



UK COMMISSION FOR
EMPLOYMENT AND SKILLS

Sector insights: skills and performance challenges in the digital and creative sector

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Sector insights: Skills challenges in the digital and creative sector

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Foreword

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, our Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and all four UK nations.

Our vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Over the next three years our ambition is to see industry in the UK create “ladders of opportunity” for everyone to get in and on in work. This means employers improving entry routes into the labour market for young people, ensuring the existing workforce has the skills businesses need to compete and individuals need to progress, and deploying those skills in a way that drives productivity and growth. This is a collective agenda for employers working in partnership with government, trade unions, education providers, industry bodies and local organisations.

Our Research

Our research mobilises impartial and robust national and international business and labour market research to inform choice, practice and policy. We aim to lead the debate with industry to drive better outcomes for skills, jobs and growth.

Our ambition is to cement the UK Commission’s reputation as the ‘go-to’ organisation for distinct high quality business intelligence, and communicate compelling research insights that shape policy development and influence behaviour change.

In order to achieve this, we produce and promote robust business intelligence and insights to ensure that skills development supports choice, competitiveness and growth for local and industrial strategies.

Our programme of research includes:

- producing and updating robust **labour market intelligence**, including through our core products (the Employer Skills Survey (ESS), Employer Perspectives Survey (EPS) and Working Futures Series)
- developing an understanding of what works in policy and practice through **evaluative research**
- providing research **insight** by undertaking targeted thematic reviews which pool and synthesise a range of existing intelligence.

Our research programme is underpinned by a number of core principles, including:

- providing **business intelligence**: through our employer surveys and Commissioner leadership we provide insight on employers' most pressing priorities
- using evaluative insights to identify **what works** to improve policy and practice, which ensures that our advice and investments are **evidence based**.
- adopting a **longer term, UK-wide, holistic perspective**, which allows us focus on big issues and cross cutting policy areas, as well as assessing the relative merits of differing approaches to employer engagement in skills
- providing **high quality, authoritative and robust data**, and developing a consistent core baseline which allows comparison over time and between countries and sectors.
- being **objective, impartial, transparent and user-friendly**. We are free of any vested interest, and make our LMI as accessible as possible.

We work in strategic partnership with national and international bodies to ensure a co-ordinated approach to research, and combine robust business intelligence with Commissioner leadership and insight.

The overall aim of this project is to identify skills and performance challenges in the digital and creative sector. Focusing on five occupations, it identifies current issues and trends that are affecting the sector's labour market; considers how the digital and creative sector may evolve over the coming decade; and draws out the potential impact of these changes for future skills needs. The study also considers the use of and interest in National Occupational Standards amongst digital and creative employers.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed at www.gov.uk/government/organisations/uk-commission-for-employment-and-skills

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail info@ukces.org.uk, quoting the report title or series number. We also welcome feedback on Twitter.

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

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Executive Summary

The digital and creative sector is an important part of the UK economy. It encompasses a wide range of activities, including: telecommunications; computer programming and consultancy; publishing; films and music; programming and broadcasting; design and photography; and creative arts and entertainment. This report covers the digital and creative sector across all four nations of the UK.

Current workforce and skills challenges

The UK digital and creative sector has grown rapidly in recent years. It contributes almost nine per cent of total UK GVA and employs 2.1 million people. Digitisation of the wider economy is driving extremely strong demand for digital services, and the recent widening of tax relief has stimulated very strong growth in certain areas of the creative industries.

The greatest recruitment challenges are currently experienced by those seeking workers with digital skills. Graduate recruitment is an important source of workers for the sector, but there are concerns that many graduates leave university without up-to-date technical skills, or the softer skills required to be effective in the workplace. Rapid technological advances are leading to skills gaps amongst the existing workforce. At the same time, employers encounter fewer difficulties recruiting to some more creative roles which are extremely attractive to potential employees. However, it would be wrong to draw a simple distinction between the digital and creative sub-sectors. The boundaries between digital and creative are becoming increasingly blurred and employers increasingly seek a fusion of creative and technical skills, combined with business and softer skills.

Outlook for the digital and creative sector

Further growth in demand for digital content and services, in particular, is expected to drive expansion of the digital and creative sector. The sector is expected to need 1.2 million new workers between 2012 and 2022, to both support growth and replace those leaving the sector. This is equivalent to half the current workforce. There are particular concerns about the ability of the education system to supply the quantity and quality of workers needed for digital roles.

There was a strong consensus amongst those interviewed for this project that technological trends will be the most important influence on the future development the digital and creative sector and its skills needs. Reflecting the increasing convergence between digital and creative activities, this view was consistent across employers in both the digital and creative sub-sectors.

