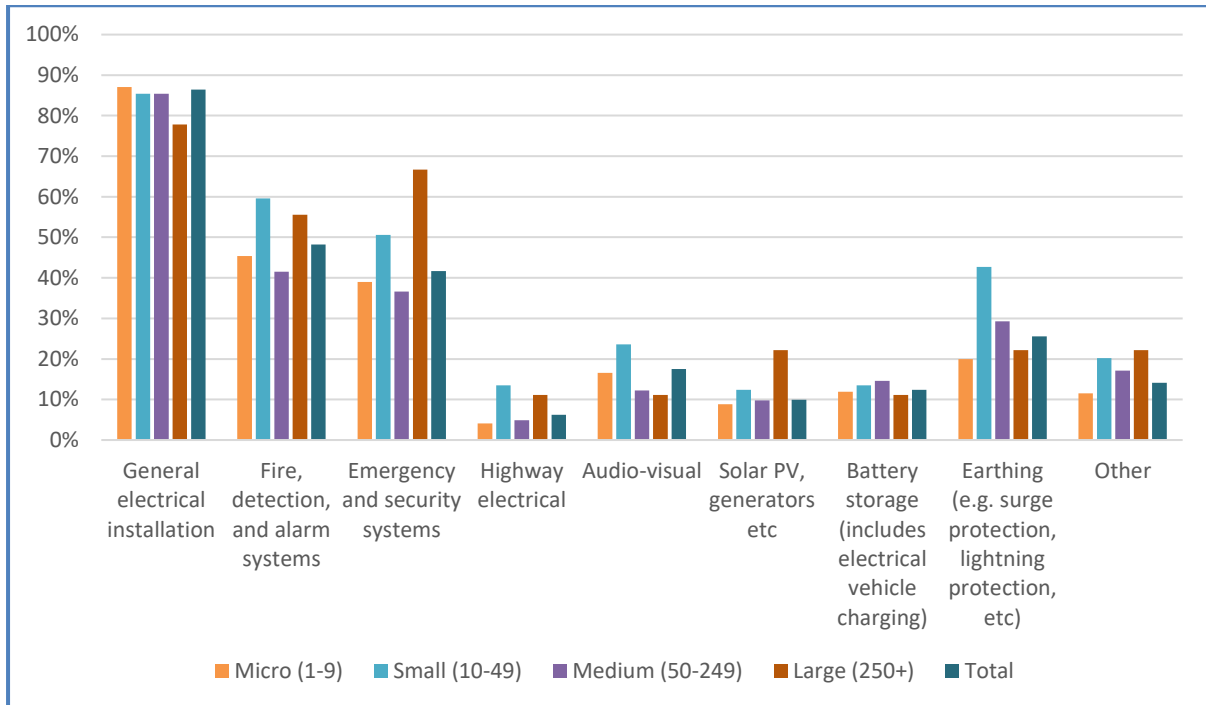
Since the last dedicated surveys into electro-technical work the major changes have been around new technologies such as solar PV, wind power, battery storage, audio-visual services, and wi-fi alarm systems, most of which have emerged only over the last ten years.

Figure 3 The activities of the electrotechnical sector



Base: 434. Pye Tait Survey, 2018, multiple selections were permitted in the response

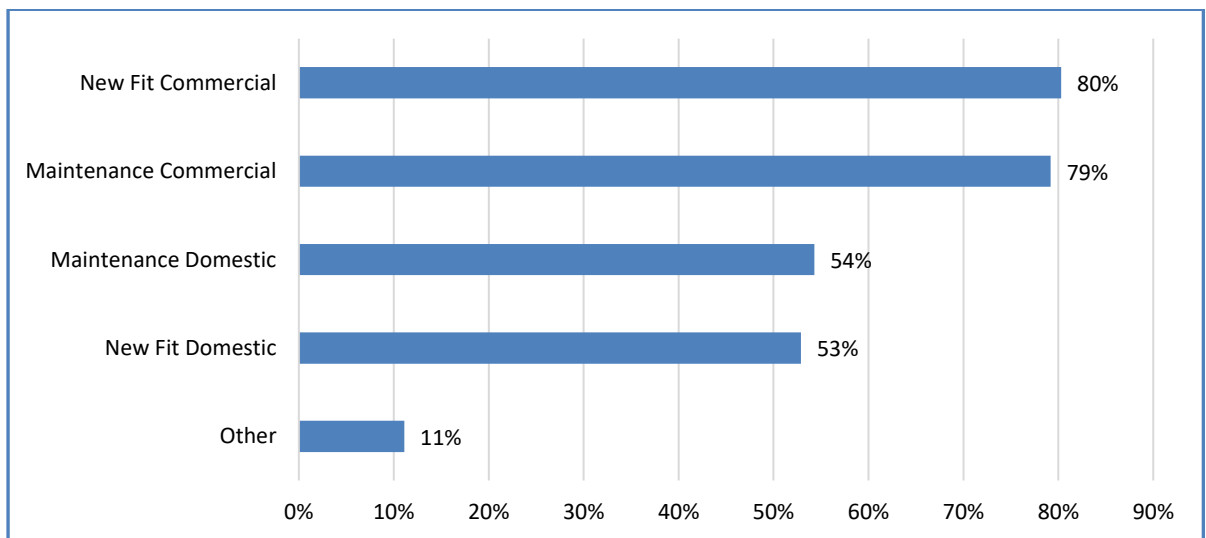
Figure 4 Activities by size of company



Base: 434. Pye Tait Survey, 2018; multiple selections were permitted in the response

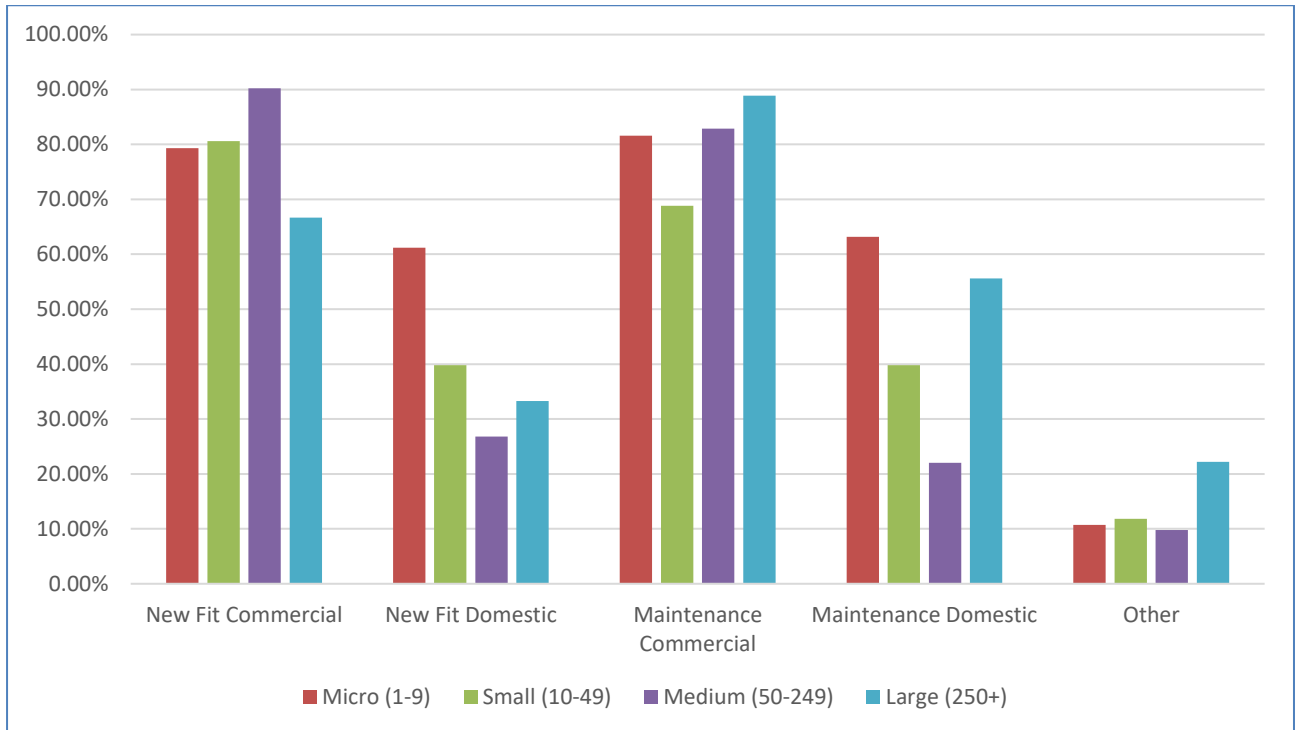
Around 80 percent of respondents work in commercial new fit and/or maintenance, and a half in domestic new-fit and/or maintenance.

Figure 5 Commercial/Domestic Work



Base: 442. Pye Tait Survey, 2018; multiple selections were permitted in the response

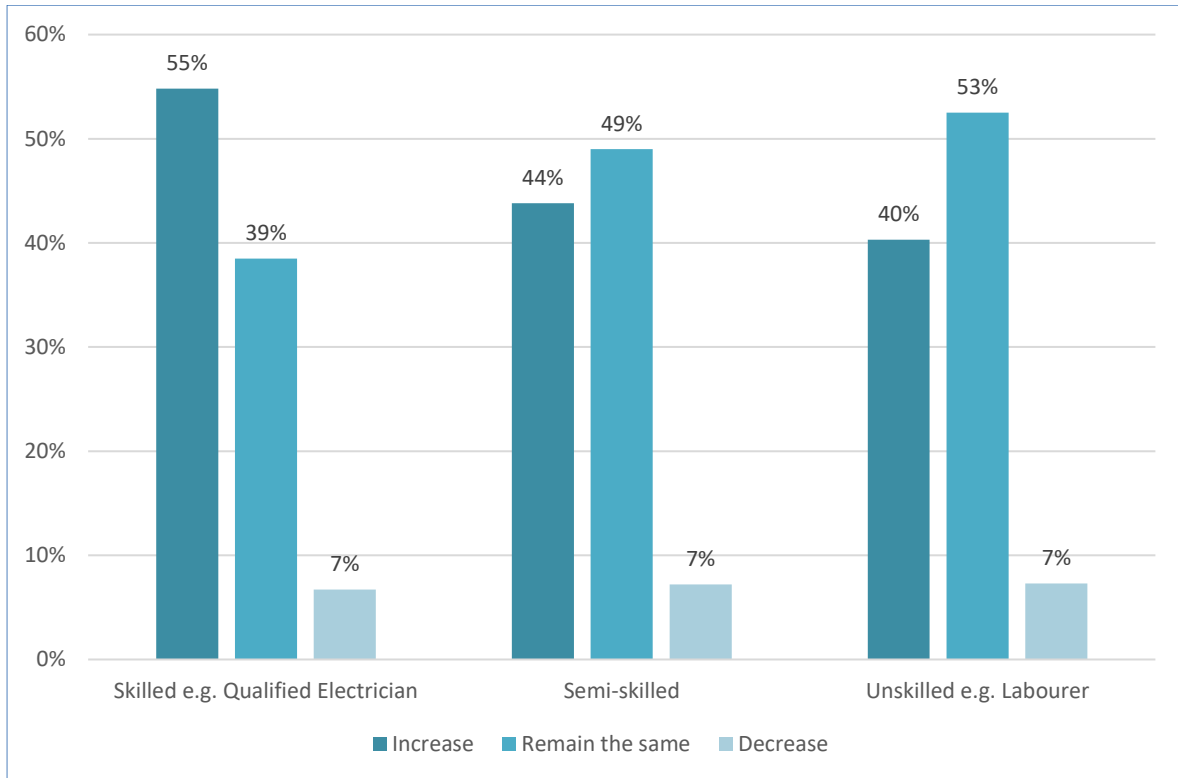
Figure 6 Commercial/Domestic Work by size of company



Base: 442. Pye Tait Survey, 2018; multiple selections were permitted in the response

2.4 Future profile of the sector

The majority of respondents to the survey expect an increased demand for electro-technical capabilities which will drive the demand for skilled electricians. The overall picture is for an increase in demand for skilled electro-technicians and a relative reduction in the need for unskilled and semi-skilled operatives (Figure 7).

Figure 7 Workforce demand over the next three years

Base: 436. Pye Tait Survey, 2018.

Large companies anticipate a greater demand for project and risk management roles. This is likely to reflect the increase in work and funding to support electrotechnical infrastructure and technological demands across the globe and the need to manage the complexities of electrotechnical projects.

Employers expect the core of installation, maintenance and repair to remain unchanged in the future. Data centres and automation are seen as drivers for change along with green energy and the new products coming into the market as a result. They see “high end” and residential projects being impacted by ‘massive advancements in controls’ with an increase in wireless applications that will need technological support from electro-technicians.

Solar power, associated battery systems, and electric charging and the infrastructure to deal with it are also expected to increase the profile of the sector and expand the range of skills and knowledge required by employees. Several employers foresee a need for the industry to ‘*gear up for introduction of the electric car, right back to ground level, from actual grids to systems*’. There is some concern that the UK currently lacks the capacity to cope with the volume of demand which will emerge from these new technologies.

Some large companies are looking further ahead to the possible introduction of superconductivity-based systems. While some processes already work with such technology (e.g. MRI scanners)

employers expect it to begin to influence train technology, using magnetic levitation, and also to enhance a number of other areas including aerospace.

Superconducting generators, more efficient and lighter than conventional ones – are under development and there is some evidence that the first such generator for a wind-turbine will be installed in 2020. So-called High Temperature Superconducting (HTS) motors and transformers are in prototype form offering energy savings (for a 1,000HP motor) of around 50%.

Superconducting circuits will also be required for the introduction of quantum computers. These are as yet in the prototype stage but are expected to enter mainstream service with research bodies and universities, and with larger companies within the next five years.

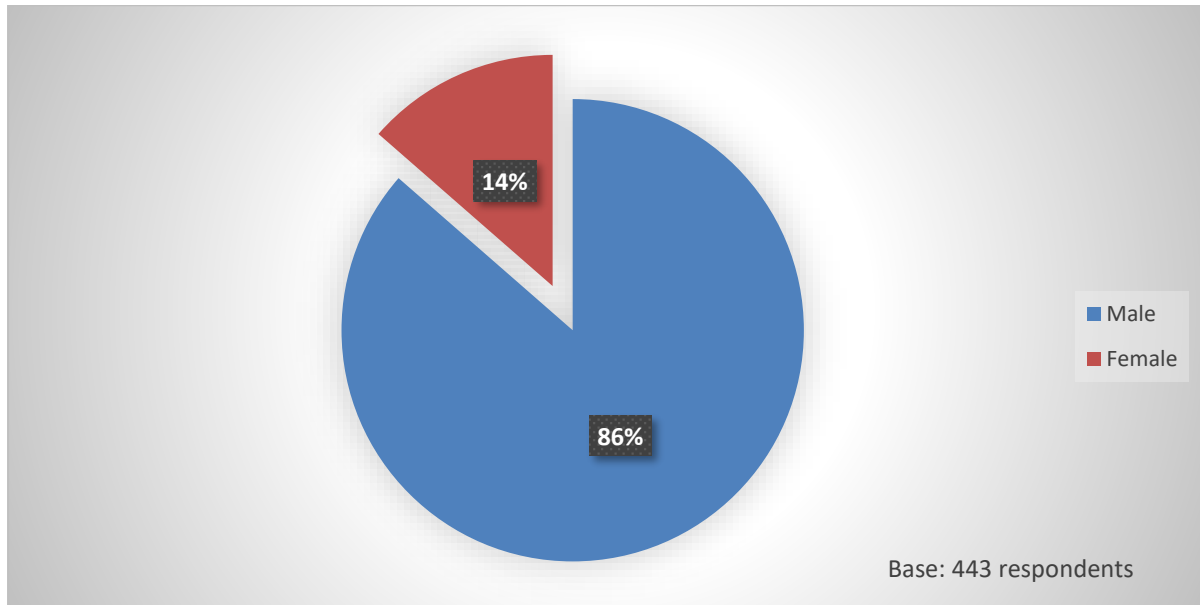
3. The Electrotechnical Workforce

- ❖ The electrotechnical workforce is dominated by male UK citizens between the age of 25-49.
- ❖ Some employers are concerned by what they see as the “ageing workforce”, with more workers over 50 than 25 and below. Scotland is the exception to this among the four UK nations.
- ❖ Employee reasons for leaving employment are most commonly redundancy and a new job (within the sector), both averaging 2.7 per company. For apprentices the main reason is higher-paid employment.
- ❖ In the next 3 years, employment demand is expected to either remain the same or increase, with the highest increase in demand being for skilled workers such as qualified electricians (which were also cited as the most difficult position to fill).
- ❖ Large companies also expect an increasing need for project management positions.
- ❖ The quality of potential employees is a key barrier to recruitment. Poor attitudes and behaviours are seen as the biggest barrier to recruitment of apprentices.

3.1 Workforce demographics

The workforce of the electrotechnical sector is around 86% male. This includes administrative and office-based workers so, when considering on-site staff only, the proportion of male employees rises. Employers believe this proportion is unlikely to change in the foreseeable future.

This view is supported by some organisations citing potential barriers to females joining the industry, including capability where heavy lifting is involved, the attitudes and behaviours of the existing male workforce, and a lack of uptake in apprenticeship amongst females.

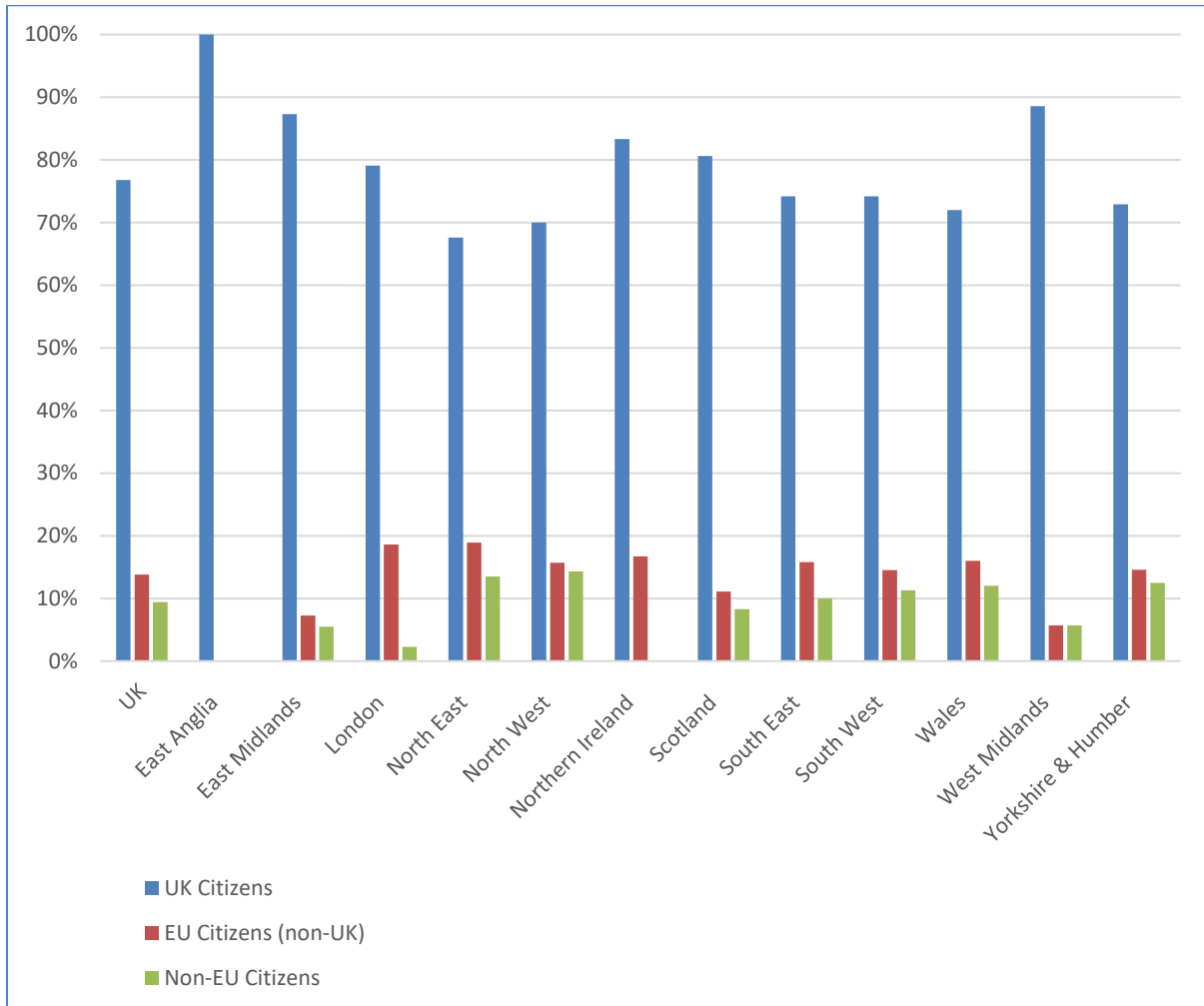
Figure 8 Proportion of Employees by Gender

Base: 434. Pye Tait Survey, 2018.

Few respondents were prepared to divulge data on the ethnic make-up of their workforces, but in-depth interviews revealed that for some the relatively low proportions of other ethnic groups is not intentional but due to the fact that they *'don't see applications from diverse candidates'*. Others suggest that this is not so much of an issue with it as they see it being reflective of population diversity, i.e. more ethnic minorities are to be expected in London than the Northeast of England. When considering non-UK nationals, employers argue that poor spoken English and a lack of skills are barriers to employment, specifically within skilled electrician positions.

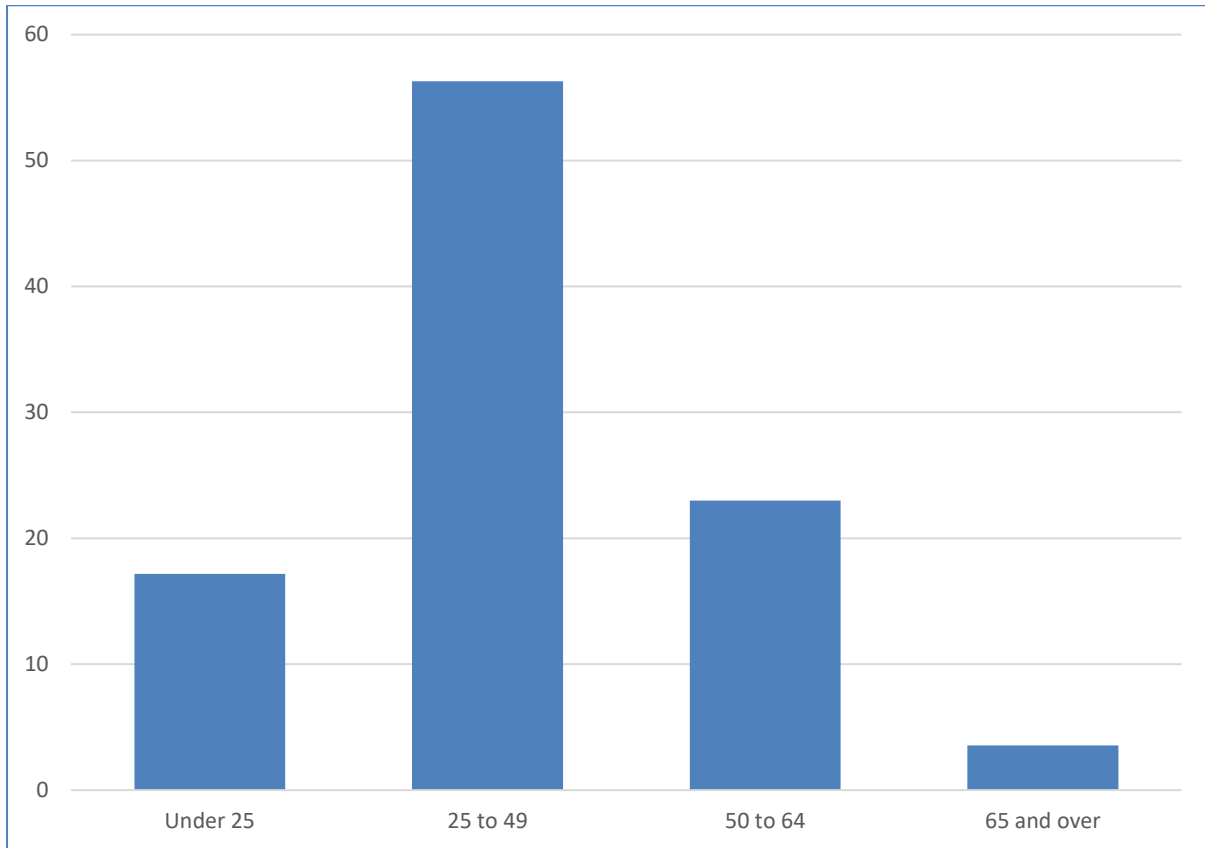
Several regions of the UK appear to draw between 15% and 20% of their workforces from the EU – with London, the North East and Northern Ireland among the highest. It should be remembered however that a proportion of the “EU-sourced” UK workforce is from Eire which has had a Common Travel Arrangement with the UK since the 1920s. The post-Brexit rights of Irish citizens to live and work in the UK (and vice versa) were also confirmed in a joint UK-Eire statement in January 2019. Therefore, citizens of Eire, in spite of the fact that official statistics combine them into the EU category, should not be counted in any consideration of the impact of a possible hard-Brexit on employment in the UK. The proportion of Eire-born in the general London workforce is about 5% (2018 Labour Force Survey) and between 10% and 15% in Northern Ireland.