Significant technological trends will include: strong growth in demand for technology from across the economy; the growing importance of cyber security; the convergence of content across platforms; mobile and cloud computing; big data and analytics; the automation of routine tasks; new applications of social media; and new business models and collaborative platforms.

The future development of the sector could also be influenced by regulatory changes (both UK-wide and within the individual countries of the UK). Some of these may reflect the need to make current regulations more relevant to the digital world, such as changes to rules governing the ownership and use of data and intellectual property. More broadly, favourable taxation rules have been an important driver of growth in the creative industries in recent years and there is a risk that the rate of growth could slow if these incentives were removed. Some of the most internationalised areas of the digital and creative industries could also be affected by changes to taxation policies in other countries which affect the relative attractiveness of the UK as a location for undertaking work.

It is possible that employment laws may be changed to make it more difficult for creative firms to employ unpaid interns, or to increase the regulation of self-employed workers. There may also be renewed pressure for employers to re-double efforts to increase the proportion of female workers in the digital sub-sector and non-white employees in the creative sub-sector. Such changes may imply a need for more formal and proactive approaches to human resource management for some employers.

Demographic and economic factors will also shape skills needs. Population ageing may create new opportunities in areas such as healthcare technologies. Workforces may increasingly include a more diverse mix of older workers that retire later, and 'digital natives' that bring a deep and intuitive knowledge of digital technologies. Deepening globalisation will present opportunities to sell into new markets, but also greater competitive pressures and the potential to move higher value activities overseas.

Future workforce and skills challenges

The merging of digital and creative roles, higher client expectations and greater competitive pressures mean that employers in both the digital and creative sub-sectors increasingly seek a 'fusion' of technical expertise, creativity and softer skills. Rapid technological change means employers will value those workers who are best able to adapt and respond to technology. They will also seek those who can think strategically to identify ways to best exploit and adapt new technologies. Although this applies most directly to those in technical roles, there will be an increased need for digital skills right across the digital and creative sector, and indeed the whole economy.

Technological trends will call for individuals with specialised knowledge in cyber security, mobile and cloud computing, big data, and social media, but workers across the sector will need some degree of knowledge of these issues and their implications. Progress in some areas may be offset by a reduction in demand for those with skills in older technologies. The digital and creative sector will also need the expertise to anticipate how markets and consumers may respond to new business models, and regulatory and legal expertise to help shape and comply with new rules on IP and data protection.

It will also be necessary to put in place new and more proactive human resources functions to meet the pressing need to recruit large numbers of new workers, particularly to digital roles, and to encourage greater workforce diversity. Stronger people management skills may be needed as older workers retiring later find themselves working alongside young 'digital natives' with very different skills.

Ever-closer global economic integration suggests a growing need for those with the skills to develop international networks; promote and sell UK outputs overseas; identify competitive threats; and develop strategies to maximise the UK's share of the global market for digital and creative outputs.

National Occupational Standards (NOS)

Awareness and use of NOS is lower in the digital and creative sector than across the economy as a whole, although employers, particularly larger organisations, do contribute to their development. NOS could be made more useful and relevant to digital and creative firms by:

- using them to ensure that those leaving education are equipped with the right skills;
- focusing on core skills, rather than technical skills that may become outdated;
- reducing detail;
- improving the NOS database;
- developing a clearer narrative on the rationale for and advantages using of NOS.

Implications for the supply of skills

A range of initiatives (both UK wide and nation-specific) have been put in place by sector bodies and employers to address the challenges above. However, it may be possible to do more in the following areas:

- Explore new models for ensuring employees in small and larger firms alike have access to the ongoing training they need to keep up with technological developments. This could include building stronger relationships with local educational institutions and training providers to enable employees to undertake modular training with minimal disruption to work.
- Help young people at school and university, as well as their parents, guardians and advisers, to identify the skills they will need for a career in the digital and creative sector. This will empower individuals to take greater responsibility for ensuring they acquire the skills employers need. This may suggest a role for specialist careers guidance and an increase in work placements.
- Consider how the allure of a career in the creative industries can be harnessed to encourage more people to acquire the digital skills needed across the digital and creative sector.
- Market the digital and creative sector to a wider field of potential recruits with different educational and professional backgrounds, and ensure conversion courses are available to help people move into roles where shortages are most severe.
- Research why unemployment rates are so high for computer science graduates at a time when the digital sector finds it difficult to hire the workers it needs.
- Identify how universities can work with employers to ensure courses better equip young people with the skills digital and creative employers need, and ensure they keep up with technological change.
- Ensure there is a wide choice of courses that combine the technical and creative skills employers need, so the study of digital and creative is not seen as an either/or choice. Such courses should also include modules on business and softer skills.
- Ensure students in digital subjects pick up at least a basic knowledge of issues such as cyber security, intellectual property and data protection.
- Consider whether there is scope to tailor apprenticeships to better suit the profile of digital and creative employers.
- Assess whether lessons may be learned from the Irish institutes of technology model to bring more non-university graduates into digital and creative roles.
- Consider whether sufficient expertise is available in areas such as legal services, human resources, market and pricing analysis, and business strategy, which will increasingly be needed to support the growth of the digital and creative sector. The sector should also consider whether there is a need for skills initiatives to tailor such expertise to the specific and rapidly evolving needs of digital and creative employers.

In addition, the sector should consider whether additional skills initiatives are needed in the immediate term to alleviate shortages in areas that are growing extremely rapidly following the introduction of new tax incentives.

1 Introduction

Chapter summary

- This chapter sets out the background to the study and the wider research programme; describes the objectives of this study; and briefly outlines the structure of the report.
- This research is part of a broader programme to examine skills and performance challenges within specific sectors of the economy.
- The study takes a broad look across the digital and creative sector, informed by detailed analysis of five key occupations. It identifies current issues and trends that are affecting the sector's labour market; considers how the digital and creative sector may evolve over the coming decade; and draws out the potential impact of these changes for future skills needs. The study also considers the use of and interest in National Occupational Standards amongst digital and creative employers.

1.1 Background to the report and research programme

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK. Together, its Commissioners comprise a social partnership of senior leaders of large and small employers from across industry, trade unions, the third sector, further and higher education and across all four UK nations. Its vision is to create, with industry, the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy.

Innovative and insightful research is central to UKCES's role as a prime source of knowledge on how skills drive enterprise, create more and better jobs and deliver economic growth. Its programme of sector research includes a series of Sector Skills Insights reports, (published in 2012), which focus on skills needs in specific sectors; and a rolling programme of sector-specific studies. The first round of these covered the role of technology in driving high level skills in the digital, off-site construction, aerospace and automotive industries. The second addressed skills and performance challenges in the logistics and wholesale and retail sectors. The third round examines sector skills and performance challenges, with an emphasis on the mix of skills needed in specific occupations, as well as employer awareness of and engagement with National Occupational Standards (NOS).

1.2 Study objectives

This report focuses on the digital and creative sector across all four nations of the UK. It:

- synthesises evidence on the sector's labour market to identify the outlook for jobs and skills;
- identifies major trends affecting the sector and how the mix of skills needs is likely to change over the next decade in response to these;
- investigates employers' perceptions of the skills needs of specific occupations, and the challenges employers have in meeting those needs;
- discusses current awareness of, engagement with and interest in National Occupational Standards in developing the sector's workforce;
- draws out the implications for skills supply and workforce development.

The study is intended to take a broad look across the digital and creative sector and identify the most important sector-wide trends and issues, informed by detailed analysis of the five key occupations (IT business analysts, architects and systems designers; programmers and software development professionals; graphic designers; arts officers, producers and directors; and photographers, audio-visual and broadcasting equipment operators). It is not intended to provide a detailed account of every activity within the sector, such as advertising, computer games, film, IT consultancy, television, theatre and so on.

1.3 Structure of this report

The next section of the report sets out the research methods employed and introduces the digital and creative sector. Chapter 3 identifies the five key occupations that are studied in detail, and the rationale for their selection. Chapter 4 assesses the current skills situation within the digital and creative sector, and Chapter 5 considers how the sector and its skills needs may evolve over the coming decade. Chapter 6 discusses National Occupational Standards. The conclusions and implications of the research are drawn together in Chapter 7.

2 Methodology and sector definition

Chapter summary

- This chapter outlines the research techniques used to carry out this research; defines the digital and creative sector; describes the activities that fall within the sector and its sub-sectors; and provides an overview of recent growth trends.
- Evidence informing the study has been gathered from a range of sources, including a literature review; analysis of published datasets; consultations with employers and stakeholders; and a survey of employers.
- The study adopts a definition of the digital and creative sector that is based on 2-digit SIC codes to ensure comparability with previous UKCES studies and enable the use of data from a wide range of sources.
- The digital sub-sector includes those working in computer programming and consultancy; telecommunications; the repair of computers and other goods; and in information service activities such as data processing, web portals, and news agencies.
- The creative sub-sector encompasses a wide range of activities including design and photographic services; advertising and market research; creative arts and entertainment; publishing; film and music; libraries, archives and museums; and television and radio programming and broadcasting.
- The digital and creative sector has grown rapidly in recent years and contributed £134 billion in GVA to the UK economy in 2014. The sector employed 2.1 million people in 2012.