Figure 9 Employees' Citizenship by Region



Base: 437. Pye Tait Survey, 2018.

Many employers regard the “ageing workforce” as a current problem and one that is likely to get worse in the future. However, the vast majority of the UK workforce is between 25-49 years old.

Figure 10 Surveyed employers' employees by Age (%)

Base: 443. Pye Tait Survey, 2018.

A high proportion of respondents shared the view that the cause of the “ageing” issue is historic and has arisen because of a lack of investment in training. Many are trying, albeit from employer perspectives, to bring through a quality next generation to their workforce. There are strong views across the sector that apprenticeships are still the best option available to provide new talent and ensure succession plans within the industry’s businesses. Some think that younger workers are crucial to adapting to new technologies with older workers being regarded as more resistant to change and technological developments.

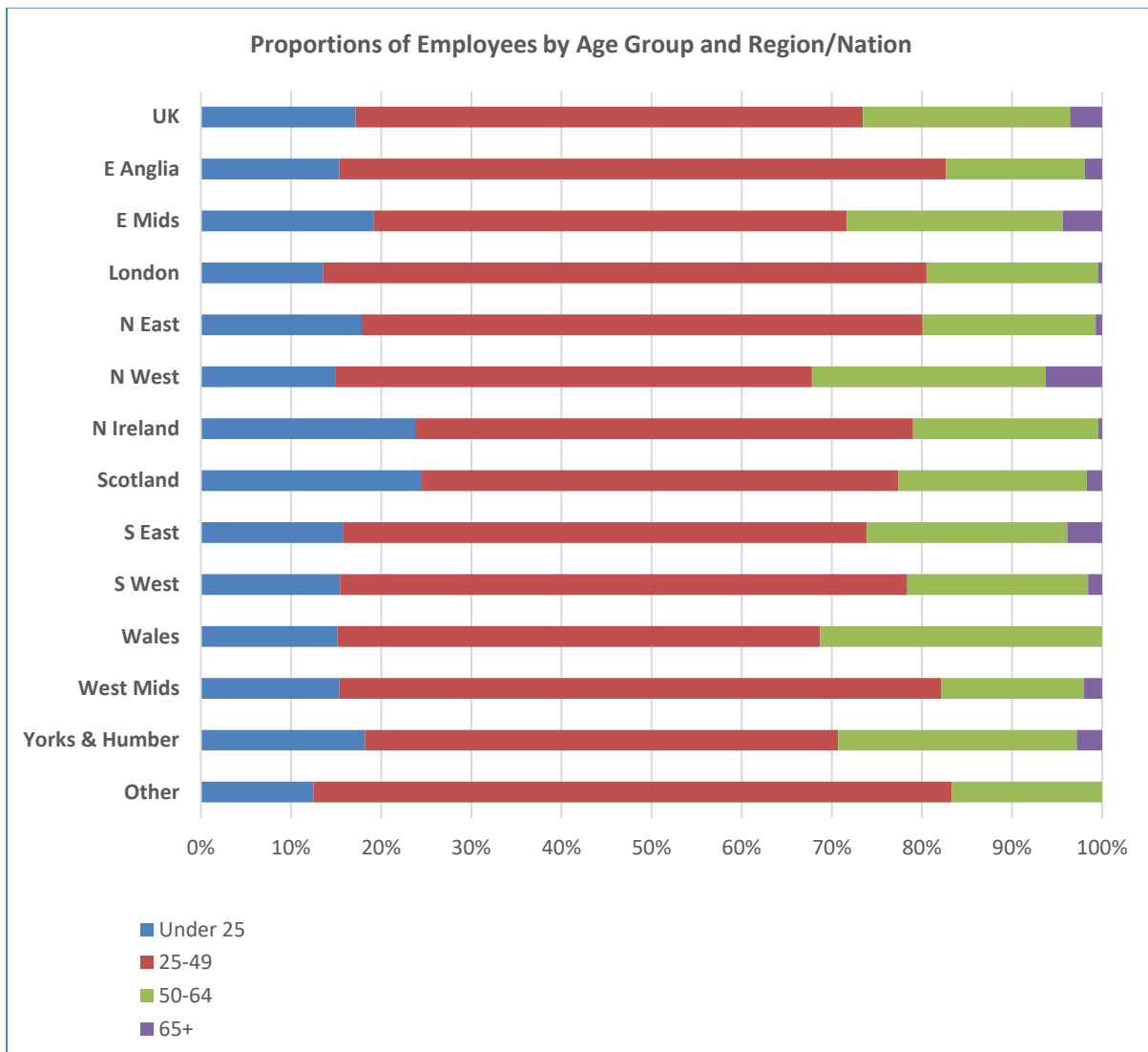
“Our workforce is quite young, average age 32, but it’s a small workforce, we’re less susceptible to aging because of our projects. We’ve been investing in apprenticeships for the last 10 years. You do find that site guys are in their early 50s and are therefore very experienced”.

**Small electrical contracting firm, Southern England
(Stakeholder Interview)**

Micro and small companies suggest that they are less likely to feel an impact from an ageing workforce. A number claim to have a youthful workforce. In terms of geographic statistics, Scotland

and Northern Ireland appear to be better placed than other UK regions in terms of ensuring against an ageing workforce. England and Wales have around 15% of their workforce under the age of 25 compared to an average of about 24% for Scotland and Northern Ireland (see Figure 11).

Figure 11 Employees by Age and Geography



Base: 443. Pye Tait Survey, 2018.

3.2 Workforce supply and demand

The electrotechnical workforce is expected to grow in line with expanding infrastructure spending and house building as well as technical advances.

The wide consensus among respondents to the survey (from qualitative input) is that the sector is not well placed to meet a rising demand for skilled electricians (and related professionals). Concerns

centre around a lack of diversity in the sector, a lack of effort to promote the sector to young people, and a lack of investment in the training of apprentices. The perceived lack of quality of potential apprentices was a common issue for employers.

Some respondents suggest that large companies¹⁸ take on higher numbers of apprentices and are, therefore, better placed to meet rising demand.

Generally speaking, employers believe that taking on apprentices is important to business success, expansion, remaining current with, or reactive to, emerging technologies, and ensuring career succession.

Those who are more positive about supply and demand issue tend to focus on their own success rather than the sector as a whole, this was most common among micro and small companies. Investment in highly qualified and experienced staff, they feel, leads to a more 'technical company' which is better placed to advance and develop the inexperienced part of the workforce.

"For us personally, we're quite a technical company, so we are well-placed [to meet the rising demand in the electrotechnical sector], we've got a very qualified guy at the top, then an equally capable guy beneath him. We're looking for that ability to be more than just a basic installer. We look for an ability to design and be more technical."

Micro organisation in Northeast England

Additional issues believed to impact supply and demand were cited as: career changes, Stormont not sitting¹⁹, the unknown potential impacts of Brexit, a lack of large training businesses, and changing expectations and outlooks of workers.

3.3 Workforce mobility

The mobility of the workforce is seen by most as very important and is not felt to be an issue by any of the respondents, with a number stating, *'that's part of the job'*. One respondent said that their workforce was perhaps *'less mobile than they once were'* but put that down to their stage in life rather than a reflection of the electrotechnical sector.

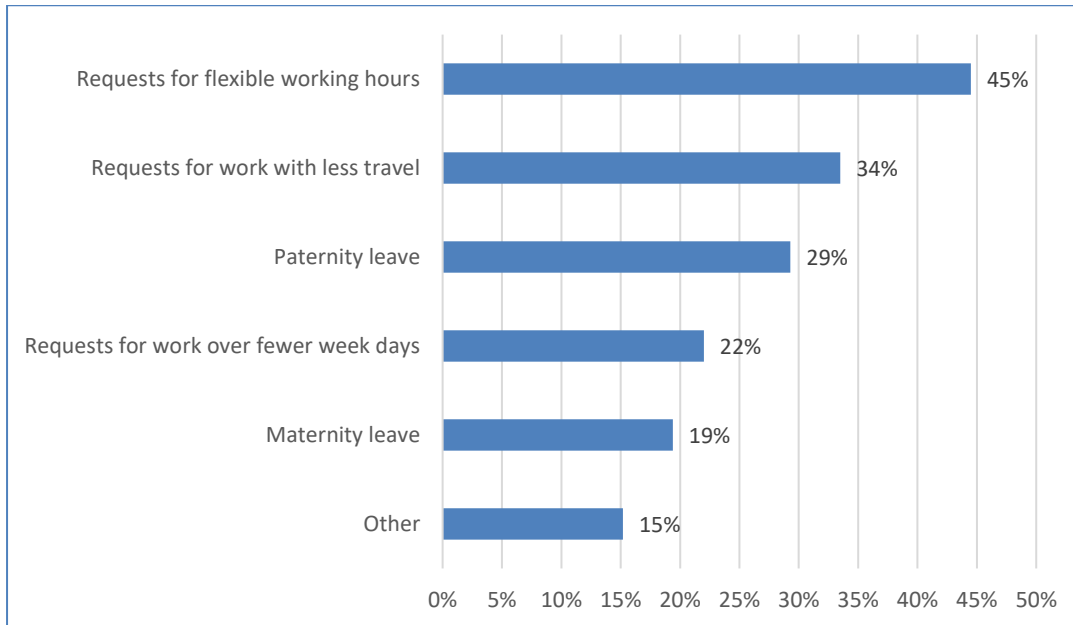
"Most of our work is within a 50-mile radius."

Micro organisation in the South East of England

Reduced mobility is matched by the perception that the next generation of workers are seeking a better work-life balance (see Figure 12).

¹⁸ Those with over 250 employees.

¹⁹ Northern Ireland has been without a government for over two years because of disagreement between the DUP and Sinn Fein. The devolved executive and assembly are normally required for decision making in Northern Ireland. One of the biggest sticking points to the disagreement is the demand by Sinn Fein for legislation to give official status to Gaelic in Northern Ireland.

Figure 12 Future Employee Lifestyle Expectations

Base: 151. Pye Tait Survey, multiple selections were permitted in the response, 2018.

3.4 Transferability of Skills

Within the electrotechnical sector

Transferability was something a number of respondents have experience of and their comments were generally positive: *'we have seen this swap from commercial to domestic and vice versa'* and *'it's a similar skill set for commercial and domestic'*.

A few comments suggest that the more specialist areas of 'solar' and 'high voltage' may be less transferable and one commented that their workforce, whilst suited to industrial work, would not have the 'softer skills required for domestic'.

Transferability into the electrotechnical sector

With greater demand for skilled operatives and high pressure on the employment market, the issue of recruiting skilled people from other sectors is becoming very important. Respondents provided some anecdotal evidence of the effective transfer of skills from other sectors:

'we've recruited from the armed forces and they have strong transferable skills';

'[Our] only experience is telecoms - much of the technical stuff is similar plus health and safety is the same; and

'we've recruited from people working in data networks, they have a very similar technical skill set and appropriate mindset for picking up new skills'.

An area that may merit future research is the mapping of skilled technical roles within and without the electrotechnical sector that are becoming increasingly automated or otherwise obsolescent. This could include looking into the impact of trends such as modern methods of construction, for example. This would include the increasing impact on electrical work in off site production. Reports such as from HSE²⁰ in 2015 and for CITB²¹ in 2017 set out, via case studies or personas, the benefits and implications of off-site production on time, skills and job roles.

These roles will result in some level of redeployment and hence the availability of a potential workforce which could be specifically targeted.

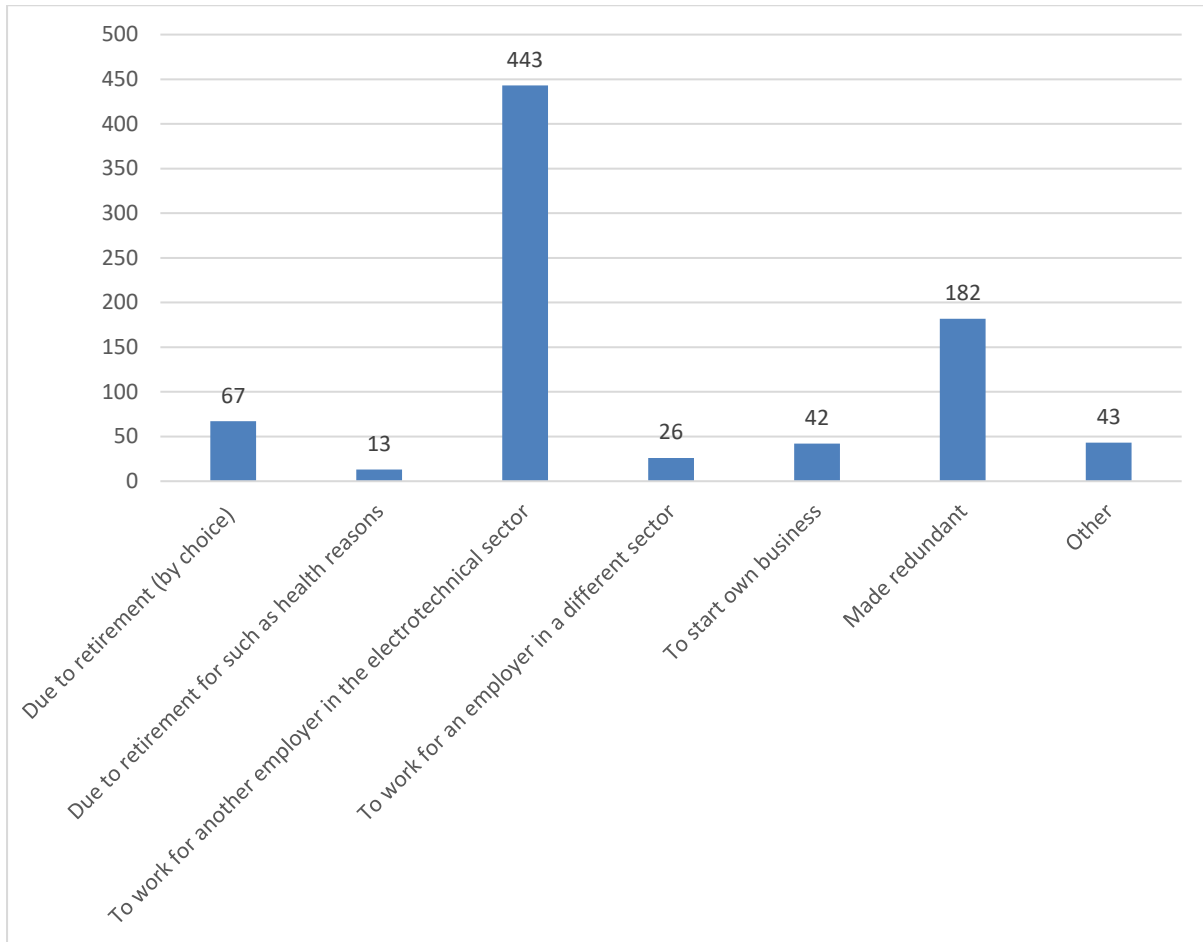
3.5 Reasons for leaving

Experienced workers tend to leave employers due to redundancy, moving to a new role within the sector, or retirement. Other reasons include emigration and death. A total of 113 employees have left the 167 companies that provided data, suggesting 2 employees for every three organisations need replacing annually to ensure workforce sustainability.

For apprentices the most common reason for leaving is pay – either for better paid employment outside the sector or to an electrotechnical employer willing to pay more.

²⁰ HSE, Off-Site Construction in the UK Building Industry- A Brief Overview, 2015

²¹ CITB, Research to establish the nature and extent of industry demand for offsite construction-related skills and training, Pye Tait Consulting 2017

Figure 13 Reasons for Leaving (Numbers)

Base: 167. Pye Tait Survey, 2018. multiple selections were permitted for this question

3.6 Barriers to recruitment

Respondents were asked to consider recruitment and what issues they experienced. The most commonly-mentioned issue was what employers see as a lack of skill or deficiencies in attitudes and behaviours.

Numerous comments focused on young people and apprentices. Many believe that they tend to be 'work-shy' and that they lack both motivation and practical experience. One respondent made an important point that experience, in the past, was almost taken for granted and which would have given young people at least a small start in understanding the job.

The respondent pointed out that it was rare, nowadays, to find someone who had '*experience of tinkering with cars or who'd helped their dad with DIY*'. Other respondents – while not making that precise point, said that experience at school and in the home provided the '*hands on dexterity and skills*' needed. Another bemoaned that fact that schools do not provide young people with the

experience of electricity, of transformers and condensers, etc in their physics lessons. Some believe that this perceived lack of practical electrics and electrical theory may be as a result of the pupils being encouraged to pursue computing.

With respect to gender, one respondent raised concerns over the physically demanding side to the role and another focused on the attitudes of other employees. Workforce attitudes towards females were pointed out by many employers as a barrier to expanding diversity. The work being done to promote the industry to women by, for example, NICEIC was mentioned as a positive step, however, most stated that promotion of the industry generally needs improvement and that this should be targeted at secondary school leavers.

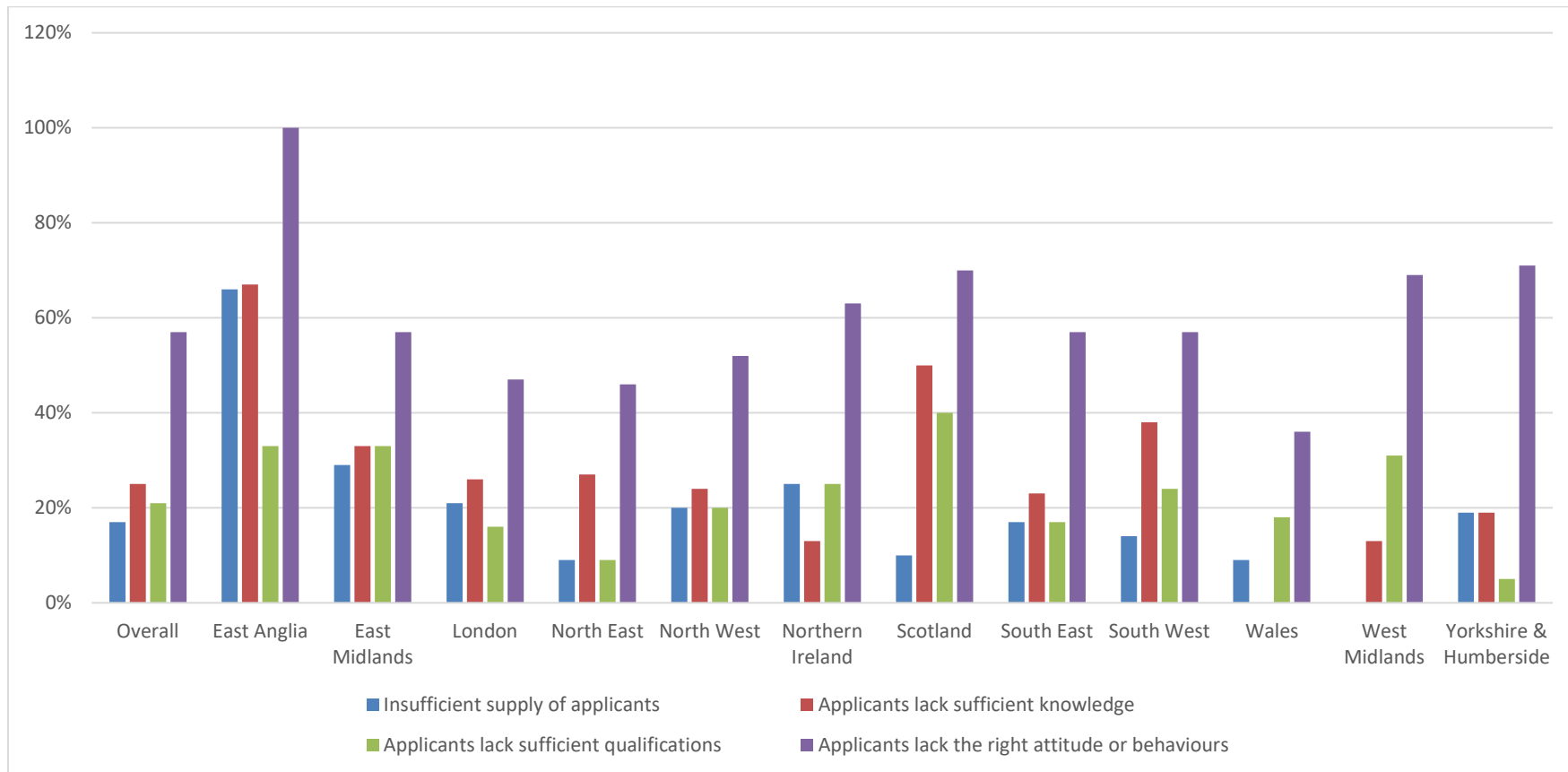
Other barriers cited by employers included the short-term nature of specific contracts, the salary, or competition from other sectors. One respondent from the Northeast of England said

'the close proximity of the North Sea and opportunities for high earnings offshore takes people away from us as soon as they qualify'.

Age restrictions and mobility are also barriers to recruitment. Health and safety rules for those below the age of 18 mean that it *'can be more hassle than it is worth'* to get them into the industry. It is also unlikely that new recruits will have access to their own transport to increase mobility. Some employers were critical of what they see as the *'excessive health and safety laws'*. One of them wondered whether any cost-benefit analyses had been done to justify them.

The majority of respondents could not identify any particular roles which they found hard to recruit, although the skilled electrician role was slightly higher than others. Individual responses recounted difficulty in recruiting: engineers; electrical engineers; supervisors; experienced inspection and testing staff; and, electricians prepared to work in a dirty environment.

Figure 14 Barriers to Recruitment by Region/Nation



Base: 213. Pye Tait Survey, 2018. Note that figures for East Anglia are for low numbers of respondents from that region.

3.7 Recruitment and retention strategy

With the majority of respondents suggesting that the sector is ill-placed to meet growing demand and the additional pressures of relative under-representation of certain groups (age, gender or ethnicity) there would appear to be a pressing need to overcome these obstacles to recruitment.

The vast majority of employers agree that encouraging the next generation of the workforce is important and that it needs to take place early i.e. at secondary/high school levels. The image of the sector is widely reportedly as unappealing (a comment that has not changed in the past twenty years). Several employers called for more to be done by the industry itself to provide clear career pathways which embrace the newer aspects of the industry and which can be easily conveyed to parents, teachers and pupils.

When considering apprenticeship recruitment and retention a common theme voiced by employers is that schools are, in their opinion, pushing students down the academic route rather than apprenticeships, which is perceived as having reduced the quality of candidates being presented for recruitment into the sector.

On average, some 10% of apprentices drop out after the first year of the apprenticeship, this reduces over the three subsequent years, but some respondents pointed out that reducing this drop-out rate could effectively retain thousands of jobs and avoid recruitment costs to replace them.

3.8 Workforce Projection

The size of the electrotechnical sector workforce is 341,800 and is expected to increase over the next 5 years. The main drivers of this expansion will be further technological development and anticipated economic growth. It may be that a short period of economic stagnation or decline will be experienced as a result of Brexit²². Economic growth in real GDP terms for the UK is expected to remain between 1.3% and 1.6% in the next 5 years^{23 24 25 26}, with some suggestions it could reach 1.7% by 2023. PwC's own forecasts predict an average annual growth rate of 1.75% during the 2020s. These figures should be taken in the context of a possible drag on UK growth caused by Brexit uncertainty, a slowdown in the global economy (both China and the Euro-zone are already experiencing such a dip), and economists' steady-state growth target of 2% for the UK economy (with an ideal of between 2% and 2.5%).