2.1 Methodology

2.1.1 Overall methodology for the sector insights research programme

In order to identify common skills issues across sectors, the projects in this third round of the sector insights programme share a common methodology where appropriate. This includes: a review of existing literature and data from the UK Commission's Employer Skills Survey (2014b), Employer Perspectives Survey (2014c), and Working Futures (2014a) labour market projections; and consultations with sector bodies and sector employers. The focus on five key occupations represents a change from past UKCES sector studies, and reflects UKCES' interest in assessing market demand for National Occupational Standards, as well as an opportunity to build on previous sector research and delve deeper into the operation of specific sector labour markets.

2.1.2 Methodology for this project

Consistent with the generic methodology outlined above, this study has gathered qualitative evidence from the following sources:

- A **review of recent literature** relating to the digital and creative sector labour market.
- **Detailed consultations with Sector Skills Councils, government departments and an industry association.** These discussions sought views on current and future challenges for the digital and creative labour market; the drivers of skills demand; employers' actions to address challenges; and National Occupational Standards.
- A **survey of employers.** This was publicised through Sector Skills Councils, industry associations, Oxford Economics' social media channels, and through direct email and telephone correspondence with digital and creative organisations. The survey included a number of open and closed questions relating to employers' current and future skills needs; recruitment; staff development; and National Occupational Standards. Approximately 60 responses were received, either online or by telephone.
- **Detailed telephone interviews with 20 employers across the UK** to explore the issues in the survey in greater detail. Employers were selected to ensure the best possible coverage across the five key occupations; the digital and creative sub-sectors; different types of activity within each sub-sector; and across the countries that make up the UK. Table 2.1, below, shows the number of employers consulted by sub-sector and activity. A more detailed breakdown of employers by sub-sector and employer size band can be found in Appendix A.

Table 2.1: Number of employer telephone interviews by sub-sector and activity

Sub-sector	Activity	Total
Digital	Telecommunications	1
Digital	Computer programming, consultancy and related activities	2
Digital	Information service activities	2
Digital	Repair of computers and other goods	-
Creative	Publishing	1
Creative	Motion pictures and music	1
Creative	Programming and broadcasting	4
Creative	Advertising and market research	4
Creative	Other professional scientific and technical activities (includes design, photographic, translation)	3
Creative	Creative arts and entertainment	2
Creative	Libraries, archives, museums etc.	-
Total		20

Source: Oxford Economics

- **Brief telephone interviews with 15 employees in the five key occupations.** These interviews asked employees about their education and career paths, and sought suggestions for how career development could be improved.

- A **stakeholder workshop**, involving representatives from BIS, Creative & Cultural Skills, Creative Skillset, the Tech Partnership and UKCES, to discuss emerging findings; identify future skills drivers; and assess the policy implications of the research.

The study team also analysed data from a range of sources including:

- Working Futures (UKCES, 2014a)
- The UK Commission's Employer Skills Survey 2013 (UKCES, 2014b)
- The UK Commission's Employer Perspectives Survey 2014 (UKCES, 2014c)
- The ONS Labour Force Survey (2014a).

The qualitative and quantitative evidence has been analysed and structured to provide the insights set out in Chapters 4 to 7 of this report.

2.2 Defining the digital and creative sector

2.2.1 Sector definition used in this study

The definition of the creative sector, in particular, has been subject to considerable discussion and debate in previous research, and researchers have adopted a range of approaches to defining the sector and its component sub-sectors. Creative & Cultural Skills and Creative Skillset (2011) provide an overview of the main approaches.

The previous *Sector Skills Insight* study (UKCES, 2012a) adopted a definition of the digital and creative industries based on the coverage of the three Sector Skills Councils engaged in this area: e-skills UK¹, Creative & Cultural Skills and Creative Skillset.

The current study retains this definition of the digital and creative sector. As well as being relatively simple to understand, basing the definition on two-digit Standard Industrial Classification (SIC) codes means the study can make use of data sources that are not robust at lower levels of disaggregation. Retaining the definition used previously also ensures that findings will be comparable with those from earlier work.