A number of variables can influence the electrotechnical sector including the action the industry takes to prepare itself for the future, the levels of political interest in the sector and its contribution to the UK economy, consumer demand and investment levels in areas such as infrastructure and

²² <https://tradingeconomics.com/united-kingdom/forecast>

²³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726262/Forecomp_July_2018.pdf

²⁴ <https://www.pwc.co.uk/services/economics-policy/insights/uk-economic-outlook.html>

²⁵ https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/GBR

²⁶ <https://www.independent.co.uk/news/business/news/budget-2018-philip-hammond-analysis-what-it-means-growth-austerity-spending-tax-obr-brexit-a8607661.html>

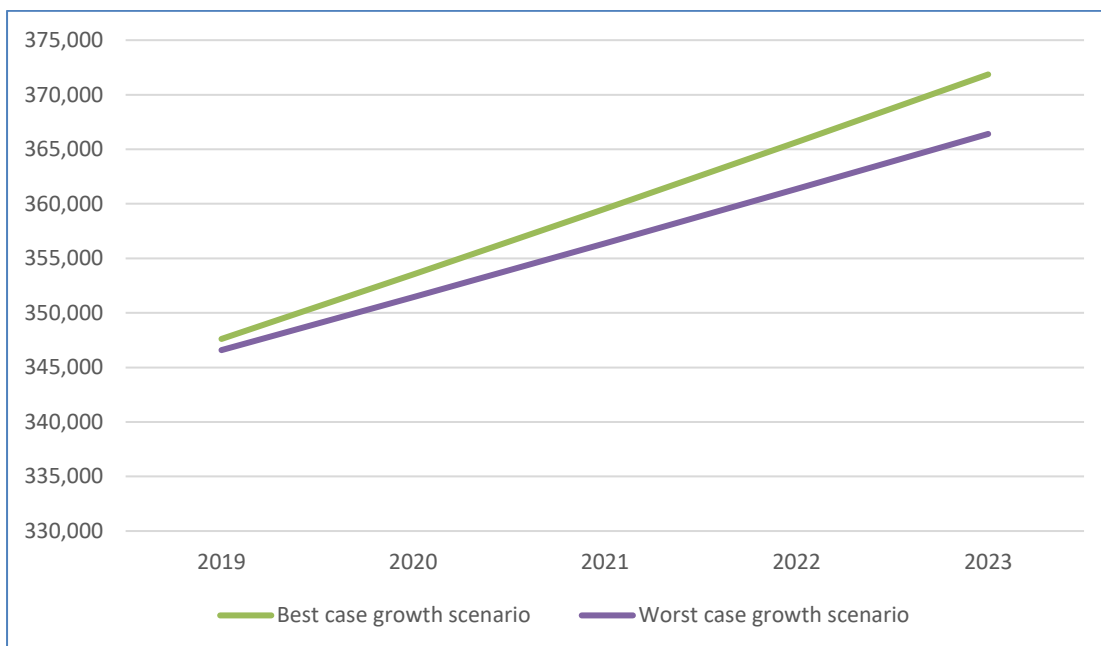
technological research. However, based on economic projections and the assumption that technological advancement will continue, overall workforce need will grow in line with the economy by between 24,605 and 30,058 employees over the next four years across all job roles (see Table 2 and Figure 15). This is only going to be partly met by apprentices entering the sector (see section 6.2).

Table 2: Economic Growth and the Electrotechnical Workforce (rounded)

	Economic Growth Rate and Current Sector Size	2019	2020	2021	2022	2023
Economic Growth Best Case	1.7	5,811	5,909	6,010	6,112	6,216
Economic Growth Worst Case	1.4	4,785	4,852	4,920	4,989	5,059
Electrotechnical Sector Size - Best Case	341,800	347,611	353,520	359,530	365,642	371,858
Electrotechnical Sector Size - Worst Case	341,800	346,585	351,437	356,358	361,347	366,405

Base year 2018. Pye Tait Survey, 2018.

Figure 15 Projected Workforce Growth (2019-2023)



Base year 2018. Pye Tait Survey, 2018.

To meet the need for new recruits solely due to sector expansion i.e. not to replace those leaving the industry, the requirement for skilled electricians, which make up over a third (35%) of sector recruitment, will rise from around 1,673 (worst case) in 2019 to 2,173 (best case) new recruits in 2023 across the UK. Table 3 shows the approximate need for “expansion recruits” over the next five years.

In addition, the Construction Skills Network report (mentioned earlier in section 2.2) predicts a reduction in the numbers of electrical trades required in construction. It predicts a fall in total employment of electrical installers from 188,760 in 2019 to 178,840 over the next four years. This prediction is probably based on the uncertainty surrounding the terms of the UK’s exit from the European Union and a stronger need for higher skilled employees over more manual occupations (in construction). Nevertheless, the CSN predicts an annual recruitment requirement of 1,570 electricians (ARR)²⁷ just to meet these lower predicted figures.

These predictions are difficult to square with predicted UK economic growth rates (even at the current pre-Brexit – fairly pessimistic – percentages being published by HM Treasury and the Bank of England). Although electrical work in construction projects is an important part of the work of electrotechnicians it is by no means the only work. The sector’s skilled people currently work more and more in a wide range of other sectors besides construction and electrical contracting companies undertake work for commercial businesses and domestic consumers, the growth in which has the potential to match or more than match the predicted slight decline in CSN statistics.

For this reason Table 3 is based on fairly low national growth estimate.

²⁷ The ARR brings together increases in demand for employment based on anticipated levels of workload, with the supply-side ‘churn’ in the industry, i.e. those moving in and out of the industry due to retirement, death, movements between industries, and so on – but it does not include flows in from training. The ARR represents the levels of recruitment required in addition to the normal ‘churn’ rates in a particular period.

Table 3 Recruitment Needs by Job Role to meet Sector Growth

Respondents	Percentage of recruitment(*)	HC/LC	2019	2020	2021	2022	2023
Directors and managers of business functions	21.0	HC	1,220	1,241	1,262	1,283	1,305
		LC	1,005	1,019	1,033	1,047	1,062
Supervisors	3.0	HC	175	178	181	184	187
		LC	144	146	148	150	152
Project personnel, incl contract, estimators and planners	7.1	HC	410	417	424	431	439
		LC	338	342	347	352	357
Skilled e.g. Qualified Electrician	35.0	HC	2,032	2,066	2,101	2,137	2,173
		LC	1,673	1,696	1,720	1,744	1,769
Semi-skilled	6.0	HC	348	354	360	366	372
		LC	286	290	294	299	303
Unskilled e.g. Labourer	7.5	HC	433	440	448	455	463
		LC	357	362	367	372	377
Apprentices/Trainees	16.7	HC	973	990	1,006	1,023	1,041
		LC	801	812	824	835	847
Other	3.8	HC	220	224	228	232	236
		LC	181	184	186	189	192
Total	100.0	HC	5,811	5,909	6,010	6,112	6,216
		LC	4,785	4,852	4,920	4,989	5,059

Notes: HC=High Case and LC=Low Case

(*) These percentages reflect the proportions of each role in total recruitment over the past year as reported by employers in response to a specific question in the Pye Tait Survey.

4. Skill Needs of the Electrotechnical Sector

- ❖ Employers believe there is a need to ensure that skilled electricians will be able to evolve their knowledge and skills in line with technological advances.
- ❖ The emergence and maturity of new technologies needs to be reflected in training opportunities whilst still maintaining the core skills of electrical installation, repair and maintenance.
- ❖ The following skills and knowledge are perceived to be of the highest need across the sector:
 - electrical installation (commercial and domestic);
 - electrical maintenance and repairs;
 - risk management and health and safety;
 - spoken English.
- ❖ ‘Attitudes, behaviours and communication skills’ are perceived to be lacking in newly qualified electricians. This is of concern when spoken English is a key skill in the sector.

4.1 Causes of Skill Shortages

Our qualitative research shows the range of perceptions by interviewed employers of the effectiveness of electrotechnical training – in the sense of it being able to equip learners with the knowledge and skills they need. Comments from employers highlighted a number of reasons for skill deficiencies in the sector, including:

- the basic nature of the education and training provision;
- the lack of focus on new technology;
- the lack of geographical coverage of good providers;
- skills shortages in teachers and tutors;
- lack of focus on practical experience;
- lack of investment in facilities and training of tutors;
- reduction in contact time;
- weak or non-existent links to industry; and,
- a lack of focus on literacy skills.

Quality

When asked to consider skills shortages in the electrotechnical sector it was rare that employers pinpointed specific skills. More commonly they referred to the perceived deficiencies in the teaching of skills and to the quality of the candidates generally. Additionally, responses pointed to training provision, the quality of training, trainers and the cost of training as key factors which lead to skill

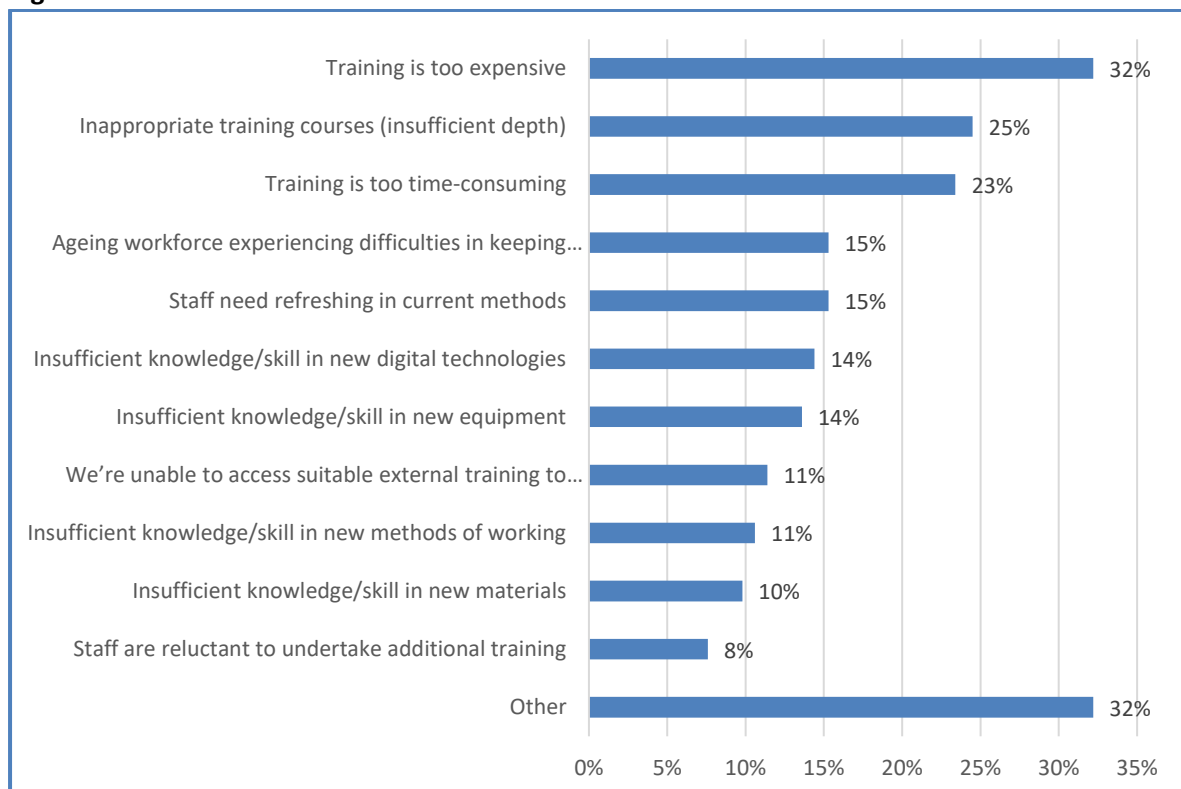
shortages. This is supported by 38% of survey respondents who cite various options for employee related issues, a further 36% who suggest cost as a contributing factor for preventing the sector from meeting skill demands, and the quarter of employers (Figure 16) who say that the training available to the sector lacks sufficient depth to support skill needs. Also, over 15% of respondents suggest that a lack of focus on new technology is a reason for skill deficiency.

The percentages shown in Figure 16 are slightly lower than they should be because many respondents placed their concerns under the “other” category. Of those who selected “other” 10.3% (a further 3.3% of all respondents) commented that the quality of the trainer is an issue that contributed to skill deficiency in the sector and 13.7% (4.4% of all respondents) commented that course availability and accessibility were impacting the skills demand of the sector.

Cost of Training

Figure 16 below also demonstrates the reasons employers believe that skill deficiencies exist within the electrotechnical sector, with cost of training seen as the main reason for deficiency by almost a third of respondents (32%). When similar responses from the “other” category are added, some 36% of respondents see training as too expensive and a barrier to acquiring the necessary skills.

Figure 16 Reasons for Sector Skill Deficiencies



Base: 367. Pye Tait Survey, 2018; multiple selections were permitted in the response

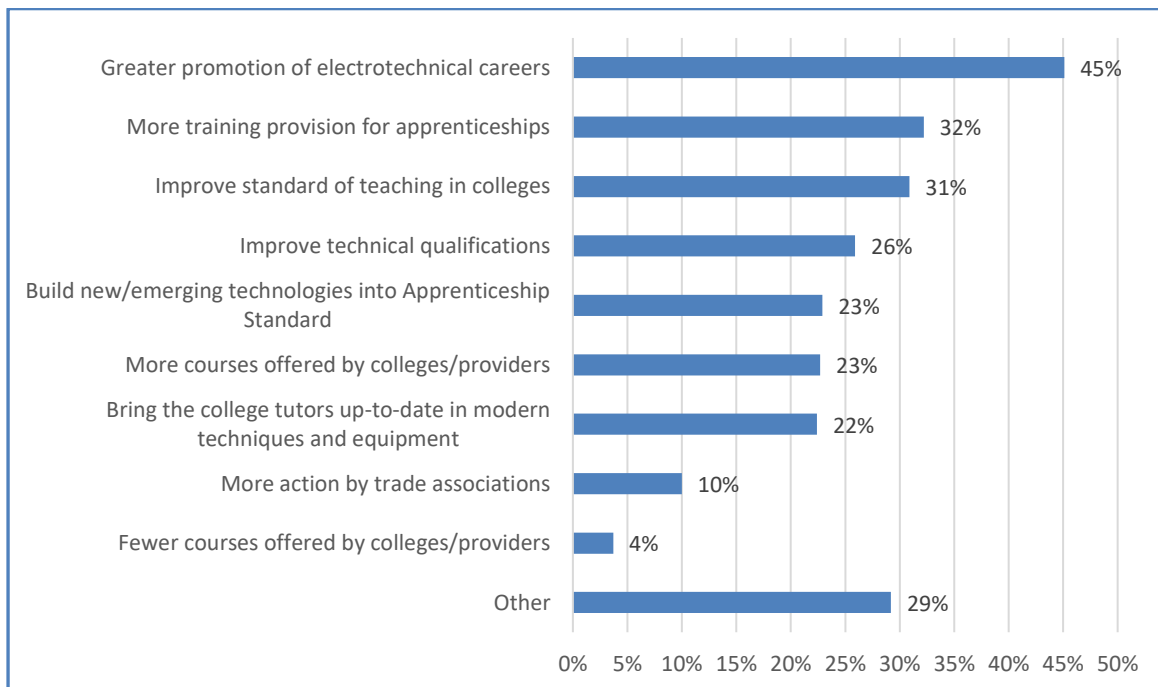
Other reasons for sector skill deficiencies include the ageing workforce and a need for refresher training of current staff (both 15%).

The lack of focus on new technologies was cited by around 15% of respondents. Some employers say that the rapid emergence of new technologies is making it difficult to remain current in skills. Sometimes, they say, training is delayed in anticipation of a more up-to-date version or piece of equipment. The 18th Edition IET wiring regulations published in July 2018 were cited as a recent example where training had been delayed pending the fall out of this update²⁸, which came into effect from 1st January 2019.

Improving recruitment and reducing skill shortages

In order to tackle skill shortages and recruitment problems, greater promotion of electrotechnical careers are deemed to be required by almost half (45%) of the surveyed employers. Almost a third of employers said that more training provision (32%) and improved standards of teachers (31%) are required. The industry experience held by teachers/tutors is often perceived as an issue by employers and is further supported by 22% of employers who would like to see them brought up-to-date in modern technology.

Figure 17 Methods for improving recruitment and reducing skill shortages



Base: 401. Pye Tait Survey, 2018; multiple selections were permitted in the response.

When considering the improvement of the overall standard of ability, over a quarter of employers

²⁸ [http://www.the50plus.co.uk/tech_support/18th-Edition-summary-of-changes-\(NICEIC\).pdf](http://www.the50plus.co.uk/tech_support/18th-Edition-summary-of-changes-(NICEIC).pdf)

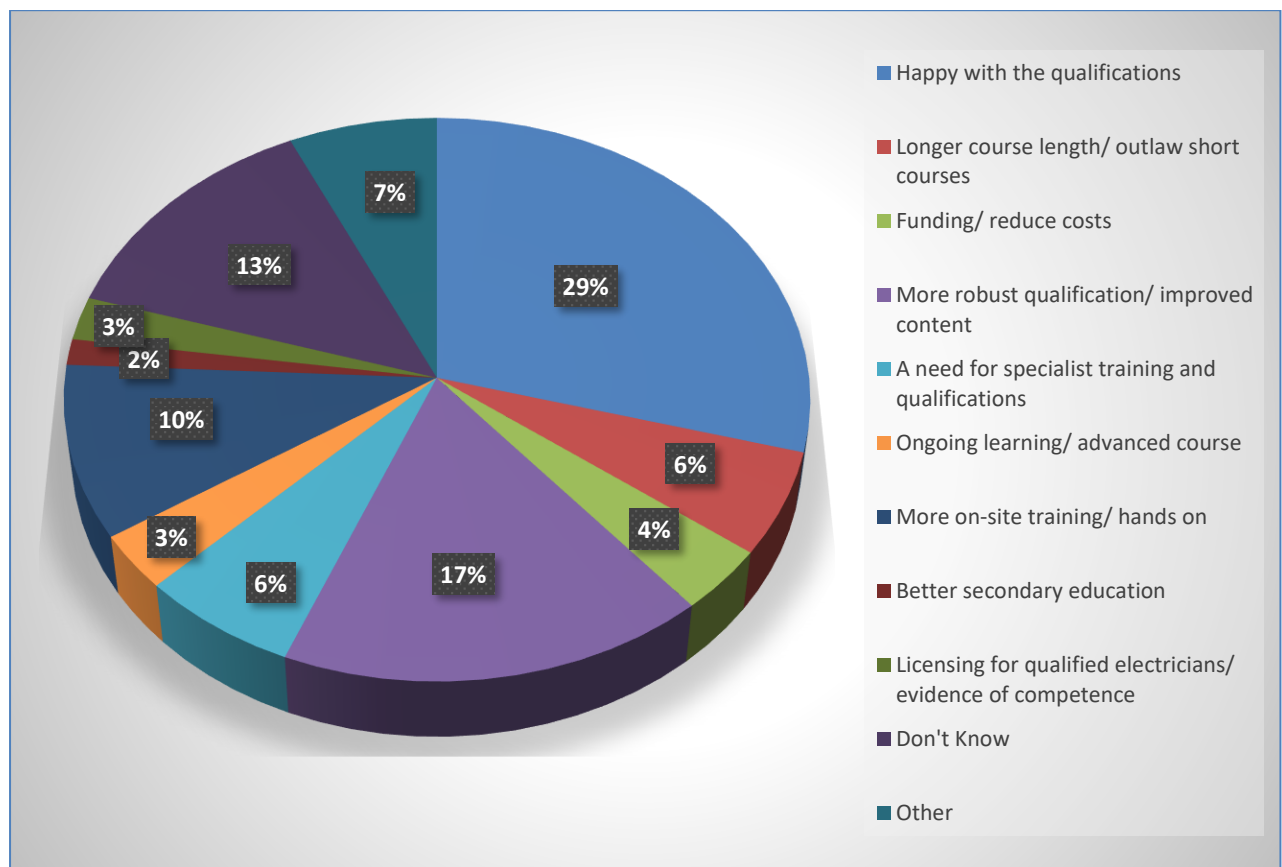
(26%) suggest that improving technical qualifications is a worthwhile approach. This general point is also supported by the 23% who suggest that more needs to be done in order to build new and emerging technologies into the apprenticeship standard.

4.2 Electrotechnical Qualifications

Almost a third of employers (29%) suggest that there is no need for changes to the current qualifications and that the current qualifications are suitable to equip employees with the skills to complete their work. A further 13% (see Figure 18) are unsure of what changes might be needed to the current qualifications.

Of those who seek changes, a more robust qualification that delivers an improved content is perceived to be necessary by 17% of employers. A larger proportion of the qualification being completed on-site or having a greater requirement hands-on experience is requested by 10% of respondents.

Figure 18 Changes to current qualifications to ensure they fully reflect demands of work



Base: 404. Pye Tait Survey, 2018.

4.3 Current and Future Skill Needs

These are the skills that employers say that they need, split into technical and soft skills and behaviours.

Technical Skills

- Electrical installation, maintenance and repairs will remain the key technical skills of the industry. In the future these will need to be upgraded continually to meet technical changes.
- Risk awareness and health and safety are also cited as a high priority due to their mandatory nature.
- There is also a need for higher level technical skills to meet technological change in such areas as the integration of electronic and digital equipment.

Soft Skills

- The main skills needed for the sector are mathematics and oral English communication.
- For supervisors and managers, training in written English is required.
- The ability to communicate is vital both within businesses and with clients (especially for domestic work).
- Risk awareness and health and safety are regarded as ongoing needs

Attitudes and Behaviours

- Attitudes and behaviours are regarded by employers as lacking in younger recruits.
- Attitudes to work and within the workplace are key issues (work ethics).

Figure 19 Electrotechnical Sector Skill Needs

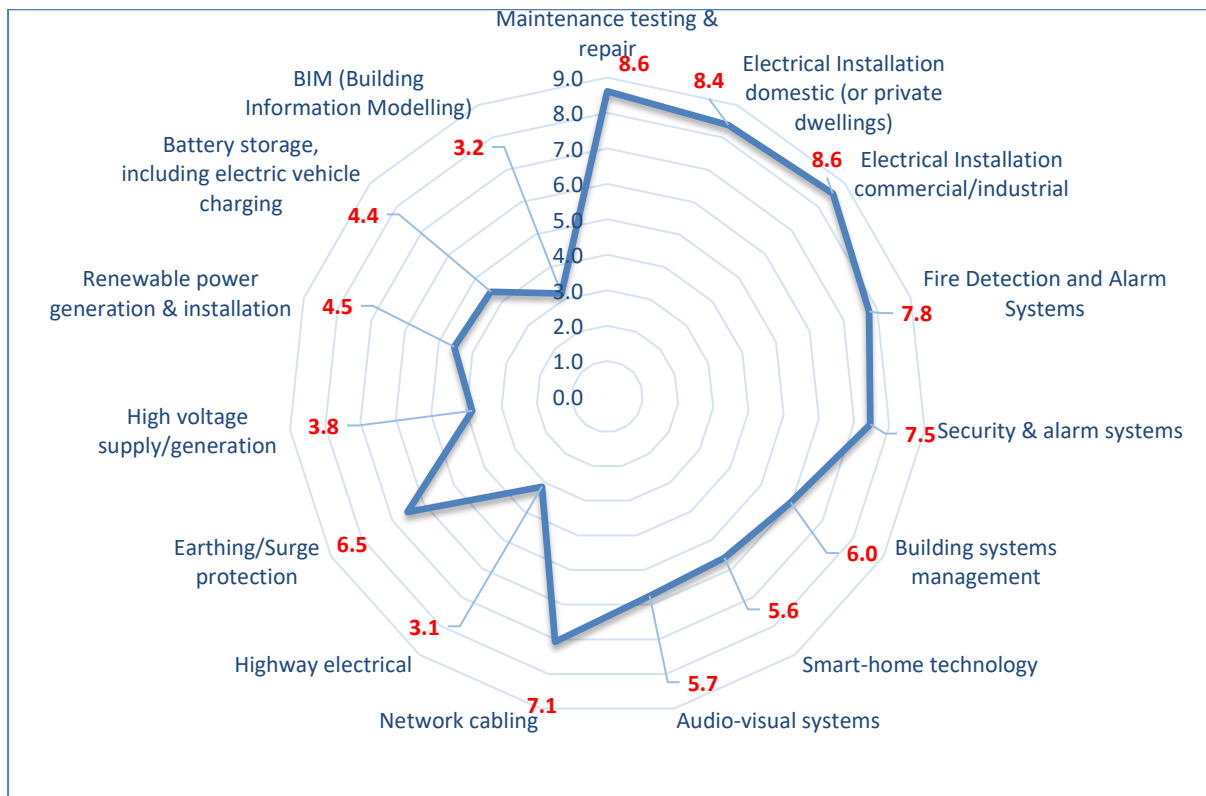
Current Needs

Respondents were asked to rate the level of skill in their workforces at present. This resulted in responses which pointed to technical skills being seen as high quality²⁹ (scoring an average value of over 8 out of 10). These included electrical installation (both commercial and domestic) and maintenance, testing and repair skills (see Figure 20).