¹ The Tech Partnership is now taking forward the work of e-skills UK

The definition of the digital and creative sector used in this study is as follows:

Digital		Creative	
SIC07 code	Description	SIC07 code	Description
61	Telecommunications	58	Publishing
62	Computer programming, consultancy and related activities	59	Motion pictures and music
63	Information service activities	60	Programming and broadcasting
95	Repair of computers and other goods	73	Advertising and market research
		74	Other professional scientific and technical activities (includes design, photographic, translation)
		90	Creative arts and entertainment
		91	Libraries, archives, museums

There are clear linkages between the digital and creative sub-sectors, particularly as digital technologies transform the way the creative sector operates. The earlier Sector Skills Insights research (UKCES, 2012a) noted that ‘the digital technology sub-sector provides the infrastructure and platforms through which creative content is often delivered’. This study has found that the linkages between the digital and creative sectors are deepening further in many areas as creative content is increasingly produced through digital media. When asked whether they operate in a digital or creative sector, a number of employers challenged the notion that they must be in one or the other, and suggested that they increasingly consider digital and creative as a single sector.

While this study uses a sector-based definition of digital and creative, many individuals work in digital or creative occupations throughout all sectors of the economy. In recognition of this, the Department for Culture, Media and Sport identifies employment in ‘The Creative Industries’ as people working within industries defined as ‘creative’, in either creative or non-creative roles. Its broader definition of ‘The Creative Economy’ also includes individuals working in creative roles in other sectors of the economy (DCMS, 2014). A similar definition is used in other parts of the UK.

While the study includes detailed analysis of five digital and creative occupations (see Chapter 3), the primary focus is on those working within the digital and creative industries, as identified in the table above.

2.2.2 Activities within the digital and creative sub-sectors

Based on the definition above, 2.1 million people were employed in the digital and creative sector in 2012. Of this total, one million were employed in digital activities, and 1.1 million in creative activities (UKCES, 2014b). This section provides a brief overview of the activities that fall within the digital and creative sector, and the contribution of these activities to total digital and creative employment. To ensure accuracy, the descriptions below closely follow, and draw extensively from, the ONS Standard Industrial Classifications (2009). The employment data quoted are drawn from Working Futures (2014b).

Telecommunications

Over 200,000 people were employed in telecommunications in 2012. The sub-sector includes those working in telecommunications and related services that are used to transmit voice, data, audio and video across wired, wireless or satellite networks.

Computer programming, consultancy and related activities

Computer programming, consultancy and related activities employed 651,000 people in 2012, making it the largest category within the digital sub-sector. It includes those working in activities such as computer programming; computer consultancy; and computer facilities management. The latter includes those that manage, operate and support computer systems or data processing services on behalf of clients.

Information service activities

The information service activities sub-sector includes those working in areas such as data processing and hosting; the operation of web portals that enable users to search and access information online; news agencies that provide news, pictures and features to the media; and other information services. It is estimated that 57,000 people worked in these types of activities in 2012.

Repair of computers and other goods

Around 89,000 people were employed in the repair of computers and other goods in 2012. This category includes those repairing and maintaining computers and related equipment; communications equipment; consumer electronics; household appliances; and other personal and household items.

Publishing

The publishing industry employed 176,000 people in 2012. It includes the publishing of various types of printed and electronic media, including books; directories and mailing lists; newspapers; journals and periodicals; computer games; other non-bespoke software; catalogues and advertising materials; greeting cards; and posters.

Motion pictures and music

This sub-sector includes the production of films and television programmes; post-production activities such as editing, the addition of titles, sub-titles, credits, computer graphics, animation and special effects; the distribution of films and television programmes; the projection of films in cinemas or at other events; and activities related to the music industry, such as the recording, distribution and publishing of music. Around 136,000 people were employed in these activities in 2012.

Programming and broadcasting

Programming and broadcasting includes activities related to the creation and broadcasting of television and radio programmes. Around 40,000 people were employed in this sub-sector in 2012.

Advertising and market research

The advertising and market research sub-sector employed around 198,000 people in 2012. It includes those who work in advertising agencies that create and deliver advertising campaigns; those who sell advertising time and space; and those who undertake and analyse market research and opinion polls.

Other professional scientific and technical activities (includes design, photographic, translation)

This is the largest category within the creative sub-sector. In 2012, 268,000 people were employed in activities that fall within this group. It includes design activities such as fashion design, interior decoration, industrial design and graphic design; photography and videotaping; translation and interpretation; and other professional, scientific and technical activities, such as environmental consultancy and quantity surveying.

Creative arts and entertainment

This area employed 187,000 people in 2012 and focuses on activities which provide cultural and entertainment events to the public. It includes those who produce, promote and participate in live performances and events; those who provide artistic, creative and technical skills to support the production of artistic products and live performances; and the operation of arts facilities such as theatres.