Companies indicated that a range of skills could be said to be of medium quality (scoring between 6 and 7.9 out of 10); these being fire detection and alarm systems; security and alarm systems; network cabling; earthing/surge protection and building systems management.

Areas in which the sector feels skills are in the greatest need of improvement (scoring 5.9 out of 10 or lower) are some of the newer skills which will certainly be required in the coming years. These include audio-visual systems, smart-home technology, renewable power generation and installation, battery storage (including electric vehicle charging), BIM and highway electrical.

Figure 20 Current Technical Skill Quality in the Electrotechnical Workforce



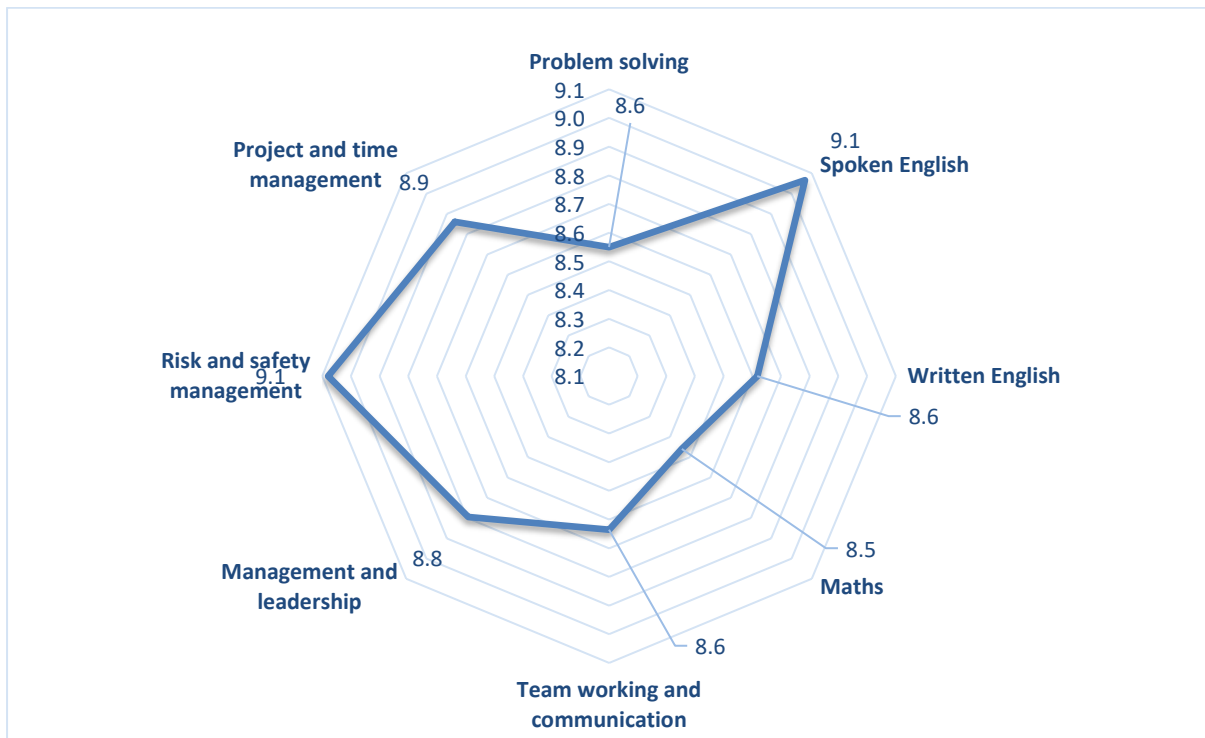
Base: 2690 responses. Pye Tait Survey, 2018 – multiple selections were permitted in the response

²⁹ In this section of the report ‘quality’ refers to the quality of the current workforce not the quality of the training they have completed.

The findings indicate that the sector is reasonably well equipped to meet the core demand but that it is less confident of the quality of newer and broader skills that are now required of the electrotechnical workforce.

When considering the quality of the industry's soft skills, employers seem more optimistic about the skills the workforce possesses. All soft skills scored an average over 8 out of 10 (see Figure 21). In contrast to responses to other questions, employers rate spoken English and risk and safety management skills to be highest in quality. Problem solving, written English and team work and communication are all deemed to be areas where quality is lower amongst soft skills.

Figure 21 Current Soft Skill Quality in the Electrotechnical Workforce



Base: 2659 responses. Pye Tait Survey, 2018 - multiple selection responses

Future Needs

Most employers expect that there will be little change over the next few years in the skills that are most important to the sector. That said, there is widespread recognition that technological advances will drive an evolution in skills and that education and training will need to evolve quite fast to meet this need.

Expected Trends in Electrotechnical Sector Skill Needs

As highlighted in the above sections, the skill needs of the sector in the next three years are expected to remain relatively stable but key areas will become increasingly important. The table

below (Table 4) indicates that soft skills – while rated very highly by employers in their current workforces – will also be of great importance to the sector in the future.

We asked employers to rate the levels of skill in their current workforces for a list of business areas and skills – both technical and soft. Anything under 7 is regarded as fair at best but mainly poor. In Table 4 the technical skills towards the bottom of the list mainly concerned with digital technologies and newer power technologies are rated low. At the same time, we also asked the respondents to say what they felt the importance of the named skills would be in the future. The results are shown in Table 4 and Figures 23 and 24.

Some of the skills which received relatively large increases in the scores between current skill level and future importance – albeit from low start-points, were BIM, smart homes, renewables, and battery technology. These are areas which are, as yet, poorly understood by employers in terms of their implications but increases in scores of up to a full point indicate a significant shift in the potential importance of these areas to the sector.

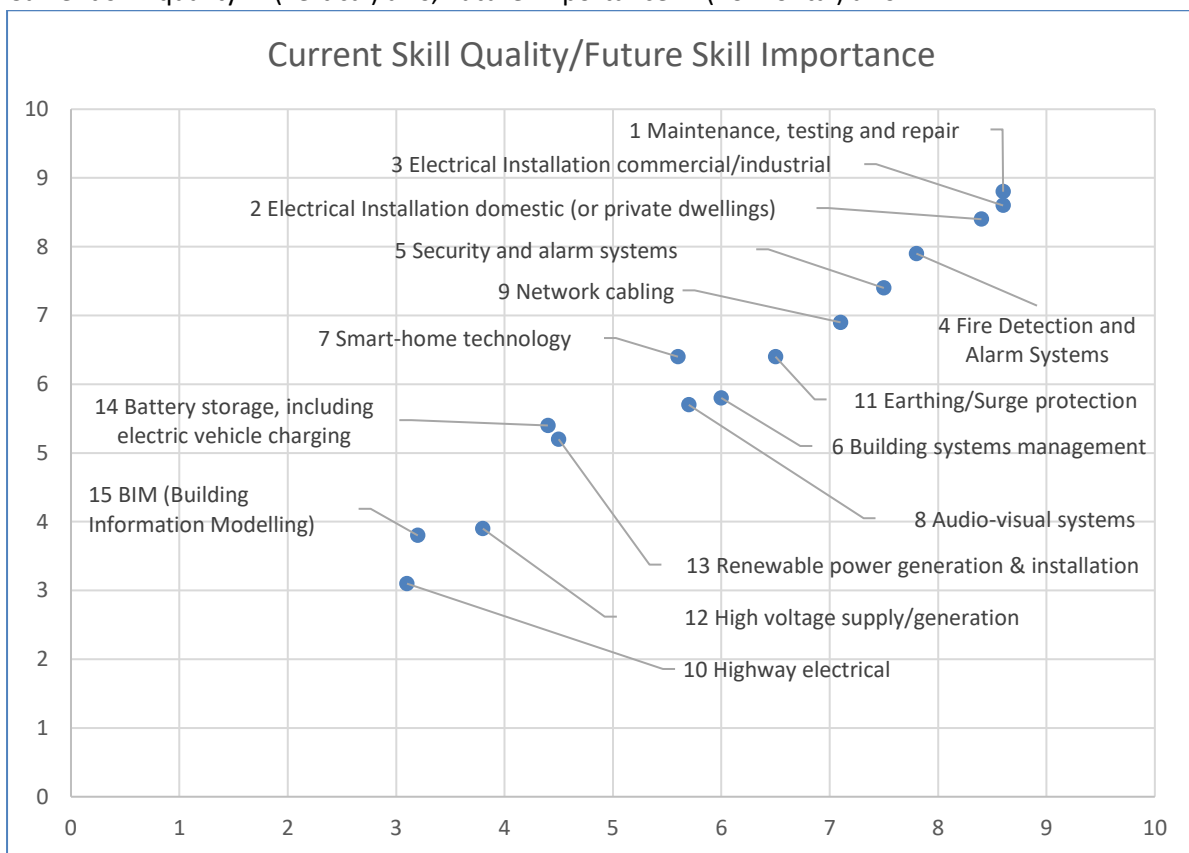
Table 4 Current Skill Quality and Future Skill Importance in the Electrotechnical Workforce

		Current Skill Quality	Future Skill Importance
Technical Skills			
1	Maintenance, testing and repair	8.6	8.8
2	Electrical Installation domestic (or private dwellings)	8.4	8.4
3	Electrical Installation commercial/industrial	8.6	8.6
4	Fire Detection and Alarm Systems	7.8	7.9
5	Security and alarm systems	7.5	7.4
6	Building systems management	6.0	5.8
7	Smart-home technology	5.6	6.4
8	Audio-visual systems	5.7	5.7
9	Network cabling	7.1	6.9
10	Highway electrical	3.1	3.1
11	Earthing/Surge protection	6.5	6.4
12	High voltage supply/generation	3.8	3.9
13	Renewable power generation & installation	4.5	5.2
14	Battery storage, including electric vehicle charging	4.4	5.4
15	BIM (Building Information Modelling)	3.2	3.8
Soft Skills			
A	Problem solving	8.6	9.2
B	Spoken English	9.1	9.3

C	Written English	8.6	9.0
D	Maths	8.5	9.0
E	Team working and communication	8.6	9.2
F	Management and leadership	8.8	8.8
G	Risk and safety management	9.1	9.1
H	Project and time management	8.9	9.3

Figure 22 Current Skills & Future Importance

Current skill quality: Y (vertical) axis; Future Importance: X (horizontal) axis.

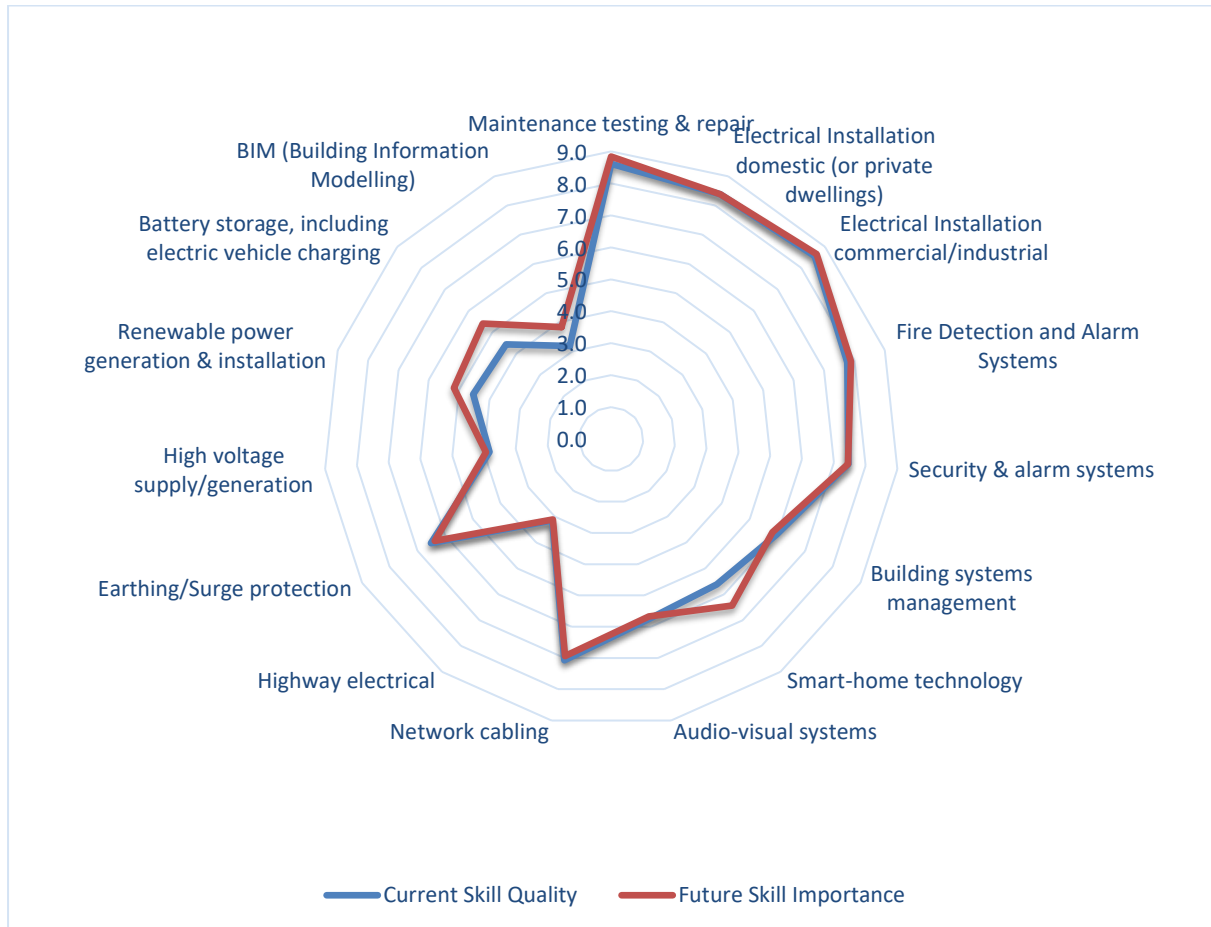


Base: 2324 responses. Pye Tait Survey, 2018 - multiple selection responses

As indicated by the scattergram above, technical skills 1 to 5 and 9 are regarded as being of high current standards by employers and are also seen as being of great future importance. While the remaining items (7 and 8) and from 10 downwards are mainly considered to be of low current skill and low future importance, this may well be due to a lack of awareness of their potential among employers.

Where soft skills are concerned, employers seem to be on firmer ground. In general, they understand what the skills mean and can take a reasoned view of their importance in the future. As can be seen in Table 4 and Figure 24 virtually all soft skills are accorded very high future importance scores.

Figure 23 Changing Technical Skill Quality in the Electrotechnical Workforce

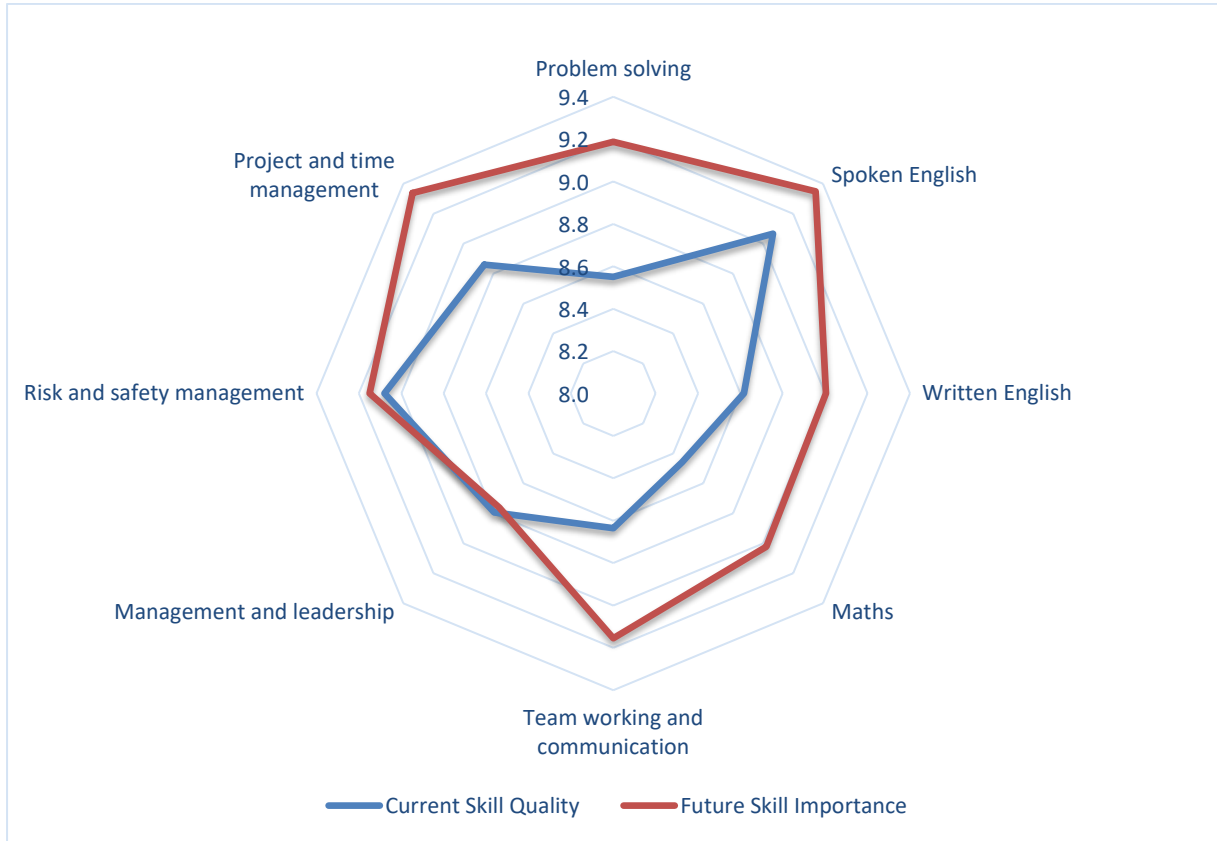


Base: 2324 responses. Pye Tait Survey, 2018 - multiple selection responses

Figure 23 and Figure 24 are showing the same information from Figure 22, but in an alternative way, reinforce the point that it is the current technical skills that were picked up and recognised as being important by employers (the right-hand side of the chart) rather than those in the left-hand side and more recent technologies.

Figure 24 illustrates the perceived importance of soft skills and, particularly those which employers believe will be of even greater importance in the future. It is noteworthy that employers apparently believe that risk and safety management and leadership and management are both in very little need of improvement.

Figure 24 Changing Soft Skill Quality in the Electrotechnical Workforce



Base: 2066 responses. Pye Tait Survey, 2018 - multiple selection responses

5. Training and Development

- ❖ Employers' comments on non-mandatory training and development generally in the electrotechnical industry were largely negative.
- ❖ In most cases, employers who do not seek external training take that view because they do not see a requirement or because they argue that on-the-job training is adequate.
- ❖ Those who commented on existing training offers said that a lack of quality in tutors and courses is the main reason they do not take it up.
- ❖ Perceived high costs and difficulties with accessing the training were also cited as issues.

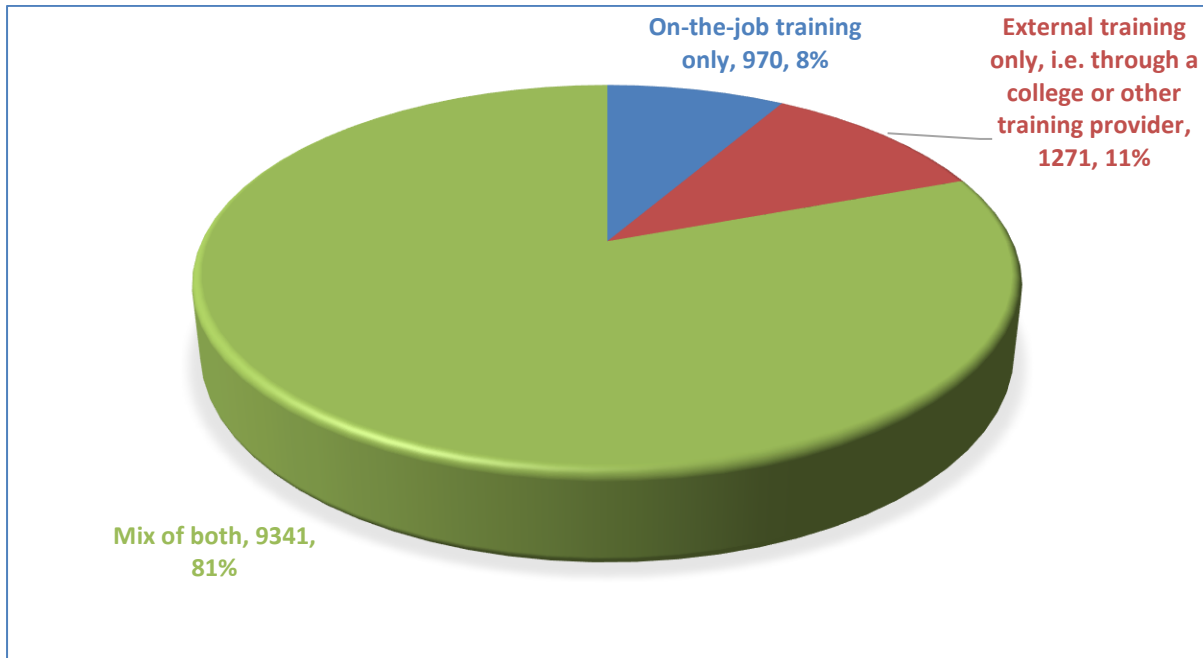
5.1 Training Uptake

Over four-fifths of organisations provide non-mandatory training or seek it externally for their staff³⁰, demonstrating that it is the norm to provide or externally source training for employees. The main rationale for not training staff is that they are already sufficiently trained to deliver the capabilities required for their job. Some employers provide additional training on-site, and a few seek external providers.

Regionally those least likely to seek training are from the West Midlands (27%) and the Southwest of England (21%). Key issues for the Isle of Wight and the Isle of Man are the lack of training available to them without staff travelling to the UK mainland. At least 70% of employers in all regions provide non-mandatory training.

Choices for why training is sought are heavily influenced by the size of organisation, what capabilities the organisation has to deliver in-house training, and what training is available locally. In over four-fifths of cases employees will receive a mixture of internal and external training.

³⁰ 85% of micro organisations conduct some type of non-mandatory training, 98% of small companies and 100% of medium and large companies carry out non-mandatory training of some sort.

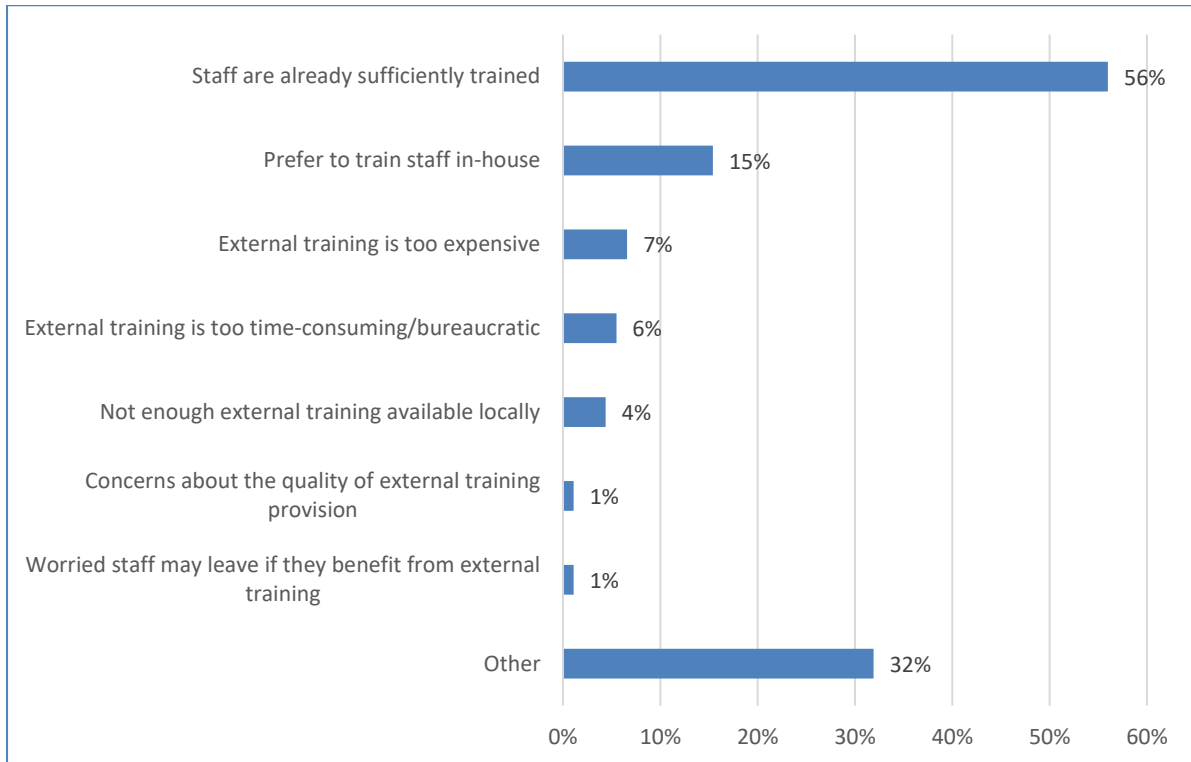
Figure 25 Employees Trained

Base: 388. Pye Tait Survey, 2018.

5.2 On-the-job training

For many employers, on-the-job training is seen as vital to the development of talent. Of those not conducting external training, 15% of employers indicate that they prefer to train their employees in house. Some 56% of employers believe their staff are already adequately trained and therefore do not require training. When considering training such as apprenticeships it is common for employers to indicate that they would prefer a greater focus on the hands-on elements of the profession and more practical and on-site experience.

Many who advocate on-the-job training indicate that it is the best assurance that a capable individual that can work within the business model. Soft skills training and mandatory training such as health and safety are considered of high importance to employers but they are considered easily delivered to employees on-the-job, and through practical experience.

Figure 26 Reasons for not seeking external training

Base: 91 responses. Pye Tait Survey, 2018.

5.3 External training

From those who provided “other” as the reason for not seeking external training 12% of the total responses provided a rationale for this selection – saying that staff were already qualified, i.e. sufficiently trained. Therefore, the proportion of respondents that deem their staff already sufficiently trained is 68%. Other reasons, of lower frequencies, included employee’s proximity to retirement and organisations waiting for regulation changes to be incorporated into training.

In addition to a lack of requirement, time and cost are seen as the key barriers to employers investing in external training for their workforce. This is due not merely to the course fees but to the need to accommodate and provide transport and subsistence for trainees in addition to the loss of work-time.

Additional costs could be reduced, employers feel, if the accessibility of training was addressed to support more remotely located businesses, or an online capability was developed that could be supplemented with work-based proof of competence. Respondents from the Isle of Wight and Isle of Man noted the cost of attending courses on the UK mainland as a major concern to their ability to develop their electrotechnical skillset.

One employer stated that the absence of a large training provider that could function as a one-stop shop for electrotechnical training was also a barrier as they had to allocate resource to consider what is the best training at the best rate and all this took time and cost money.

“Big training companies that can train 300 electricians at a time do not exist anymore with that in mind I don’t doubt there is a skills shortage.”

Medium sized organisation from the Southeast of England

For small and micro companies business demands often make it impracticable to lose an employee during working hours, suggesting that the option to complete training out of working hours courses would be useful.

“evening and weekend courses would be helpful”

Small sized organisation from the East Midlands

As mentioned earlier in this report some employers in the sector are concerned about the quality of the external training provided. One example cited is the ability for someone to be called an electrician having only completed a short-course in electrical installations, rather than a full apprenticeship and the AM2/S industry standard end-point assessment.

“These 6-week courses [such as City and Guilds Domestic Electrical Installer courses] which suggest you are a qualified electrician are simply not possible and shouldn’t be allowed.”

Medium sized organisation from the Southeast of England

5.4 Linking the industry to Further or Higher Education (FE/HE)

Where training is concerned a clear consensus emerged across the research: employers are not satisfied with what education and training providers are producing, most notably the ability to practically apply the theoretical skills taught.

“youngsters being trained at college are coming out without experience, the quality of tutoring isn’t there, a lot lack qualifications and experience in the trade.”

Micro sized organisation from the Southwest of England

Although many employers mentioned what they regard as poor quality tutors and deficiencies in the content of the apprenticeship (especially practical skills and new technology), there were also a few who said that the situation was not all about FE/HE providers and that the industry should do more to help – particularly in terms of developing stronger links with Further Education and Higher Education (FE/HE) training providers.

Perceptions are that, historically, this link has been very strong but has since lapsed and that, while links are being strengthened again, this is taking time to produce tangible results.

Other employers suggested that links should be developed much earlier in order to create a better understanding of the sector and its career opportunities. These employers believe that engaging teachers and young people early in their secondary careers is critical to avoiding pupils being led solely down the academic route. One employer said that school teachers see the apprenticeship as:

“the poor relation to the academic route.”

Medium-sized organisation in the Northwest of England

Although many employers regard the responsibility for enhancing links as lying with FE/HE providers, some said that the industry needs greater numbers of employers to step up and get involved. The concept of having a working group to encourage the involvement of employers and take a structured approach to enhance the education-to-industry link was considered a step in the right direction.

Micro and small sized organisations find the activity of linking to education very difficult due to work demands, costs, time constraints, etc.

6. Apprenticeships

- ❖ The industry has a strong view that apprentices make an invaluable contribution to the sector.
- ❖ The perceived preference for secondary education to guide students down the academic route has led to a view in the industry that candidates are of a lower quality than was previously the case.
- ❖ Employers insist that the exposure apprentices get to demonstrate their practical application of technical skills is vital and makes them the most skilled workers in the industry in the long-term.
- ❖ Younger apprentices come with several disadvantages related to their age such as they are less likely to drive, have less workplace experience, and also can be prevented from accessing sites due to health and safety regulations.
- ❖ The return on investment for apprentices is a positive one. There are a number of upfront costs that cannot be recovered if the apprentice drops out but the long-term value to businesses and the sector is extensive and goes beyond the cost of employment and supervision.

6.1 Industry view of apprenticeships

Apprentices in the electrotechnical sector are seen as vital for its future. Employers see them as a way to overcome the ageing workforce and to create succession plans where needed. They are described positively with adjectives such as ‘critical’, ‘invaluable’ and ‘essential’. Where this positive view was qualified, respondents commented on the challenges of retaining apprentices once they completed their apprenticeship, with the risk of poaching by other organisations a problem in some cases.

Some employers suggest that the scheme should be increased in length to 4.5 or 5 years in view of the additional technology and skills that will be required in the future. These same employers also asked that what they perceive as the low level of pay to the apprentice³¹ should be addressed. Respondents from micro companies aired their view that, due to their size, apprentices were less valuable to them but they saw the value of the scheme generally for employers larger than themselves. The key benefit suggested by the sector for taking on apprentices was primarily the opportunity to grow your own employees and ‘*training them [in the company’s] own nuances*’.

³¹ This feedback was received in the telephone interviews. Only a few employers specified whether the perceived problem lies with the National Minimum Wage or JIB rates although the small number who mentioned a comparator specified the JIB structure.

Apprentices were also deemed to be best placed to train, understand and support company progression and to reinforce a company's approach to emerging and future technologies.

The use of apprenticeships was also seen to have wider benefits for the organisation as it also creates a chance for additional responsibility and development of the supervising staff.

The use of apprentices does not come without challenges. However, employers feel these do not outweigh the opportunities and benefits. Reference was made to: the varied level of calibre; the ability to retain them once they are qualified to ensure a solid return on investment; the time required to train and supervise which also comes at a cost and prevents skilled professionals from operating at 100%; the fact they can be unsuitable due to the location of jobs and/or age restrictions on-sites; the apprentice's ability to make the transition to the world of work from education; and finally, the view that schools are pushing more pupils to stay in full time education and are not promoting apprenticeships.

Another key aspect is that an apprentice is not just a school leaver but can be a person transferring from another route of education or sector.

6.2 Apprenticeships in the four nations

An apprenticeship is achieved by completing a combination of theoretical knowledge-based learning, normally in a college, and hands-on practical experience, learnt on the job. Apprenticeships can be secured through numerous employment pathways including through government websites, such as 'Find an apprenticeship'.

Apprenticeships are offered in each of the four nations in the UK, with the design requirements in each nation differing. This difference has become more marked since 2014, when, in England, a new model for designing and specifying apprenticeships was introduced.

The devolved nations approach to Apprenticeships

In Northern Ireland, Scotland and Wales, the content of each apprenticeship is specified in a 'framework'. This document sets out the entry requirements (which include a certain level of achievement in English and maths), qualifications and training that every apprentice will need to cover in order to achieve the respective apprenticeship. The component qualifications typically include a competence-based qualification (e.g. an NVQ/SVQ) plus a 'technical knowledge' qualification. The apprentice's competence is developed in the workplace and continually assessed via workplace observation and questioning and documented in a portfolio. The technical knowledge (also referred to as 'underpinning knowledge') is learnt 'off-the' job at a training provider.

A new stakeholder – BSE Skills – a joint body created by SELECT and two other partners – has been approved by Skills Development Scotland to develop and manage apprenticeships and qualifications for the Building Services Engineering sector across the devolved nations and to review and maintain specified National Occupational Standards across the UK.

In England, until 2014, the content of apprenticeships was specified in a framework, however due to concerns expressed over the quality of some apprenticeships and the way they were assessed, the Government embarked on a programme of radical reform, in response to the findings of the Richard Review³². Whilst apprenticeships in England still contain many of the same features as their counterparts in the devolved nations, there are a number of fundamental differences in their design, specification and assessment.

- The component parts of apprenticeships in England are set out in a Standard which specifies, at a high level, the skills, knowledge and behaviours that the apprentice must possess.
- Apprenticeships in England are no longer typically 'qualification-led' – i.e. depending on the standard, the apprentice does not have to achieve a qualification as part of their apprenticeship.
- The design of apprenticeship standards is employer-led (a reaction to a view that training providers and skills bodies had too much influence over the design of apprenticeship frameworks).
- Apprenticeship standards are assessed only by an end-point-assessment (consisting of a minimum of two assessment methods), rather than via continual assessment.
- End-point assessments are externally quality assured, by either an employer-group, a professional body, Ofqual, or the Institute for Apprenticeships and Technical Education.

Apprenticeship levels

Apprenticeships are available at many different levels of demand, typically from Level 2 (equivalent to GCSE) to Level 7 (equivalent to a post-graduate qualification)³³ – see Appendix 7 for a level comparison chart.

Electrotechnical apprenticeships

In 2015, the new Apprenticeship Standard for Installation electrician/maintenance electrician was approved for delivery in England. The apprenticeship framework which it replaced (issued in 2012) was subsequently phased out, as new starts began on the Standard. The typical duration of the apprenticeship is 42 months³⁴ - this switch over can be seen in Figure 27 in the achievement rates.

³² For further information, please refer to the report of the Richard Review: <https://www.gov.uk/government/publications/the-richard-review-of-apprenticeships>

³³ Note, qualification levels are specified differently in the four nations and are not always directly comparable. For example, a Level 2 qualification in England is broadly equivalent in level of demand to an SCQF Level 5 qualification in Scotland.

³⁴ <https://www.instituteforapprenticeships.org/apprenticeship-standards/installation-electrician-maintenance-electrician/>

Starts and achievements

The table below show the starts and achievement data available for the Level 3 Electrotechnical Advanced Apprenticeship over the last three years in England^{35 36}. Comparative data for the other three nations are not openly available.

These data include all apprentices (including those aged 25+). It is possible that the lower numbers in 2017/18 starts are in part indicative of a data lag for those beginning their apprenticeship that year and the introduction of the levy in May 2017³⁷. If the levy continues to impact the numbers of apprentices entering the industry it is highly likely that demand for skilled electricians will increase further³⁸. Changes announced in March 2019's budget may encourage the drastic dip in starts across all apprenticeships, also felt in electrotechnical to some extent, start to pick up at greater speed towards pre-levy figures.

Table 5 Starts and Achievements in England for the Electrotechnical Apprenticeship

Numbers /Year	14/15	15/16	16/17	17/18
Starts	5740	6170	6550	6090
Achievements	2160	2520	2600	2860

(2018/19 – were only partially reported at Q1 but the full data 2018/19 are imminent).

Note: Starts and Achievements in Table 5 cannot be used to measure percentage progress within a year. They are separate, independent performance metrics and that electrotechnical apprenticeships can take four years to complete. Instead, separate figures (see Figure 27) are available that show successes or achievements in an apprenticeship.

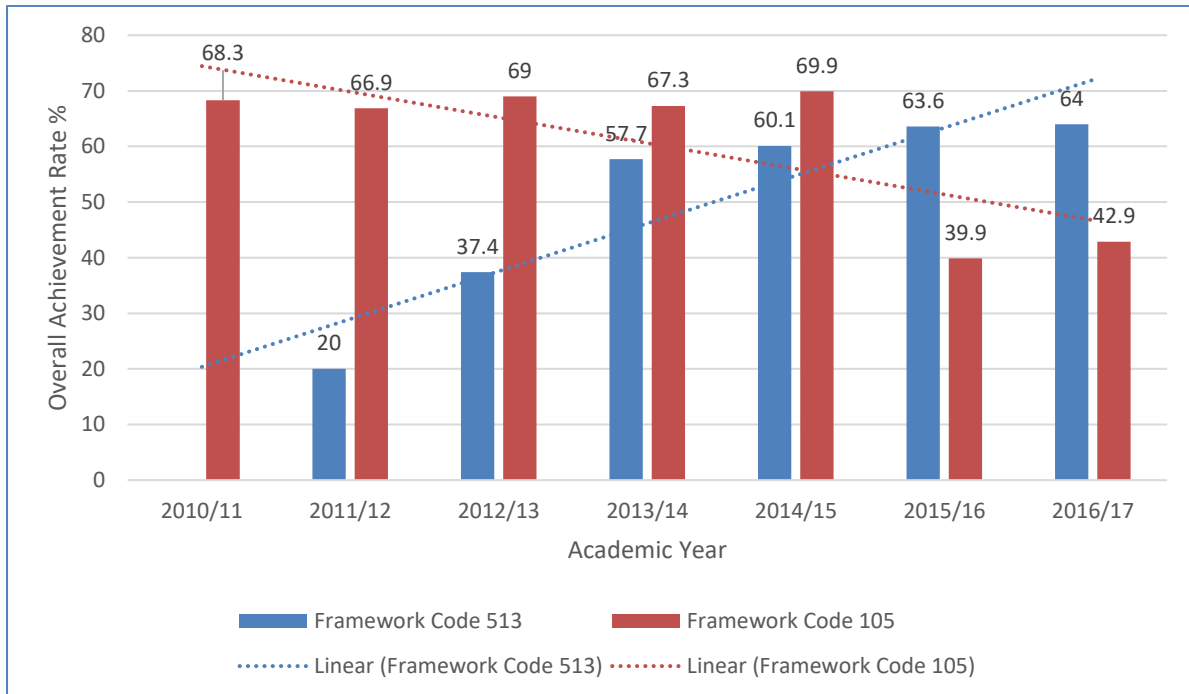
³⁵ <https://www.gov.uk/government/statistics/apprenticeship-and-levy-statistics-october-2018>

³⁶ <https://www.gov.uk/government/statistical-data-sets/fe-data-library-apprenticeships>

³⁷ <https://feweek.co.uk/2018/01/25/apprenticeship-starts-jan-2018/>

³⁸ apprenticeship reforms announced in March 2019 at Budget – From April 1st employers will see the co-investment rate they pay cut by a half from 10% to 5% ; levy-paying employers are able to share more levy funds across their supply chains, with the maximum amount rising from 10% to 25%

Figure 27 Overall (Framework and Standard) Electrotechnical Advanced Apprenticeship Achievements (%) – England³⁹



Department for Education Data, FE library, National Success/Achievement Rates Tables 2010-2017

The cohorts for 2015/16 and 2016/17 for instance were 4,100 and 4,070 respectively and the achievement rate is based on the number achieving the Apprenticeship aims – an average (combining the older Framework and the newer Standard) of 61.8% and 63.8% respectively.

One point to emerge from this is whether the volume of achievers (Table 5) is sufficient for the industry to sustain the need for growth as discussed in section 3.8 or whether the industry and wider sector needs to look to widen the pool or pipeline of talent to beyond the Apprenticeship route?

6.3 The Return on Investment of Electrotechnical Apprentices

One of the most important questions facing employers is whether it is worthwhile taking on an apprentice. Numerous government and industry documents argue that apprenticeships are not only good for young people but bring substantial benefits to the companies that take them on. In spite of this, many employers remain wary of what they see as excessive up-front and running costs for an apprentice.

³⁹ <https://www.gov.uk/government/statistical-data-sets/fe-data-library-apprenticeships>

With this in mind we were given the task, as part of this research, of developing indicative figures for the value of apprenticeships in the electro-technical sector. The research question was, effectively, what is the return for an apprentice with respect to the investment made by the employer over the four years of the apprenticeship?

Return on investment calculations with respect to education and training are notoriously difficult. Companies differ, apprentices differ, and areas of specialism differ. All make it impossible to generalise and to be accurate in establishing costs and benefits. Nevertheless, it is possible to derive reliable outline figures and this was a major focus for this research.

To do this we developed a short questionnaire and spoke to twenty companies of different sizes and specialisms. In confidence, we asked them questions on the weekly wages of apprentices over the course of the apprenticeship, as well as additional costs for course fees, travel, equipment and so on. We also asked for recruitment costs but these turned out to be so low in weekly terms that they have been ignored in the cost-benefit model. One of the core costs of an apprentice is that of in-house support and training. Consequently, we asked questions around the time spent by supervisors and other skilled staff in mentoring and supporting an apprentice.

The findings from the small-scale survey are presented in Table 6 below.

Table 6 Average work completion, supervision and costs for employing apprentices⁴⁰

Row	Activity type	Year 1	Year 2	Year 3	Year 4
(a)	Time spent watching and being mentored	56%	40%	25%	17%
(b)	Time spent on menial tasks	29%	30%	26%	20%
(c)	Time spent completing the work of a qualified electrician	15%	30%	49%	63%
(d)	Weekly ⁴¹ cost of an apprentice	£205.60	£284.00	£385.60	£416.80
(e)	Weekly cost of an apprentice as a percentage of a skilled electricians wage	31.4%	43.3%	58.8%	63.6%
(f)	Weekly cost of supervision ⁴²	£334.28	£275.29	£216.30	£176.97
(g)	Percentage of supervisor time spent on monitoring/training	51%	42%	33%	27%
(h)	Total weekly cost of an apprentice (h) = (d)+(f)	£539.88	£559.29	£601.90	£593.77

⁴⁰ Average from 20 respondents

⁴¹ Based on a 40-hour week and the average cost of an apprentice each year.

⁴² This calculation is based on £655.45 the mean average of a supervisor's wage (gross). Responses from employers varied from £500.00 to £900.00. The mean average is £655.45 and median is £630.00.

Table 7 shows the calculations for a Return on Investment which uses the average costs and times provided to the survey and sets against them three possible charge-out rates.

The result of these calculations was an average overall weekly cost for an apprentice which rises to around £600 per week in the fourth year of the course (equivalent to a salary of about £32,000 pa). The benefits derived by an employer from an apprentice were confined to the extent to which their work could be charged-out to customers and clients at unskilled and skilled rates. We are conscious that apprentices in the latter stages of their course can also contribute by helping to support earlier-stage apprentices and are also able to support the sales effort and even win small contracts, but these contributions have been ignored on the “returns” side of the calculation because they are extremely difficult for employers to calculate.

The value of any member of staff is equal to their contribution to corporate earnings (i.e. their productivity). In this case too, the question was not put to employers due to the complexity of working out not simply an overall productivity figure but one which applies solely to apprentices. This is, of course, technically possible, but such an approach would have meant considerable research and financial calculation by each employer – a task which was felt to be too onerous to ask of respondents.

Instead, we have considered the value of any hours worked by the apprentice on unskilled and skilled tasks and used three possible charge-out rates for each type of work. The charge-out rates represent the “value” of any hours worked by the apprentice on customer-work. For example, we know that the average number of hours per week spent by a first-year apprentice on unskilled electrical work is around ten. At a charge-out rate of £20 per hour, this work is worth around £200 to the employer.

Table 7, below, shows the way in which the return on investment for an electro-technical apprentice has been calculated together with the overall net costs and benefits for each of three possible projections using a relatively low charge-out rate for both unskilled and skilled work, a medium and a high projection.

At the “low” rates an apprentice delivers a net benefit of around £8,300 over the four years. However, at higher charge-out rates, the apprentice begins to pay for him or herself in year two and, by the end of year four has created a net benefit of just over £16,000 at medium charge out rates and £23,000 at high rates.

Over the four years of the apprenticeship the apprentice could earn the employer a net benefit of over £37,000 (at the higher charge out rates).

Table 7 Apprentice Cost/Benefit Model

		Year 1	Year 2	Year 3	Year 4
Weekly	Weekly cost of apprentice	205.60	284.00	385.60	416.80
Costs	Add costs of supervision and mentoring				
	% Time of supervisor for mentoring	51	42	23	27
	Weekly cost	334.56	275.52	150.88	177.12
	Add cost of equipment/travel/fees	101.21	102.82	103.13	103.04
	Total weekly cost of apprentice	641.37	662.34	639.61	696.96
Weekly	Unskilled work				
Value	at £20/hr charge out	203.00	210.00	182.00	140.00
	at £25/hr charge out	253.75	262.50	227.50	175.00
	at £30/hr charge out	304.50	315.00	273.00	210.00
	Skilled work				
	at £30/hr charge out	136.50	325.50	535.50	735.00
	at £35/hr charge out	159.25	379.75	624.75	857.50
	at £40/hr charge out	182.00	434.00	714.00	980.00
Weekly Net cost/benefit of apprentice (@)					
	Low charge out	-301.87	-126.84	77.89	178.04
	Medium charge out	-228.37	-20.09	212.64	335.54
	High charge out	-154.87	86.66	347.39	493.04
Annual Net cost/benefit of apprentice					
	Low charge out	-14,489.76	-6,088.32	3,738.72	8,545.92
	Medium charge out	-10,961.76	-964.32	10,206.72	16,105.92
	High charge out	-7,433.76	4,159.68	16,674.72	23,665.92

Hours spent in Unskilled and Skilled Work

	Year 1	Year 2	Year 3	Year 4
Hours unskilled	10.15	10.50	9.10	7.00
Hours skilled	4.55	10.85	17.85	24.50

Four-Year Net benefit for Employers from an Apprenticeship

Low charge out	£-8293.44
Medium charge out	£14386.56
High charge out	£37066.56

Note: (@) In the following two sections of the model a negative number represents a net cost to the employer and a positive number a net benefit.

The Return on Investment model illustrates that there are potential benefits over four years for all levels of charge out rate. The figures relate to an individual apprentice completing the full course but they also enable an employer to see what the net cost or benefit might be should an apprentice drop out of their course.

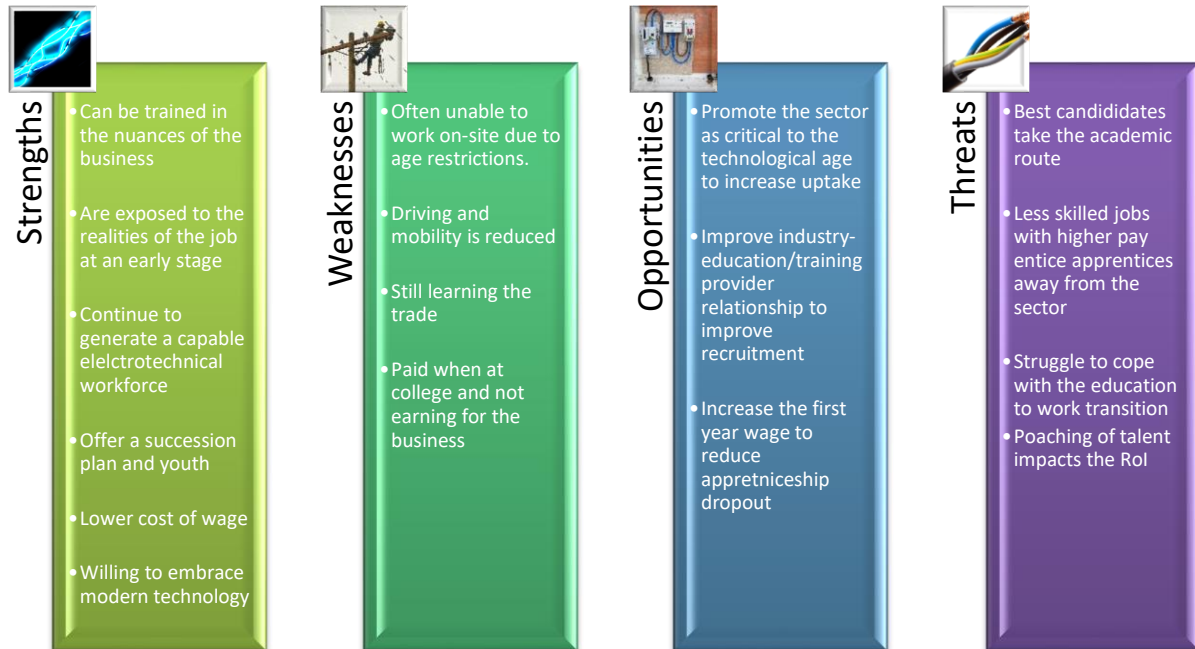
By national standards the rate of drop out for electro-technical apprentices is quite low. We found an average drop-out rate for Year 1 apprentices of 10%, and rates for the subsequent years of: Year 2 3.6%; Year 3 0.5 %; and Year 4 0.9%. Depending on the charge-out rate an employer could potentially lose between £7,000 and £15,000 on the one in ten apprentices who drop out during Year 1 (but, of course, proportionately less depending on how many months into the year the apprentice leaves).