Libraries, archives, museums

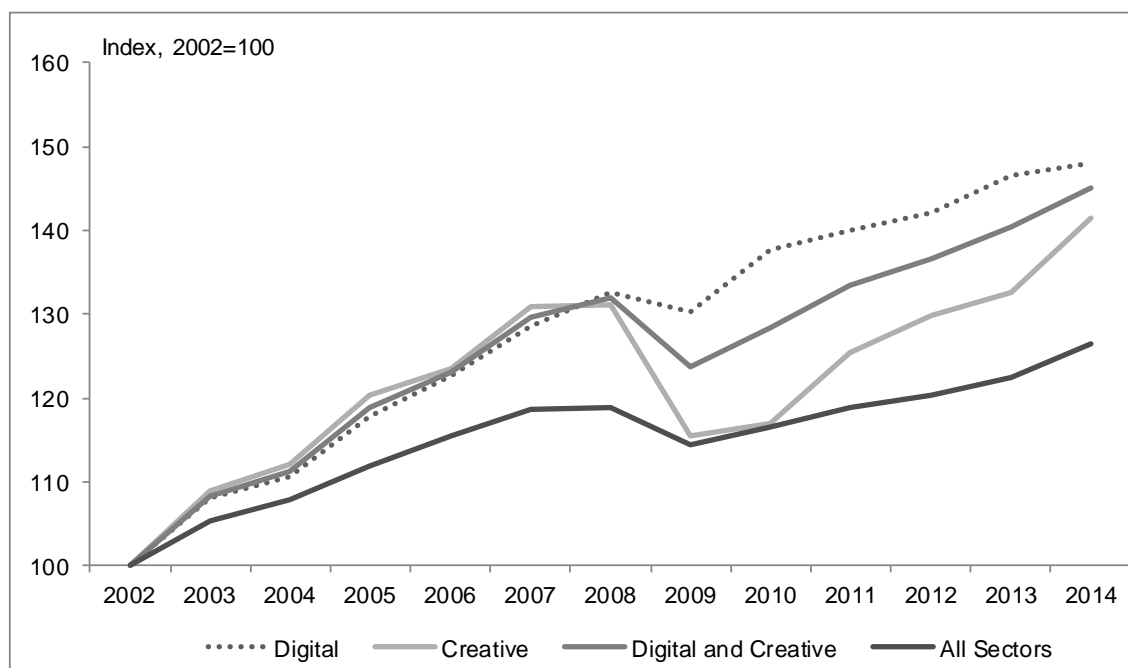
Around 112,000 people were employed in libraries, archives and museums in 2012. This category also includes the operation of historical sites, nature reserves, and the preservation of objects and sites that are of historical, cultural or educational interest.

2.3 Output and employment in the digital and creative sector

2.3.1 Output

The digital and creative sector is estimated to have contributed £134 billion in gross value added (GVA) to the UK economy in 2014. Within this total, digital sectors contributed £76 billion and creative sectors contributed £58 billion. The digital and creative sector is estimated to have directly accounted for 8.7 per cent of total UK GVA in 2014, up from 7.5 per cent in 2002.

Figure 2.1 Real GVA, 2002 to 2014



Source: Oxford Economics, UK Regional Forecasting Model (2014a)

Figure 2.1, above, shows that in real (inflation-adjusted) terms, the GVA contribution of the sector has grown by around 45 per cent since 2002, compared to 26 per cent growth across all sectors of the economy. Nonetheless, the creative sub-sector was hit particularly hard by the recession: GVA declined by almost 12 per cent in 2009 in real terms and recovered only slightly in 2010. Since then it has recovered strongly.

While strong recent growth in the digital and creative sector partially reflects the broader economic climate, a number of sector-specific developments have also played a role. Rapid advances in technology and internet usage have driven demand for digital services as firms right across the economy have developed a digital presence and moved operations online. The sector also received a strong boost from the introduction of tax relief to animation, high-end television, video games and theatre during 2013 and 2014. The UK's existing film tax relief regime was also amended in 2014.