In calculating net costs and benefits much depends on the rate used by an employer to charge out an apprentice's time but also on the actual rates of pay and the true amounts of any additional weekly costs.

6.4 Apprenticeships SWOT

The findings in the SWOT analysis were arrived at by collating data from qualitative depth interviews with employers, literal responses from the quantitative research and data provided during the return on investment research.

Figure 28 Apprenticeship SWOT analysis



Key strengths cited from organisations that take on apprentices:

“The advantages are that you are, in a certain aspect, training an engineer to suit your business model. They train in everything, but an engineer will come out with a stronger skillset to suit our business needs.”

Micro sized organisation from Scotland

“It's [taking on apprentices] a balance - we've got to keep the flow of labour force coming through - a 50-year-old can't do the physical work of a 20-year-old. We've got to keep it going, we've learnt from past mistakes - we had a period of 4 or 5 years without apprentices and it cost us more money - because we had no apprentices we had to send two fully trained men out to a site due to health and safety requirements whereas we could have sent one fully trained with an apprentice.”

Medium sized organisation from Yorkshire and Humberside

A key drawback for organisations that take on apprentices:

“The disadvantage is that they started at the college on Monday and are there for 5 full weeks while the business still has to pay his wages, and that happens for 3 blocks this year. Striking a balance could be improved. His time at college could be split into smaller blocks e.g. two-week chunks at more regular intervals.”

Micro sized organisation from Scotland

A key opportunity for organisations that take on apprentices:

“Apprentices tend to come to us after a year at college - schools are not signposting candidates to apprenticeships. Our industry is not recognising the training they have already done which causes problems. For example, a candidate who has completed a year at college can't transfer what they have covered in that year over to JTL, the requirements are different. This could be more joined up and I do think it puts some people off [taking these candidates on].”

Medium sized organisation from Southeast England

Key threats to organisations that take on apprentices:

“Recruitment is a challenge as the pay is lower for apprentices compared to graduate schemes. The industry needs to improve its reputation as a career path.”

Micro sized organisation from Northeast England

“It is hard for a young person making the transition to the working environment and employers need to be aware of this, by helping them to adapt. It's not just about the technical skills, it's the little things they often struggle with like turning up on time every day.”

Medium sized organisation from Northern Ireland

7. Future of the electrotechnical sector

- ❖ Emerging and future technologies are expected to be the main driver of change in the electrotechnical sector over the next decade. Other areas that are likely to influence the sector include changes to regulations and the political agenda in areas such as energy efficiency and fire safety.
- ❖ The majority of employers are expecting an increased workforce in the future, most notably a greater demand for skilled electricians and technicians with advanced skills.
- ❖ There is minimal change anticipated by employers regarding the future core technical skill needs within the sector. Soft skills are highly regarded by employers and are expected to be of great importance in the future. Top of the priorities are problem solving, teamwork, communication and numeracy and literacy levels.

7.1 Major Drivers of Change in the Electrotechnical Sector

Employers made 501 references to forces they expected to influence and drive change in the electrotechnical sector over the next ten years. The majority of responses (see Figure 30) can best be categorised into four areas: technology including numerous types such as LED and SMART technology; changes to regulation including the 18th edition; increased workforce, the need for more skills and better education and training provision, energy efficiency and renewables.

Other expected drivers over the next 5-10 years include the UK's departure from the EU, health and safety, fire and security systems and consumer demand.

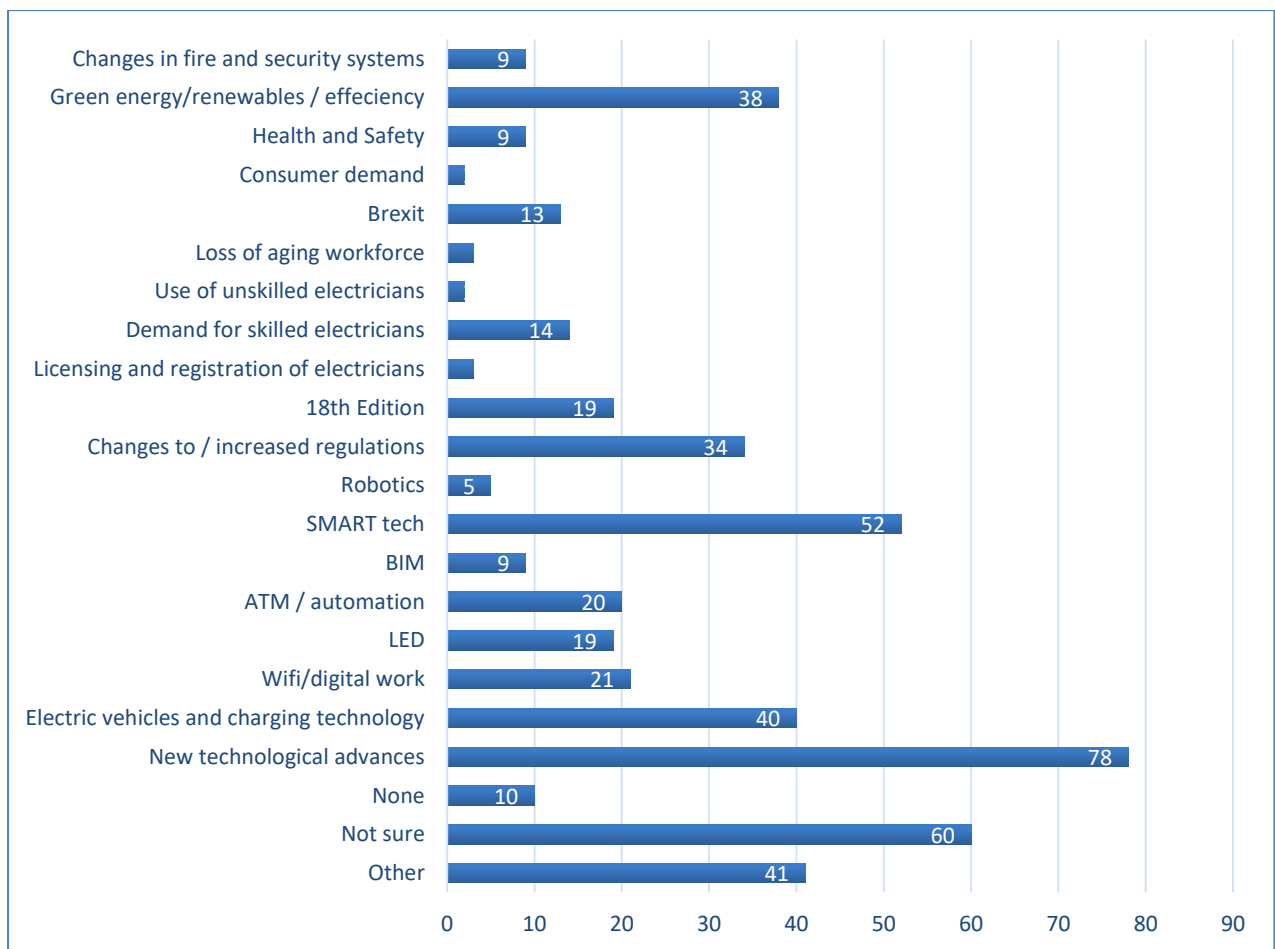
Almost half of respondent comments (48.7%) indicate that technology will influence the sector over the next decade. Employers pointed to the following, in order of mention:

- new technology (78),
- SMART technology (52),
- Electrical vehicles and charging (40),
- Wi-Fi and digital work (21),
- ATM and automation (20),
- LED lighting (19),
- Building Information Modelling (9), and
- Robotics (5).

Changes to the regulation of the industry were expected in 10.6% of responses (19 comments specifically cited the 18th edition as a major driver of change).

Energy related comments account for 7.6% of the total comments about major change, this is also the case for comments on fire alarms which support earlier suggestions that the political agenda and topical events such as Grenfell and climate change are highly likely to influence change in the electrotechnical sector. Few expect no change but large numbers (60) are uncertain what will drive change in the sector over the next decade.

Figure 29 Major Changes in the Electrotechnical Sector in the next 5-10 years



Base: 411. Pye Tait Survey, 2018.

7.2 Future workforce and career pathways

Future workforce needs are expected to remain constant or increase in quantity. Where most change is expected is the sector's need to have a workforce that can meet the demand of future technologies. Micro to medium businesses are predominantly more risk averse and are less willing to expand into new areas of technology and research. Whilst they recognise the value and potential for

large profits if they provide revolutionary technology, the risk to the business is considered too great, with many citing the lack of uptake in Solar PV as a reason for caution.

It is expected that large companies – “industry leaders” – will have the capacity to determine where the sector is heading with regard to meeting the demand for future technologies. One of their key workforce differences is the expectation of more project management roles, suggesting that further research and development projects are needed to assess whether there is value in exploring new and emerging technologies and then undertaking trials in those deemed to be the most game-changing.

Two major drivers of change were cited by large electrotechnical companies. First, the introduction of BIM and modelling is affecting the dynamic of projects as clients wishing to have greater control can assess overall project lifecycle costs and timescales through BIM. The second driver of change is the move towards more energy efficient and sustainable buildings, including the use of smarter building controls, as carbon initiatives and energy prices come to the fore.

In ensuring the future skill and workforce needs of the industry are met and to ensure future prosperity in the sector, a focus on education and promoting of the industry was seen as the most needed by employers. Better liaison between FE/HE training providers and employers was critical to ensuring that the bridge from education to work was seamless and that training providers were able to draw on practical experience to support knowledge.

In addition to this bridge for younger workers, large companies commented that focus should also be placed on training older staff in new technology (in all roles), taking them out of their comfort zone and giving them support and confidence to use emerging technologies regularly. Keeping all staff abreast of the latest updates to technical standards is equally important.

The need to promote a good and clear career pathway is seen as a valuable endeavour in support of the general promotion of the industry. A strategy that expands mindsets of young people, encourages the ones who have got that mentality in them to see that there is a career beyond being an electrician within the electrotechnical sector will highlight the sector’s position at the cutting edge of future technology and change across almost all sectors. Placing more emphasis on technical skills within courses, and on the opportunities and rewards available were noted as ways to attract the brightest of young people. In a sense, some myth-busting would also go some way to highlight the benefits of apprenticeships to both school leavers and more experienced individuals. Information regarding the training available and financial support for training were also seen as ways in which the workforce could be better supported for the future.

7.3 Future skills need

In terms of future skills, there is a growing trend towards automation and digitalisation which will mean that certain technical skills and occupations may be made obsolete and others will emerge. In spite of employers’ low scores for technical awareness and skills in the newer specialisms such as

Wi-Fi and the application of smart technology, there is little doubt that these will be extremely important in the years to come. The response of employers to digitalisation and other newer technologies in this survey is remarkably similar to their reaction to data-cabling and new forms of energy generation to the survey we conducted in 1999. There is no sense of employers dismissing the technologies, simply a possibility that their reactions owe more to a lack of awareness.

The relative lack of understanding of advanced technical skills has, however, increased the focus on “meta skills”, that is generic skills and behaviours that create adaptive learners and prepare the workforce for future changes⁴³. According to the Edge Foundation⁴⁴, five of these kinds of skills will prove to be indispensable for future success:

- Complex problem solving
- Creativity
- Cognitive Flexibility
- Emotional Intelligence
- Collaboration

In addition to these more generic skills for all sectors there is an expectation that, whilst electrical installation, repair and maintenance will remain core to the sector’s range of skills, the need for a more adaptable model that ensures training for new and emerging technologies and specialisations will be required.

One respondent from a large organisation noted that, compared to 30-40 years ago, current courses and apprenticeships focus much more on skilled work but contain less detailed technical knowledge than previously (e.g. interpreting circuit drawings) leading to a perceived skills shortage. This current approach to training therefore does not, the respondent argued, provide sufficient technical background to support foresight for the future of the sector.

7.4 Future technologies and the sector’s adaptability

Future technologies are expected to have a significant impact on the electrotechnical sector and this impact is only expected to increase in all cases (see Figure 30).

It is important for the reader to note that there is a difference between what employers may feel at the present time, based on differing levels of understanding, and the change anticipated by organisations like Innovate UK, BEIS, and some of the sector’s larger and more technologically-aware companies. This view was also reinforced by the stakeholders interviewed at the start of this research to inform the questionnaire.

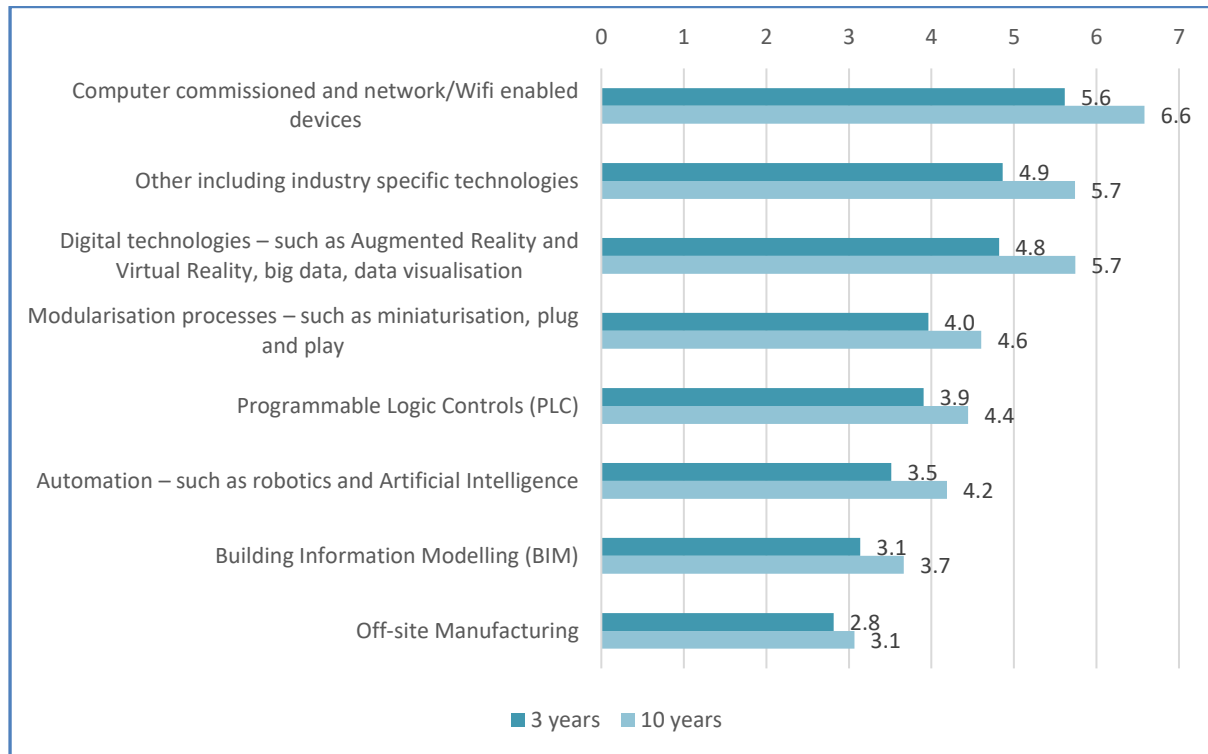
Looking at technological impacts, Wi-Fi is anticipated to have the greatest impact over the next 3 and then over the next decade. This is consistent with the anticipated reduction in the skill need for

⁴³ The Edge Foundation (October 2018), *Towards a Twenty-First Century Education System*, p.9-10

⁴⁴ <https://ukcareers.ey.com/students/career-advice/future-skills/what-is-eyfutureskills>

network cabling.

Figure 30 Technological Impact in the Electrotechnical Sector in the next 3-10 years



Base: 2011 responses. Pye Tait Survey, 2018. multiple selection responses

Employers have a positive view of the industry's ability to respond and adapt to technological and process change. It is, however, the view of some employers that the industry can be *'a bit slow to embrace new technologies'*, and that organisations *'tend to wait until someone has fully tested it before they're willing to fully embrace it'*. The pace of change was also felt to be *'dictated by money and spending power'*, supporting the lack of ability for micro to medium organisations to conduct such ventures. LED lighting for example is *'a no-brainer that you'd swap [from other lighting options], but it's still a cost when you've got hundreds of places with lights in'*.

The industry has a challenge to overcome in so much as older workforce members are perceived to take longer to adapt to new technology and that training these staff, especially those who are near retirement, is seen by some employers to not be a worthwhile activity. It is recognised that the risk of not adapting could lead to *'getting left behind'* but many consider the next generation of employees to be best placed to enable the industry to adapt. Conversely the speed of change in the industry is at risk of being beyond that of the consumer's capability to keep up.

BIM is seen to be one of the lower impact activities for the industry over the next 3 and 10 years, scoring 3.1 and 3.7 out of 10 for impact respectively (see Figure 31). One large organisation notes that *'a couple of market leaders are investing a lot of money putting themselves out there'* with

regard to BIM and Bluetooth technology, and that now *'the bigger companies are playing catch-up or have done so'*; the reward for investing in new and emerging technologies is recognised across the industry it is the risk posed to medium to micro sized companies that act as a deterrent to their ability to take part in such activity.

When considering both current and emerging technologies provided during the research in the sector three key themes were apparent in responses from micro-medium respondents: smart technology, renewable energy and, Electric Vehicles (EV). This is supported by those who cited other technologies that will have the most impact over the next decade of which over a tenth (10.5%) cited battery and charging (including electrical vehicles) and smart technologies (19.3%). The impact of the 18th edition as having an impact on the industry's future by a third of those who thought other technologies would impact the sector.

Electric Vehicles (EV)

Whilst EV were frequently mentioned there was a lack of confidence in the infrastructure being in place for the 2032 target of phasing out all petrol and diesel: *'it's a massive undertaking and one that doesn't appear to be achievable at present'*.

EV have a number of aspects where electrotechnical involvement is concerned but the most commented on is the electrical charging capability⁴⁵ and the infrastructure to support this capability. Experts predict that residential grids will play a crucial role in EV infrastructure, meaning that drivers will charge their vehicle from off-street parking at home or on the street. Experts distinguish between three broad categories of charging, of which level 2 is most appropriate to the UK:

1. Alternating current charging (Level 1 and Level 2) or "standard charging" – in use

Using an inverter Alternating current is converted to direct current to charge the vehicle battery. Level 1 represents the US standard voltage of 110-120V whereas Level 2 stands for the European voltage of 220-240V and therefore more important for the UK (see the chart below). It is envisaged that Level 1 and Level 2 systems will be the dominant technologies until 2030.

2. Direct Current fast charging (Level 3) - emerging

Very similar to alternative current charging but does not rely on the use of inverters. The chargers also have a higher capacity.

3. Wireless charging – emerging

Batteries are charged through electromagnetic waves. The waves are emitted from a socket in the wall and directed at a plate attached to the car.

Only a few years ago electric vehicles were considered something that may or may not arrive in a couple of decades.

⁴⁵ <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand>

As of 2019 the electro-technical industry is already beginning to address charging needs and employers who were interviewed expressed some concern as to whether standards and training could keep up with government targets.

Employers are anxious that the education and training undertaken by the sector and its providers should keep up with and if possible outstrip the pace of change towards this technology.

Source: McKinsey, 2018

Smart technology

Smart technology, specifically app-based equipment, smart controls and wireless communications for smart meters were mentioned as areas that will see a rise in demand in the electrotechnical sector. Employers suggest that these technologies should be *'simple for a qualified electrician'* implying that the sector is ready to meet this demand. One area of caution was that in new and unoccupied buildings these systems cannot be fully tested until a property is occupied and the apps have been set up by the occupants.

Bluetooth – and wireless technology in general – is predicted to become more commonplace, giving buildings greater flexibility in applications such as lighting, heating, power management, and air-conditioning, etc., and can be controlled remotely via app-based technology. Such solutions are becoming increasingly commonplace, and fittings for such applications contain a module that can process and is ready to use from a box (once set-up) and does not involve traditional installation of wiring and associated components. Data and information generated are delivered via Bluetooth and the IoT is integrating this information to update the end-user.

Renewable Energy

Renewable energy such as 'wind farms', bio fuels, nuclear energy and solar energy are common areas that are expected to influence the sector's future people and skills needs as well as small scale (domestic) PV production and storage. This is not only seen as something to benefit the sector but as something that is and will likely be increasingly driven politically to reduce the effects of climate change by becoming more energy efficient and 'green'. To quote one respondent, *'we are going into the electric era and sustainability is the key word from now to 2030'*.

7.5 The introduction of occupational licensing

Recent research in the construction sector has considered the merits of occupational licensing as a way to reduce concerns over the quality of workmanship. Recent consultations have determined that some view this as unfounded with little evidence to suggest that there is a need for this change, but many regard licensing as not without merit⁴⁶.

⁴⁶ <https://www.electricalsafetyfirst.org.uk/media/1626/best-practice-guide-4.pdf>

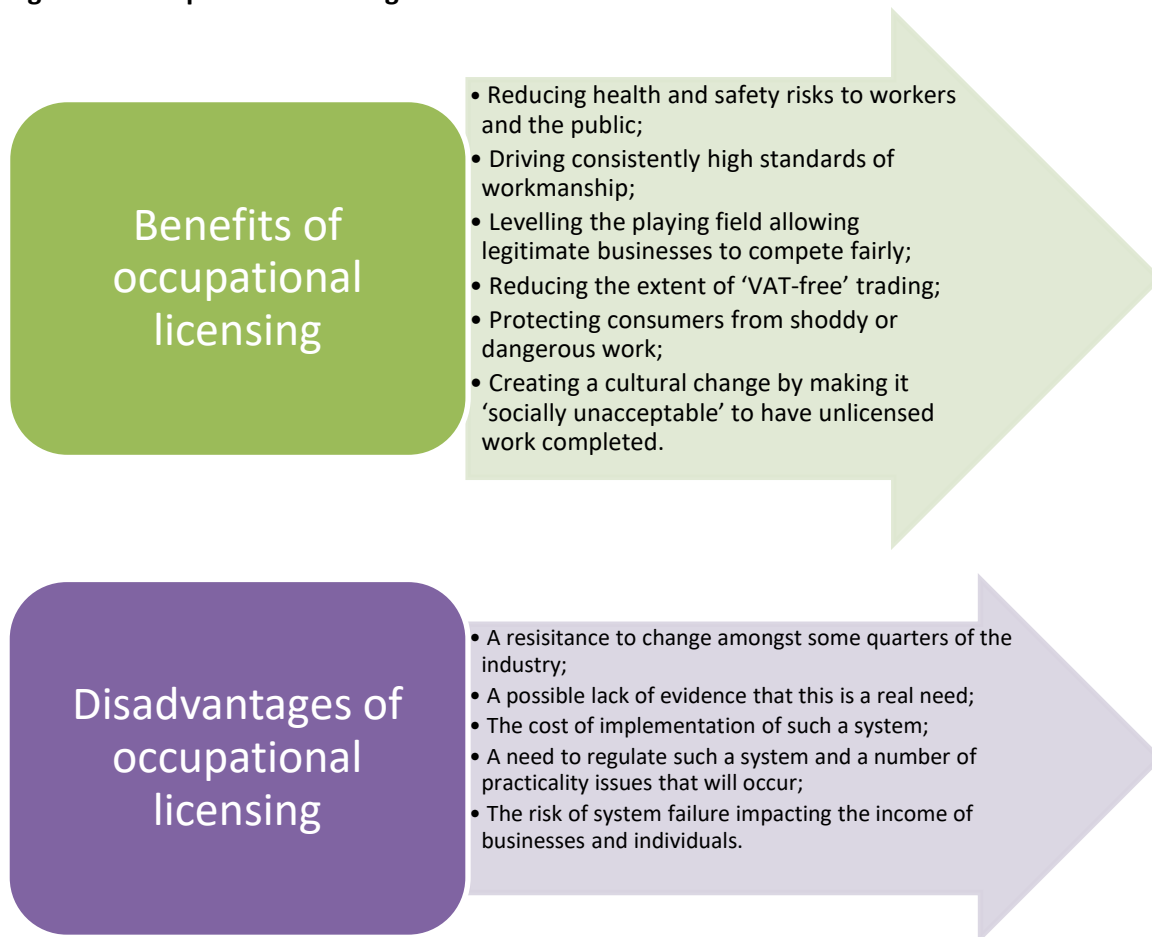
For the electrotechnical sector the subject faces several key challenges mainly around the reporting of incidents, the need for these incidents to be investigated in the first place and the fact that the electrotechnical sector remains unregulated. Trade body membership is an important and valued commodity for some but it is often suggested that it is less valuable than getting the job done for the lowest rate for customers. Consumer groups worry that forgery and fraud are too easy in an age where logos can be printed and stuck onto vans with no external control.

Another key aspect, specifically on the domestic front, is that many homeowners/landlords remain unaware of their responsibility for ensuring that the work has been conducted to the correct standard.

When asked for their views of the implementation of an individual licensing system half of respondents felt it would be a positive move with 29% opposed to the option. Of the negative responses, most referred to the existence of numerous bodies such as individual TESP partners who 'vet businesses' and already offer accreditations such as the ECS card and NICEIC, ECA or SELECT membership. This indicates that some respondents were unclear that the focus of licensing would be on individuals not businesses.

Respondents who were pro occupational licensing expressed views that it should be designed to protect 'industry standards' and raised the point that the industry appears too lax when compared to other trades such as 'GasSafe'. Some took this one step further to suggest that the purchase of electrical items should be restricted to competent persons to reduce the risk of dangerous electrical installations. It was suggested this was unlikely to take hold as it would have a negative impact on retailers of these products.

Licensing comes with a series of benefits and disadvantages. The diagram below is by no means an exhaustive list but highlights some key factors that drive opinion in this arena.

Figure 31 Occupational licensing benefits and dis-benefits

The consideration for the introduction of occupational licensing requires discussion of how such a system might be implemented, what would be necessary and who might be responsible for its implementation, auditing of the system and enforcement against those who might abuse the system.

Most employers suggested that organisations such as 'JIB', 'ECA' and 'NICEIC' would be the most appropriate to hold responsibility for monitoring, implementation and ensuring compliance. These options whilst offering technical expertise and industry knowledge have the potential to be viewed as having a conflict of interest in taking ownership. Other employers commented on the need for an independent body to be involved and other suggested something similar to the UK driving license approach, suggesting a government agency could be a suitable option for ensuring impartiality.

In order for a system to be worthwhile it was recognised that an online database that can be viewed would be required to ensure that consumers were able to ensure licensed professionals were not making attempts to defraud them which any replica or false advertising approaches to conduct electrotechnical work.

One of the key barriers to the sector in this area would also be the diverse nature of its role, therefore any licensing would need to determine which electrical work they are licensed to deliver for example commercial, domestic, agricultural, industrial. Due to the volume of potential sub categories of experience and competence it would be necessary to have the system supported by an online database that demonstrates skills in this area. It could also be used to support recruitment within the industry.

8. Conclusions

1. The electrotechnical sector is, today, very similar to the sector first researched for the *Skills and Labour Market Intelligence* report in 1999. It has altered only a little in size, and the drivers of change (albeit brought on by different technologies) are much the same: skills challenges and concerns about recruitment of young people, an ageing workforce, and the image of the sector.
2. The electrotechnical industry employs around 227,000 people but those with electro-technical skills operating across the UK total some 341,800.
3. With anticipated economic growth of between 1.4% and 1.7% annually over the next five years, the sector will grow to between 366,000 and 372,000 by 2023.
4. Sector expansion alone implies a need for an additional 8,500-10,500 electricians and 4,000-5,000 extra apprentices over the next 5 years. The latter figures would, of course, have to be increased to meet the extra recruitment required to address drop-out rates. This figure is additional to those needed to replenish leavers through retirement, emigration, or leaving the sector for other employment.
5. There are additional challenges. Recruitment into the industry is becoming increasingly difficult. Top-level issues include: the perceived primacy of the academic route over apprenticeships in secondary education; the need to improve the industry's links to, and collaboration with, HE/FE education and training providers; the dropout rate of apprentices and the perceived upfront costs potentially deterring employers from taking on apprentices.
6. The current demographic of the industry is dominated by white British males between the age of 25-49, strongly suggesting that recruitment could be bolstered by targeted recruiting in areas outside this demographic.
7. The industry currently has more employees in the over 50s age group than it does under the age of 25. This statistic is the tip of a serious iceberg whose hidden dangers include problems recruiting young people, problems recruiting people from under-represented groups, possible reductions in workforce due to early retirement, and, of course, the issue of relatively low numbers of employees remaining in work after the age of 65.
8. A parallel issue is the need to ensure that training and development provision for the industry not only ensures that the core need for electrical installation, maintenance and repair skills is met but that there is the capability to meet future skill needs as a result of a realistic anticipation of future technological developments. The corollary to this is an additional need to ensure that the speed of reaction by education and training to new technologies is sufficiently fast.

9. Future technologies are expected to be the most significant influencer and driver of change in the industry over the next decade. The political agenda is also a contributing factor in this area with topical subjects such as reducing carbon emissions, increasing regulation (especially after events such as the Grenfell Tower tragedy) and the financial issues represented by Carilion, and the UK's exit from the EU all having an impact on the direction and level of investment in future technologies.
10. Key new developments such as BIM, electric vehicle charging, new forms of generation, renewables, and battery storage are areas that being driven not only by global forces but by the current political agenda (not to mention parallel social pressures). All are anticipated by employers to grow rapidly in their impact over the next five to ten years.
11. For the most part employers are in two minds about the quality of education and training for the sector. On the one hand they are satisfied that current standards reflect current needs (subject to standards being kept up to date). However, they find themselves somewhat dissatisfied with current education and training provision – in contrast with previous research – on the basis of their perception that providers lack up-to-date tuition staff.
12. In contrast to the perceptions of many employers, the return on investment from employing an apprentice are potentially significant, even in purely monetary terms (i.e. putting aside the obvious benefit from having a home-grown skilled operative). Over the course of their training period apprentices appear at least to always break even in financial terms. Depending on the individual company's charge-out rates, apprentices can deliver substantial contributions to the bottom line over a four-year period.

9. Recommendations

Based on the conclusions and the findings of this research there are a number of options available to the industry to prepare itself for the future and we have presented these in a table below to sum up the issue and a potential action. In designing and implementing an action plan, particular account should of course be given to the preponderance of small and micro businesses in the industry and how such firms might be supported.

- ✚ The overall workforce issues, when considered together, require immediate action. This action could best be undertaken under a broad strategic plan that focusses on the recruitment of young people, recruitment of under-represented groups, behaviours and attitudes of existing workforces, retention of apprentices and other staff, and retention of older workers.
- ✚ Improving recruitment into electro-technical job roles is also a priority. All of these actions warrant consideration: a targeted strategy at secondary and tertiary education, helping employers with ways to retain apprentices (including possible moves to address rates of apprentice pay and subsistence), and considering recruitment of under-represented groups. This could include research into ameliorating attitudes and behaviours in the current, mainly male, workforce and into ways to retain older workers.
- ✚ Building on the impacts of future technologies gleaned from this research, further investigation may prove valuable into the views, perceptions and strategies of industry leaders in order to provide an “early warning system” for new technologies for the sector as a whole, and how they might be used. A Delphi format of PESTLE-focussed research supported by discussions with industry leaders about future technologies and developments would potentially provide much valuable data for all industry companies.
- ✚ Research into future technologies alongside the outcomes of technology Delphi groups could be used as the foundation of a review of Apprenticeship Standards in 2019. This would seek to have key organisations, industry bodies, government agencies, and employers provide data on the importance of technology-driven skills (for example for EV, energy storage, handling new technologies, etc.) in order to ensure that apprentices are equipped to meet the future demands of the sector. This work would also be invaluable for guiding the development of updating courses for existing operatives.
- ✚ Talking to training providers is an extremely important target. The sector requires regular and deep communications between it and those who provide education and training in the light of the outcomes from the current research. We would recommend a series of roundtable events at which employers and education and training providers, potentially also manufacturers/wholesalers, could discuss issues and potential solutions.

Table 8 Recommended actions and target groups

Proposed action and comments	Target Group	Problem
Research into the motivations for choosing the industry and reasons for drop out. An incentivised online survey could be a good starting point. Consider promotion and marketing strategies to increase recruitment.	Apprentices	Recruitment, dropout rates, pay, incentives.
Research into encouraging young people into the industry and the motivations for their career choices (those who join the industry and those who choose alternatives). Methods might include social media-based research and/or an online survey and focus groups to gather quantitative findings and deeper insight from young people. Work is on-going for a similar purpose in Scotland looking at Careers in Building Standards (2019).	Young people (with young apprentices)	Recruitment of young people into the industry
		Motivations for career choices
Research that investigates reasons for leaving the industry and possible approaches and support that could enable retention. A review of actions that targeted those approaching 50 to consider alternatives to total retirement such as research conducted in 2018 for CITB building on work by the Department for Work and Pensions that looks at 'fuller working lives'.	Ageing workforce	Retention of the ageing workforce
A review of literature on diversity and workforce attitudes and behaviours as a whole. Development of employer-support materials and promotional efforts designed to provide a clear view of the advantages of a diverse workforce.	Under Represented Groups	Lack of representation and diversity
Promote the findings of this study with respect to Return on Investment of apprenticeships and support this with signposting to standards and frameworks that enable these businesses to take on apprentices with greater ease.	Small and Medium sized businesses	Taking on apprentices
A mapping exercise of roles and potential future roles that are likely to become automated or obsolete. It is possible that TESP could lobby at government level for support to tackle unemployment from automation and ensure future workforce demand can be met for the electrotechnical industry. Consider also the impact of offsite production.	Those in roles being automated in related other sectors	Recruitment into the industry; emerging technologies.

<p>The pace of change is now such that employers in the industry would greatly benefit from a reliable glimpse of the future in all respects.</p> <p>A Delphi-style project considering horizon scanning, mapping with indicators, and warnings of their potential impact and influence over the sector would be invaluable.</p>	<p>Industry leaders and experts</p>	<p>Understanding the Future</p>
<p>It is essential that the industry and its education and training providers have a deep and ongoing dialogue about current and future needs and the issues which underlie them. Technology, apprentice training, tutor CPD, upskilling, and other topics could be regular discussions at regional round-table events.</p>	<p>Training providers</p>	<p>360° view for this research</p>

Appendix 1 - Survey questionnaire

Introduction

Good morning/afternoon. I'm calling from Pye Tait Consulting on behalf of The Electrotechnical Skills Partnership (TESP), whose partners include NET (National Electrotechnical Training), ECA (Electrical Contractors' Association), JIB (Joint Industry Board), SELECT and Unite the Union. We're conducting important research focussing on the activities, skills and staff delivering work in the electrotechnical sector.

We'd like to ask you some questions which should take about 10-15 minutes. The findings of the work will inform TESP/NET's strategy, help prioritise future actions and support the case for any funding initiatives.

Data protection

Your responses will be treated confidentially by Pye Tait Consulting and reported anonymously to TESP/NET in line with the Data Protection Act 2018, General Data Protection Regulations (GDPR) and the Market Research Society (MRS) Code of Conduct. Any Personal Data you choose to provide (where asked) will be on a voluntary basis, treated in the strictest confidence by Pye Tait Consulting, and only used for the purpose(s) stated in the questionnaire. You have the right to request any Personal Data you provide to be deleted at any time in the future. If you have any questions, please contact Pye Tait Consulting on 01423 509433, or email – info@pyetait.com

PART 1: Your business and your workforce

1. Firstly, where is your business based or headquartered? [Select one answer]

	North East
	Yorkshire & Humber
	North West
	West Midlands
	East Midlands
	East Anglia
	South East
	London
	South West
	Scotland
	Wales
	Northern Ireland
	Other

If Other – please specify:

2. Which of the following types of work do you undertake? [Select all that apply].

	New Fit Commercial
	New Fit Domestic
	Maintenance Commercial (includes hospitals)
	Maintenance Domestic
	Other

If Other – please specify:

3. And, what sort of activity? [Select all that apply].

	General electrical installation, maintenance and repairs
	Fire, detection, and alarm systems,
	Emergency and security systems,
	Highway electrical
	Audio-visual
	Solar pv, generators etc
	Battery storage (includes electrical vehicle charging)
	Earthing eg surge protection, lightning protection, etc)

If Other – please specify:

4. What proportion of your work falls into each of the following sectors? [Enter ONLY a number from 0 to 100 and exclude % symbol]

Commercial/Industrial	%
Domestic/Residential	%
Auto-total (must add up to 100%)	%

5. By splitting your workforce into PAYE direct employees and ‘other’, how many people within each of these categories does your business a) currently employ/engage, and b) hope to employ/engage in five years’ time?

6. (5yrs time)

	Now	5 years’ time
PAYE direct employees		
‘Other’ (including self-employed staff)		
Auto-total:		

7. How many of your workforce are: (Entire workforce including admin etc)

Male	
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Female	
Auto-total (must equal total in q5)	

8. How many fall into the following age groups:

Under 25	
25-49	
50-64	
65+	
Auto-total (must equal total in q5)	

9. How many are ... ?

UK Citizens	
EU Citizens (non-UK)	
Non-EU Citizens	
Auto-total (must equal total in q5)	

10. How many have a disability (as defined by the Equality Act of 2010)?

PART 2: Workforce turnover

11. Over the past year, how many vacancies have you: 1) advertised in total; and 2) advertised but which have proved hard or impossible to fill, of the following

	Advertised in total (numbers)	Hard to fill (numbers) (go to Q13)
Directors and managers of business functions		
Supervisors		
Project personnel, including contract, estimators and planners		
Skilled eg Qualified Electrician		
Semi-skilled		
Unskilled eg. Labourer		
Apprentices/Trainees		
Other		

12. If Other – please specify:

13. If 'hard to fill' ticked: Which specific job roles have you found hard or impossible to fill and why

do you think it was so challenging?

Job role?	Challenges?
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14. How many apprentices has your organisation taken on in electrotechnical roles over the past year and how many do you expect to take on over the next year?

Past year (mid 2017 to mid-2018)	
Next year	

15. Which of the following or other barriers have you faced in finding and recruiting new apprentices? (Tick all that apply)

<input type="checkbox"/>	Insufficient supply of applicants
<input type="checkbox"/>	Applicants lack sufficient knowledge
<input type="checkbox"/>	Applicants lack sufficient qualifications
<input type="checkbox"/>	Applicants lack the right attitude or behaviours
<input type="checkbox"/>	Other

16. In the past year, how many of your directly employed staff have left your organisation for each of the following reasons:

Due to retirement (by choice)	
Due to retirement for such as health reasons	
To work for another employer in the electrotechnical sector	
To work for an employer in a different sector	
To start own business	
Made redundant	
Other	

17. If Other – please specify reasons:

18. [If Q ABOVE = option 4:](#) Which sector(s) did these staff move to?

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PART 3: Workforce training and development (including apprenticeships)

19. Have any of your staff received training over the past year

Yes	Go to Q20
No	Go to Q21

20. How many of your staff received training over the past year?

On-the-job training only	
External training only, i.e. through a college or other training provider	
Mix of both	
AUTO-Total	Then Go to Q22

21. What are the reasons for your workforce not having received any non-mandatory external training over the past year? (Tick all that apply)

<input type="checkbox"/>	Staff are already sufficiently trained
<input type="checkbox"/>	Prefer to train staff in-house
<input type="checkbox"/>	Not enough external training available locally
<input type="checkbox"/>	Concerns about the quality of external training provision
<input type="checkbox"/>	External training is too expensive
<input type="checkbox"/>	External training is too time-consuming/bureaucratic
<input type="checkbox"/>	Worried staff may leave if they benefit from external training
<input type="checkbox"/>	Other

If Other – please specify:

22. How do you think the demand for electricians will change in the next two to three years?

	Increase	Remain the same	Decrease
Skilled eg Qualified Electrician			
Semi-skilled			
Unskilled eg Labourer			

23. What changes would you make to current qualifications to ensure that they fully reflect the demands of the work?

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24. Looking further into the future, what do you think will be the major changes in the electrotechnical sector in the next five to ten years?

PART 4: Skills (and gaps)

Please answer the following questions openly and honestly. Remember your answers will be treated anonymously and will help to identify where there are weaknesses in electrotechnical skills that need to be addressed.

	25. On a scale from 1 to 10, how would you rate the current skill level of your electrotechnical workforce relating to each of the following?	26. On a scale from 1 to 10, how would you rate the future importance of that skill over the next three years?
	1 = skills completely lacking 10 = perfectly skilled	For example: 1 = not at all important 10 = extremely important
Technical skills		
Maintenance testing & repair		
Electrical Installation domestic (or private dwellings)		
Electrical Installation commercial/industrial		
Fire Detection and Alarm Systems		
Security & alarm systems		
Building systems management		
Smart-home technology		
Audio-visual systems		
Network cabling		
Highway electrical		
Earthing/Surge protection		
High voltage supply/generation		
Renewable power generation & installation		
Battery storage, including electric vehicle charging		
BIM (Building Information Modelling)		
Soft skills		

Problem solving		
Spoken English		
Written English		
Maths		
Team working and communication		
Management and leadership		
Risk and safety management		
Project and time management		

27. What would you say might be the reasons for skills deficiencies in the electrotechnical sector? (Tick all that apply).

<input type="checkbox"/>	Ageing workforce experiencing difficulties in keeping up-to-date
<input type="checkbox"/>	Inappropriate training courses (insufficient depth)
<input type="checkbox"/>	Insufficient knowledge/skill in new digital technologies
<input type="checkbox"/>	Insufficient knowledge/skill in new equipment
<input type="checkbox"/>	Insufficient knowledge/skill in new materials
<input type="checkbox"/>	Insufficient knowledge/skill in new methods of working
<input type="checkbox"/>	Staff are reluctant to undertake additional training
<input type="checkbox"/>	Staff need refreshing in current methods
<input type="checkbox"/>	Training is too expensive
<input type="checkbox"/>	Training is too time-consuming
<input type="checkbox"/>	We're unable to access suitable external training to meet our needs
<input type="checkbox"/>	Other

If Other – please specify:

28. What actions do you think are needed, if any, to tackle recruitment problems and skills shortages in the electrotechnical sector? Tick all that apply.

<input type="checkbox"/>	More action by trade associations
<input type="checkbox"/>	Improve standard of teaching in colleges
<input type="checkbox"/>	More courses offered by colleges/providers
<input type="checkbox"/>	Fewer courses offered by colleges/providers
<input type="checkbox"/>	Greater promotion of electrotechnical careers
<input type="checkbox"/>	Bring the college tutors up-to-date in modern techniques and equipment
<input type="checkbox"/>	More training provision for apprenticeships
<input type="checkbox"/>	Build new/emerging technologies into Apprenticeship Standard
<input type="checkbox"/>	Improve technical qualifications
<input type="checkbox"/>	Other

If Other – please specify:

29. Do your workers have sufficient skills to be able to move competently from the domestic to the commercial sector, or vice versa?

	Yes	No
Domestic to commercial		
Commercial to domestic		

30. How would you say the skills requirements differ between domestic and commercial work? Please provide some brief detail. (if no, none, nil etc please enter as NONE)

PART 5: Future and technology

31. (next 3 years) Thinking about emerging technologies and processes (see below), please rate each of them from 1 (no impact) to 10 (significant impact) to reflect the **expected** impact on your business over the next three years and the next ten years.
(next 10yrs)

	Next 3 years	Next 10 years
Digital technologies – such as Augmented Reality and Virtual Reality, big data, data visualisation		
Programmable Logic Controls (PLC)		
Computer commissioned and network/Wifi enabled devices		
Automation – such as robotics and Artificial Intelligence		
Modularisation processes – miniaturisation, plug and play		
Building Information Modelling (BIM)		
Off-site Manufacturing		
Other including industry specific technologies		

32. If Other – please specify:

33. As a direct result of new technologies and processes over the next three years, for each of the following job roles, please state whether you expect demand for these roles to increase, remain the same or reduce.

	Increase	Remain the same	Reduce
Directors and managers of business functions			
Supervisors			
Project personnel, including contract, estimators			

and planners			
Skilled eg Qualified Electrician			
Semi-skilled			
Unskilled eg labourer			
Apprentices/Trainees			
Other			

34. What challenges, if any, does your organisation face in adopting these types of new technologies and processes? (Tick all that apply)

<input type="checkbox"/>	Lack of finance/resources
<input type="checkbox"/>	Lack of time to make big changes
<input type="checkbox"/>	Lack of information/awareness
<input type="checkbox"/>	Workforce lacks the skills to adopt them
<input type="checkbox"/>	Dependent on other organisations in the supply chain adopting them
<input type="checkbox"/>	Lack of readily available training courses
<input type="checkbox"/>	Training courses are not at the cutting edge of industry needs
<input type="checkbox"/>	Don't see as relevant to our business
<input type="checkbox"/>	Prefer to research new technologies and processes according to client demands
<input type="checkbox"/>	No challenges (no other boxes can be ticked)
<input type="checkbox"/>	Other

If Other – please specify:

35. Which lifestyle changes are affecting the way your business and employees work? (Please tick all that apply)

<input type="checkbox"/>	Maternity leave
<input type="checkbox"/>	Paternity leave
<input type="checkbox"/>	Requests for work with less travel
<input type="checkbox"/>	Requests for flexible working hours
<input type="checkbox"/>	Requests for work over fewer week days
<input type="checkbox"/>	Other
<input type="checkbox"/>	

If other, please specify

PART 6: Additional comments

36. Do you think there is an appetite for a compulsory industry-recognised licence for individual electricians rather than organisations?

Yes

No
Don't Know

37. Do you have any other comments in relation to the electrotechnical workforce, its training, qualifications and development?

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38. Thank you very much for taking the time to complete this survey. Please let us know if you are willing to be re-contacted by us for one or both of the purposes set out below:

	Yes	No
To clarify any of the information you have provided in this survey		
To invite you to take part in a follow-up telephone interview to explore your views on this subject in more detail?		

39. If Yes to Q ABOVE (a or b): Thank you. Please provide your contact details below.

Any Personal Data you provide will be separated from your other responses and retained ONLY for as long as it takes to be checked and analysed. This is usually within a week and always within a month of the survey process being completed.

Name:	
Organisation:	
Telephone number:	
Email address:	

PART 7: Optional questions

The following two questions have been included so that TESP/NET can better understand diversity within the electrotechnical sector.

If you do not wish to answer these questions, please leave blank and click SUBMIT at the bottom of the page to submit your response.

40. Over the past three years would you say the proportion of ethnic minorities working in your organisation has:

	Increased more than 20%
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	Increased 1-19%
	Not changed
	Decreased 1-19%
	Decreased more than 20%
	Don't know
	Prefer not to say

41. How many of your UK electrotechnical workforce identifies with each of the following ethnic groups and backgrounds?

Enter a number ONLY and respond ONLY about your UK workforce.

English/Welsh/Scottish/Northern Irish/British	
Irish	
Gypsy or Irish Traveller	
Any other White background	
White and Black Caribbean	
White and Black African	
White and Asian	
Any other Mixed / Multiple ethnic background	
Indian	
Pakistani	
Bangladeshi	
Chinese	
Any other Asian background	
African	
Caribbean	
Any other Black / African / Caribbean background	
Arab	
Any other ethnic group	
Total Number	

PART 8: Individual and Company Details

Appendix 2 – England

The majority of the electromechanical sector in the UK is based in England. Therefore, the main body of this report is likely to be the best source of data for advising on national level strategies for England. However, this appendix includes standout regional findings from across England.

- More England-based employers report taking on commercial work than domestic. The North of England (including the Northwest, Northeast and Yorkshire and Humberside), London and the East Midlands reported the highest proportions of companies delivering commercial work. This is likely influenced by the location of other industry powerhouse locations and infrastructure projects.
- Workforce demand across England is largely consistent with UK findings. Exceptions include respondents from the Northeast which expect the least change and the Southwest of England, London and the West Midlands who are expecting the highest levels of increased demand.
- Respondents from the Southeast of England and the East Midlands demonstrate higher levels of youth employment in this research.
- The West Midlands reported a lower proportion of companies (73.3%) than elsewhere that send their staff on non-mandatory training annually. One of the reasons for this could be related to the depth of training available which over a third (36%) of employers in that region indicated was the cause of skill deficiencies in the sector. Also, almost half of companies (46.4%) in this region called for improvements to the technical qualifications with all others closer to the UK average of 26.1%.
- Greater promotion of careers within the industry was a particular area where many employers believe more could be done. Companies in East Anglia (83.3%) and the Northeast of England (69.6%) voted overwhelmingly for more to be done in this area.
- Regional trends were consistent with the UK when considering future challenges with the main absence of the norm being in the Northeast of England where a higher proportion (39.1% compared to the 19.6% UK average) are expecting to face no challenges.