2.3.2 Employment

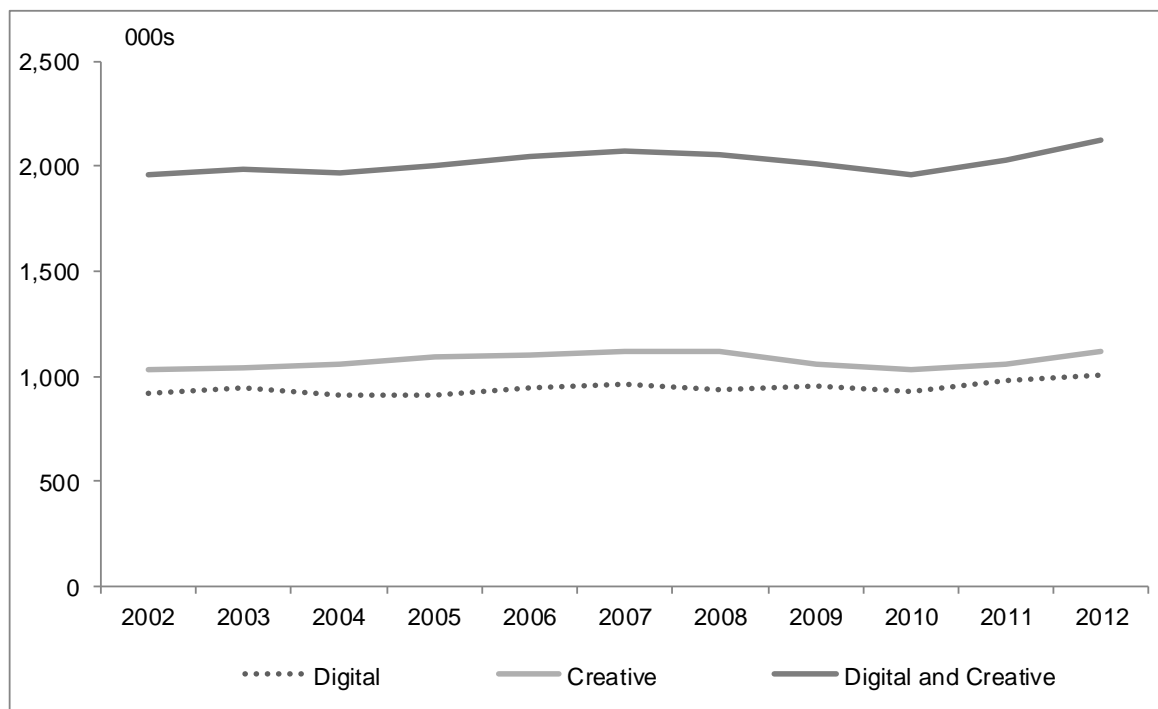
Around 2.1 million people were employed in the digital and creative sector in 2012, which is 6.6 per cent of total UK employment. The total is split fairly evenly between the digital and creative sub-sectors. Figure 2.2, below shows an uplift in digital and creative employment after 2010: the sector is estimated to have generated 157,000 jobs between 2010 and 2012.

Digital employment growth has been driven by computer programming and consultancy, which generated around 131,000 jobs between 2002 and 2012, many of them since 2010. Employment in the repair of computers and other goods increased by 20,000 between 2002 and 2012. In contrast, employment in telecommunications and information service activities fell over this period, by 58,000 and 12,000 respectively.

Creative employment growth between 2002 and 2012 was primarily driven by other professional, scientific, and technical activities, which include design and photographic work. Employment in this category increased by 62,000 in the ten years to 2012. Employment in the advertising and market research also increased, by 39,000. Smaller increases were included in film and music (15,000); libraries, archives and museums (12,000); and programming and broadcasting (3,000). Employment in creative arts and entertainment activities fell by 24,000 between 2002 and 2012, and publishing employment fell by 22,000.

This evidence is consistent with the observation in Section 2.3.1 that rapid technological advances and the growth of the internet have been an important driver of growth for some parts of the digital and creative sector. Most directly, computer programming and consultancy was, in absolute terms, the largest source of digital and creative employment growth over this period. But within the creative sub-sector, areas such as design and advertising have grown strongly as the demand for online content has increased.