Appendix 3 – Scotland

The electrotechnical sector in Scotland has some key differences with the rest of the UK. This aspect of the report comes with a strong caveat that it is based on a small sample of Scotland-based organisations and therefore the data have a greater margin for error than the main report. As a result, these findings should be considered as the view of a very small sample of the industry in Scotland and not nationally representative of the Scottish electrotechnical industry.

- Scotland's workforce profile demonstrates a strong core of general electrical installations, maintenance and repair work (conducted by 93% of organisations). Fire, Emergency, and Security work is second at just under two fifths (37.9%). Scotland exceeds the 9.8% UK average by having 4% more organisations conducting work in Solar PV.
- Tackling the ageing workforce is a key area of success in Scotland, this is reflected in it having the lowest number of concerns with the promotion of careers within the sector across the UK. Scotland-based employers have on average 7-8 employees under the age of 25, more than double that of other areas across the UK.
- Scotland is expecting less change in workforce demand than other UK nations, with only Scotland's expectation for an increase in semi-skilled workers (52.9%) to be above the UK average.
- The largest single category of respondents (31.0%) believe that future technology will have minimal impact on their businesses. Of those some expressed concern over the industry's preparedness to meet training needs when these technologies emerge. Employee training in Scotland is above the UK average with 93% of Scotland-based employers putting staff through non-mandatory training annually.
- The most influential factors for skill deficiencies are the time it takes to train (41.7%) and the cost of training (37.5%). Reasons surrounding knowledge and equipment were selected by 20-30%.
- Over two fifths (40.7%) of Scotland-based employers want interventions that improve training provisions for apprenticeship programmes, a third seek improved teaching standards and over a quarter (29.6%) want more focus on future technologies within the apprenticeship programme. Apprentices are seen as invaluable to the sector with concerns that academic pathways are preferred by parents, teachers and students over the modern apprenticeship.
- Scotland demonstrate the highest favourability on the introduction of occupational licensing into the industry with almost two-thirds (65.5%) voting in favour of it.

Appendix 4 – Wales

The electrotechnical sector in Wales is consistent for the most part with the wider UK view demonstrated within this report. This aspect of the report comes with a strong caveat that it is based on a small sample of Wales-based organisations and therefore the data that has a larger margin for error than the main report. As a result, these findings should be considered as the view of a small section of the industry in Wales and not nationally representative of the Welsh electrotechnical industry.

- More so than Scotland, 95% of Wales-based employers conduct general electrical installations, maintenance and repair. Wales differs to the rest of the respondents across the UK by having almost one third of respondents involved in earthing and over a quarter in audio visual electrotechnical work.
- Wales has greater parity between organisations delivering domestic and commercial work compared with the other three UK nations. Over four fifths of respondents (84%) state that domestic and commercial skill requirements are transferrable but that the need for greater technical knowledge in commercial settings.
- The ageing workforce is a key concern in Wales. It is believed that attracting new and quality talent into the sector is an issue with two fifths believing better promotion of electrotechnical careers is needed. Workforce demand is expected to increase across all job roles (albeit with similar numbers believing it will remain the same). Around 58-59% expect an increase in skilled and semi-skilled worker demand.
- Wales is notably lower than the others in providing a rationale for skill deficiencies in the industry, although most companies in Wales stated that they provide or outsource non-mandatory training each year. Time, cost and the availability of training were seen as the main barriers. This is compounded by the risk of skill flight, which can deter employers against providing training and reduce their future appetite to take on an apprentice.
- The attitudes and behaviour of apprentices is the biggest concern for employers regarding this group. Their poor work ethic and unwillingness to work in unappealing conditions was cited as particular undesirable traits.
- Electrotechnical companies in Wales expect little change in the future of the sector but noted that more should be done to modernise the sector and its training provisions. There was also a call for a more 'hands-on' approach to training. In terms of course content, a greater variety of modules including specific mention for Fire, Emergency and Security Systems and LED Lighting.

- In terms of embracing future technologies it was suggested that only larger companies will have the finances and appetite, with the risk for smaller organisations being too great.

Appendix 5 – Northern Ireland

This aspect of the report comes with a strong caveat that it is based on a small sample of Northern Ireland-based organisations and therefore the data that has a greater margin for error than the main report. As a result, these findings should be considered as the view of a small sample of the industry in Northern Ireland and not nationally representative of the Northern Irish electrotechnical industry.

The electrotechnical sector in Northern Ireland draws parity for the most part with the wider UK's view demonstrated within this report, notable exceptions are regarding the reliance on workers from the EU (notably the Republic of Ireland) which could pose significant issues and change following Brexit. A wider issue specific to Northern Ireland is the absence of the Stormont chair in parliament that has placed some projects on hold, impacting the electrotechnical sector and beyond.

- In Northern Ireland, twice as many companies are delivering commercial work (both new fit and maintenance and repair) compared to those operating in the domestic environment. With only 60% of employers stating that domestic electrotechnical skills are transferable to commercial work, this differs from the UK average of around 80%.
- 91% of Northern Ireland-based employers are expecting an increase in the demand for skilled electricians with 73% who believe the same of semi-skilled workers. Brexit's impact on the large EU workforce in Northern Ireland is expected to be a major driver of change in the next 3-5yrs, with the contentious border issue between the Republic of Ireland and the UK leading to concerns over the availability of the EU based workforce and suggesting an even greater burden on recruitment into the sector.
- The training and development concerns in Northern Ireland include the poor availability of training and the ability for training content to meet employer needs. Some also suggested that training could lead to skills flight to the likes of Australia.
- For the electrotechnical sector in Northern Ireland the benefits of taking on apprentices are viewed to be that apprentices can be trained to meet the business need and that the apprenticeship route is the only way to ensure good candidates are brought into the business but note that candidate quality varies. Drawbacks are deemed to be their desire for roles closer to home, thus reducing sector mobility and that the transition from full time education to the working environment can be a struggle for some candidates.
- Employers are expecting Northern Ireland to embrace emerging and future technologies but anticipate slow reactions with companies waiting for someone else to take the risk first before they are willing to embrace it fully. A lack of information and awareness (36.4%) and the dependencies on others in the supply chain (36.4%) was seen as the main influencing factors for this approach. The modernisation of techniques and equipment for training were cited as the key requirement to ensure that training would meet industry skill needs.

Appendix 6 – About ‘The Electrotechnical Skills Partnership’

To shape policy TESP works with a range of political stakeholders to ensure that changes in the political and legislative landscape supports employers and employees in the electrotechnical industry. TESP’s current priority is to ensure that changes to the apprentice funding system balances the aims of Government with the needs of industry.

To raise standards and promote professionalism TESP works with employers to develop and set the training standards for the electrotechnical industry. This includes current and new occupations, and spans entry level through to upskilling and Continuing Professional Development (CPD) and includes provision for specialist areas. TESP’s aim is to ensure there is a coherent and holistic pathway between standards, assessment and accreditation for all electrotechnical professionals regardless of age or experience.

To promote career opportunities TESP works with employers and relevant stakeholders to promote careers in the industry and to ensure high-calibre individuals are recruited and retained by the industry to maintain the levels of personnel required.

Appendix 7 - Comparison of apprenticeship levels in UK nations

England	Scotland ⁴⁷	Wales ⁴⁸	Northern Ireland ⁴⁹	Equivalent educational level
Intermediate	Foundation or Modern Apprenticeship	Foundation	Level 2 Apprenticeship	GCSE, Standards Grade, SVQ or NVQ Level 2
Advanced		Standard	Level 3 Apprenticeship	A level, Higher, SVQ Level 3
Higher	Modern or Graduate Level Apprenticeship	Higher	Higher Level Apprenticeship	Foundation degree and above
Degree		Degree		Bachelor's or master's degree

The table below shows the range of available electrotechnical apprenticeships in the four nations.

Apprenticeships in the four nations with Electrotechnical relevance

Nation	Apprenticeship title	Level
England	Installation electrician/maintenance electrician	3
	Highways electrician/service operative	3
	Highway electrical maintenance and installation operative	2
	Electrical, electronic product service and installation engineer	3
	Electrical/electronic technical support engineer (degree)	6
	Embedded electronic systems design and development engineer (degree)	6
Northern Ireland	Level 2 Apprenticeship in consumer electrical and electronic products	2
	Level 3 Apprenticeship in Electrotechnical	3
	Higher Level Apprenticeships in Construction (Building Services Engineering)	4

⁴⁷ <https://www.ucas.com/alternatives/apprenticeships/apprenticeships-scotland/scottish-apprenticeships-entry-requirements>

⁴⁸ <https://www.prospects.ac.uk/jobs-and-work-experience/apprenticeships/apprenticeships-in-wales>

⁴⁹ <https://www.belfastmet.ac.uk/apprenticeships/higher-level-apprenticeships/> and <https://www.nidirect.gov.uk/articles/level-3-frameworks-apprenticeships>

Scotland	Modern Apprenticeship Electrical Installation	3/4
	Modern Apprenticeship Electronic Security Systems	3/4
Wales	Electrotechnical (Wales)	3

Appendix 8 – Industry Case Studies

The four case studies below have been selected (and approved by the companies concerned) as demonstrations of some of the modern skills issues being faced by electro-technical contracting businesses and how they meet those challenges.

Adele Wilkinson, Director, Envirolectrics Ltd. (Yorkshire and Humberside)



Recruitment challenges and investing in young people

Adele Wilkinson is a Director at Envirolectrics, a micro company based in West Yorkshire specialising in design, maintenance and installation of electrical systems. Adele feels that, to encourage youngsters in this sector, more promotion is required in schools at a younger age.

“You’ve got to start to get them around the time when they’re making GCSE choices, about 14, on a par with when they might start thinking about going to university.”

The LMI research supports these findings with most employers concerned that recruitment has become more difficult, the industry and learning providers are less aligned than has previously been the case, and that schools are also trying to push students down the academic route more, which contrasts with employer preferences for greater hands-on training.

Furthermore, with a background in teaching A levels, Adele believes a fundamental shift in the perception of the routes available to pupils is required.

“I could see what was going on in college, that if you didn’t go to university you were a failure almost. There’s a view that everyone should go to university and apprenticeships don’t have a very positive image, especially electrical which is not being promoted as an academic subject. It is a scientific subject in terms of design and calculations, there are brains involved, which makes it different to plumbing or joinery, say.”

The electrotechnical sector is often considered as part of the construction industry. There are similarities between the two sectors and electricians are needed to install, maintain and repair the electrotechnical components within various infrastructures. However, the breadth of the

electrotechnical sector is vastly expanding to support emerging and future technologies in arenas such as electric vehicles, green and renewable energy, the Internet of Things (IoT) and Wi-Fi enabled devices. To promote the sector's need for strong academic credentials the development of a promotion strategy that targets and informs schools, HE/FE training providers, parents and students of the importance and value of a career in the sector would hold great value in protecting the sector against issues such as an ageing workforce, skill shortages and increases in workforce demand. In terms of attracting young people, Adele believes that apprenticeships are critical to the future of the workforce.

“Young lads learning straight out of school have got a good, long career ahead of them with lots to learn. The advantage for us is that we train them up as we are in quite a niche area of work and we can't find anyone who's qualified to do what we do exactly or has got the right experience.”

This is consistent with employer views that indicate that apprenticeships are fundamental to the future workforce. They provide extensive benefits which include: a workforce with hands-on experience, employees that are trained in the nuances of the company, a willingness to embrace technologies, and provide business succession.

Adele stated that, being a micro company operating nationwide, the ability to be mobile is also a key consideration when taking on new starters. This runs counter to the employer expectations that anticipated a greater demand by employees to remain closer to home and have greater flexibility.

“The biggest issue is their ability to drive, obviously they can't drive if we take them straight from school, but if we take them when they're a bit older with a licence then that's a massive bonus to us.”

Adele would like to see training providers working closer with employers to enhance what they currently offer. The view of most employers is that the links between HE/FE training providers is getting better but this followed a steep decline. This relationship is not deemed to be what it once was.

“Their links with us aren't strong enough so we don't really know what apprentices are learning, or their scheme of work, or what the specification really means. We don't see the detail: we have to ask for it, it's not included in the documentation we receive. If apprentices can come back to me with a few certificates for basic things like manual handling, health and safety, PAT testing etc., then we don't have to release them later once they start work to do these.”

This is an area where Adele believes that industry bodies could make a real difference. Others have noted the changing availability of training suggesting that some would prefer a large training provider that does everything whilst others seek something that is cost effective and in close geographical proximity.

“If someone like ECA could cover a range of things like health and safety as well as technical aspects to make a single training package which would be cheaper, that would be great, rather than having lots of different schemes with lots of varying elements. It’s about trying to pull it all together and rationalise it.”

When it comes to recruiting for more experienced roles, Adele has found that the talent pool locally is rather limited. Employers across the sector have noted the reduction in talent and the quality of talent as key issues that are facing the industry and that these issues are likely to get worse over time.

“We advertised for a qualified guy and we had applicants from Portugal, China and Russia with PhDs or who wrote to us in Portuguese. Of more local guys there weren’t many who could apply with qualifications and experience.”

Enviroelectrics look for a broad spectrum of abilities including both technical and softer skills. Soft skills are deemed by employers to be growing in need and the expectation is that this growth in demand and quality will continue. Technical skills are expected to increase in need in both cases however, employers have noted that new and emerging technologies mean that other technical abilities may be required in the future.

“Written skills, oral communication, and being able to express ideas can often be lacking. We’re quite a technical company so we’re also looking for the ability to be more than just a basic installer - we look for an ability to design and be more technical.”

Chris Allen, Senior Operations Director, FES Group (Scotland)



The impact of emerging technologies on the sector and skill needs

Chris Allen is Operations Director at FES Group, a large company based in Scotland delivering a range of services, products and building service solutions across a variety of market sectors, including electrotechnical. Chris is cautiously optimistic about the future of the sector and highlights areas where the industry is picking up.

“There are a lot of good opportunities, but there’s also talk around projects taking place and if they will actually appear. We see Universities investing a lot of money in terms of refreshing their existing buildings or adding to their portfolio; the other area is refurbishment of office buildings, there appears to be an upsurge in that

sector again.”

The LMI research has demonstrated that most employers are expecting the workforce demand to increase or remain the same. The demand for skilled electricians is expected to increase by over half (55%) of employers and less than one in ten (7%) are expecting a decline in demand in the future. Chris believes that the introduction of BIM and modelling is having a profound effect on client-contractor relationships and the way the electrotechnical industry operates.

“Clients are demanding to be fully informed on how their building operates including environment performance. The expectation is that the BIM process will deliver the models, data and information in a way that will add real value to support the ongoing management of the assets in the operational phase, and in turn support the organisations wider vision, mission and strategic objectives. There is much more focus and energy here and it’s not just on the outlaying capital cost, but on the full lifecycle of maintenance strategy and regimes. That’s all being developed through BIM.”

The research on the industry suggests that BIM is less likely to have a vast, widespread impact on the sector. BIM, as Chris suggests is likely to have more of a significant impact on large businesses who will be expected to provide greater project insight to clients. The majority of businesses in the sector are micro organisations and many operate on small domestic works or are likely to subcontract work from large companies who would be expected to provide this client facing capability.

Besides BIM, Chris notes that there are two, interconnected emerging technologies within the industry at the moment: the Internet of Things (IoT) and Bluetooth technology.

“We’re seeing a massive difference in lighting and heating solutions via Bluetooth and infra-red; when previously wiring installations and components were quite cumbersome, now you get power supplies and light fittings with a module in the fitting that can process; it comes out of a box and is ready (plug and play). IoT is integrating all the information and giving the end user more data. I think wireless technology is the next big thing that will take off in years to come - that is the way the industry is pushing to give buildings more flexibility.”

This view is embraced by the industry who rate network and Wi-Fi enabled devices, such as Bluetooth, smart technology and the IoT as the most game changing technologies that are likely to impact the sector over the next 3-10 years. Embracing technological change across the wider electrotechnical sector will take time, Chris believes, and often companies do not wish to invest until a technology is proven, even though they are yet to realise their full potential.

“There are several market leaders investing a lot of money putting themselves out there in the industry, and we’re now seeing bigger companies playing catch-up to ensure they remain an effective solutions provider. In terms of BIM, there are still some companies that aren’t up to speed yet, providing a library of information. For

Bluetooth, that will be introduced not just for lighting but also for mechanical systems such as heating and venting installations.”

This view is consistent with micro, small and medium sized companies who expect less impact from emerging technologies due to their risk adverse nature. Some employers suggested that investment in Solar PV, which was not reciprocated by consumer demand, left business owners wary of investing in technologies.

Training the workforce to have the ability to deliver such solutions is critical to their implementation and Chris notes that a skills gap might exist across different age groups.

“Technology is smartphone/app-based, and staff can modulate areas and spaces through use of a phone rather than by more traditional means. With technology always advancing, kids and apprentices nowadays have grown up through this technological age and been brought up with computers, tablets and smartphones. The industry needs to look at training the older generation around using new technology and to give them confidence to use a smartphone and technology and provide support. There’s possibly a skills gap within the older generation, who have less confidence to use new technology as you’re taking them out of their default comfort zone.”

This view matches that found across this research where employers have noted that older workers are less willing to upskill in future technology. Furthermore, employers prefer to use the younger workers, who as Chris indicates ‘have grown up through this technological age’, to remain current in technology.

Adrian Cross, Managing Director, Gilbert and Stamper Ltd (Southeast of England)



Apprenticeships as a means of securing the future workforce and a view on industry licensing

Adrian Cross is the Managing Director of Gilbert and Stamper Ltd based in Tonbridge, a medium sized business providing commercial and domestic electrical services. They currently have ten apprentices, two of which are mature people who have decided on a career change in their 30s, although as Adrian acknowledged, this was a rare occurrence. When discussing their apprentices Adrian explained:

“It's part of our succession planning - we've taken on two [apprentices] each year for as long as I can remember”.

The LMI research has highlighted that employers are aware of the benefits of taking on apprentices. The reasons provided include apprentice's adaptability to modern technology, their physicality and the relatively low cost compared to the employment of a fully qualified electrician.

Retention rates within the organisation are good. The dropout rate of apprentices, from the return on investment research, is at its highest in year one of the apprenticeship, with around 10% dropping out. This reduces to around 3% by year two and less than 1% in the subsequent years of the apprenticeship. The motivations for these drop outs vary and some organisations experience almost no issue at all.

Adrian stated that they recruit through JTL which:

“Makes the process easy”.

Adrian also notes the lack of coordination between JTL and other providers, which makes the transition of apprentices from one programme to another difficult.

“Our industry doesn't recognise certain training, for example a young person who has completed a year at college can't transfer what they've covered in that year over to JTL. The JTL requirements are different. This could be more joined up and I do think it puts some people off [the industry]”.

Adrian explains that the workforce at Gilbert and Stamper is very stable, highly skilled and experienced in all areas, which brings greater flexibility. Certain qualifications available and the ability to call yourself an electrician without meeting a certain quality level raised concerns for Adrian who noted the existence of:

“ineffective intensive six-week training courses which allow those completing them to be considered a fully qualified electrician which is simply not possible and shouldn't be allowed”.

Adrian believes these are frequently the reason that other companies can undercut his company on price. Having been with the company for 43 years Adrian has seen many changes in the sector and believes the demise of the large training companies which used to exist ***“who were training around 300 electricians at any one time”*** is a key concern. The shift to the more diverse training which now exists would benefit from being more joined up.

On the potential introduction of an individual licensing system...

“It would be better regulated if the electricians had to be registered individually rather than the company”.

Half of respondents felt that occupational licensing for individuals was a positive step with 29% opposed to the option citing the ECS system as an example of where this capability already exists. Adrian's concerns lie with the cost of a licensing system and who would be responsible.

“All our guys are already JIB registered, but JIB just look at the certification side of things – they don't physically check their work. At the moment we are checked as a business but it's such a small amount of our work that they actually inspect – some electricians are therefore never assessed externally”.

He felt that:

“The NICEIC and the ECA have systems set up and seem well placed to operate such a scheme”.

One of the key findings for such a system in the research was that a viewable online database would be required for consumers to ensure licensed professionals were genuine.

Jez Revell, Divisional Manager, Engenda Group Lectec Services Ltd (East Anglia)



Electrotechnical industry pathways, occupational licensing and Brexit

Jez Revell is a Divisional Manager at Engenda Ltd, with a small-sized base in East Anglia but with additional sites in both the UK and Europe. Jez is based at Immingham, North East Lincolnshire where they have circa 10 apprentices with an approximate 70% retention rate.

Jez's major concerns are in respect of the ageing workforce. This is consistent with the main research, which determines that the number of workers across the UK over the age of 50 exceeds those under the age of 25. He has identified that there is a gap in the workforce of employees aged between 35 and 50. Again, this is consistent with findings that the ageing workforce is an issue that has developed over time as a result of a lack of investment in training. Jez expressed the view that the younger employees are keen to learn, and the older employees are highly competent, however the gap in the middle is a potential issue area for the workforce moving forward. As an organisation Engenda Group are seeking to address this, however, it is difficult as they *"can't turn back the clock"* – there were several lengthy periods within the industry when recruitment almost ceased.

Jez feels that skills shortages should be the main driver of the direction of education and training for the industry however he does not believe this is the case. When considering other issues face by Engenda Group with accessing training the geographical location of training centres, cost of training and time out of work as a result are deemed to be key barriers. These activities all impact the cost on the employer of training their employees. Cost of training is seen as the main reason for deficiency by almost a third of employers (32%) involved in the main research. Jez explained that a greater flexibility to training would be beneficial to his organisation and reduce the current perception that the cost of training and the time employees are out of work doubles the cost of training staff:

"We get caught by a double whammy [the cost of the training and the loss of productivity in terms of the time out of work for them to attend]".

He suggested a solution to this could be to make training available on an evening/weekend. Jez also raised a further concern over the practice of training providers to offer *"add-ons"* to their courses far too regularly which in his view is *"profiteering"*.

Jez feels that those providing training could take on a better/bigger role, specifically that a *"portal"* could be established, essentially, a search facility which would allow employers, employees and job seekers to get the info they need. He believes that there is a lack of understanding of the different

pathways available:

“people need to know the routes available to them”, furthermore, “it needs to go back as far as schools”.

This is consistent with almost half (45%) of surveyed employers who believe that tackling skill shortages and recruitment problems requires greater promotion of electrotechnical careers. Jez explained that as a company they recognise that they need to look at career pathways for their employees whilst considering business needs and the employee’s desires and that this:

“might involve the need to take side steps but, both the employer and employee should be able to see the merit in it”.

Regarding representation within the workforce and corroborated by the research findings, Jez explained he felt numerous groups were under-represented as the workforce is predominantly white, British and male (the survey shows the industry is 86% male excluding administrative staff, who are more commonly female). Jez has seen an increase in females entering the workforce which he believes is driven by improved conditions and the offer of a regular place of work, although:

“the contracting side of the industry remains white, British and male”.

Within the industry, in Jez’s experience, parity of esteem between academic and vocational qualifications does not exist, with vocational qualifications (like apprenticeships) coming out on top for the simple reason that the skills they have enables them to earn money for the company.

When discussing his views about an individual licensing system, Jez deemed that the industry was already heading in this direction:

“we’re already part of the way there with JIB training cards”.

He suggests that what’s currently happening is that the work is being licensed, rather than the workforce, and points out that this works differently in other countries. If such a scheme was to go ahead, Jez suggests it should be:

“similar to the JIB card and should feature a minimum criterion and a list of the individual’s competencies”.

He further suggests that:

“The JIB and ECA would be in a good position to oversee it as a joint body with some involvement from the IET (Institution of Engineering and Technology) regarding qualifications”.

In determining the potential drawbacks, especially in the early stages, Jez could see problems with

such a system because:

“clients could use it as a bench mark and refuse to have people on their site who have not reached a certain level which could make staffing an issue”.

Finally, Jez raised the point that both the immediate and long-term fallout from Brexit is a massive concern to his organisation. The level of uncertainty currently surrounding the UK economy and the ability to trade with Europe following Brexit are the most commonly cited issues among all respondent types in the survey. Most of Engenda’s clients are not UK owned and as such they are delaying signing off contracts which is creating a lull in work. The impact of this will likely be felt in the next 2 or 3 years which will have a cyclical effect on the availability of workforce (gaps like that which the company are currently trying to combat).