Figure 2.2 Employment in the digital and creative sector, 2002 to 2012

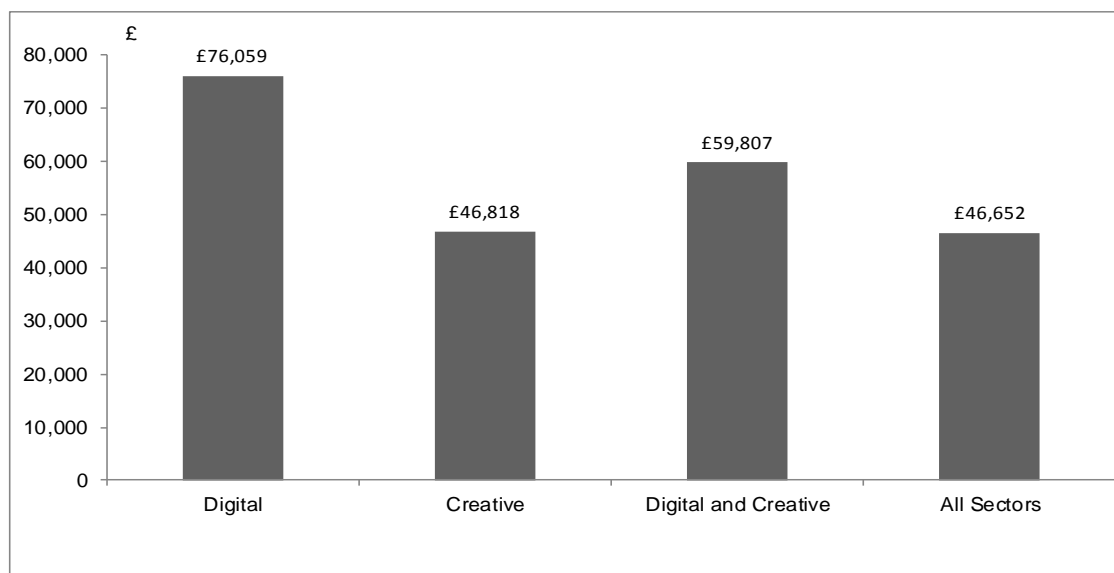


Source: UKCES Working Futures (2014a)

2.3.3 Productivity and wages

The digital and creative sector is orientated towards high-skilled roles and graduates make up a large share of the workforce (see Section 4). This is reflected in relatively high levels of productivity: GVA per worker (Figure 2.3) is just under £60,000 amongst digital and creative firms, compared to £47,000 across the economy as a whole. This trend is driven by extremely high productivity in the digital sub-sector, where output per worker is £76,000, 63 per cent above the national average.

Figure 2.3 GVA per worker, 2014



Source: Oxford Economics, UK Regional Forecasting Model (2014a)

Relatively high levels of productivity are also reflected in above-average wages. Gross median weekly earnings are estimated to have been £559 in the digital and creative sector in 2014, compared to the national average of £418. However, wages in the creative sub-sector are substantially lower than in the digital sub-sector (£472 per week in the former, compared to £645 in the latter). This is likely to be at least partially due to the productivity differences highlighted above. In addition, many creative roles are extremely attractive to potential employees and there can be significant competition to secure them. Where this is the case, employers may not need to offer such high wages to attract workers. The latest research (Creative Skillset, 2015) highlights that the prevalence of unpaid working practices amongst those seeking entry-level positions is very high with 77% of work experience unpaid.

2.4 Conclusion

This section has outlined the study methodology, which includes a literature review; quantitative analysis of published datasets; consultations with employers and stakeholders; and a survey of employers. It has set out the definition of the sector, which for the purposes of this study is common across all four UK nations, and based on 2-digit SIC codes to ensure comparability with previous UKCES studies and enable the use of data from a wide range of sources. Although the definition allows digital and creative sub-sectors to be separately identified for analytical purposes, it is important to note that those working within the sector increasingly consider digital and creative as a single sector.

The digital sub-sector under the definition in this study includes those working in computer programming and consultancy; telecommunications; the repair of computers and other goods; and in information service activities such as data processing, web portals, and news agencies. The creative sub-sector encompasses a wide range of activities, including design and photographic services; advertising and market research; creative arts and entertainment; publishing; film and music; libraries, archives and museums; and television and radio programming and broadcasting.

The digital and creative sector contributed £134 billion in GVA to the UK economy in 2014 and employed 2.1 million people in 2012. Since 2002, the digital and creative sector has grown much more strongly than the economy as a whole, supported by rapid advances in technology and internet usage and, more recently, the extension of tax relief arrangements to a number of creative activities. Productivity and wage levels in the digital sub-sector are significantly greater than the national average, reflecting the high-skilled nature of many digital roles. While the creative sub-sector also employs an above-average proportion of graduates, productivity and wage levels are closer to the national average.

3 Key occupations

Chapter summary

- This chapter outlines the approach taken to identify the five key occupations researched for the purposes of this study, and describes the main features of each of the shortlisted occupations.
- Five detailed occupations were selected from the 37 that appear on either the e-skills UK list of digital occupations or DCMS' list of creative occupations.
- Occupations were shortlisted based on their importance to the digital and creative sector's recruitment needs over the coming decade; their expected exposure to technological change; and with a view to obtaining representation across a range of digital and creative activities.
- The occupations selected for detailed analysis are:
 - IT business analysts, architects and systems designers
 - Programmers and software development professionals
 - Graphic designers
 - Arts officers, producers and directors
 - Photographers, audio-visual and broadcasting equipment operators

3.1 Introduction

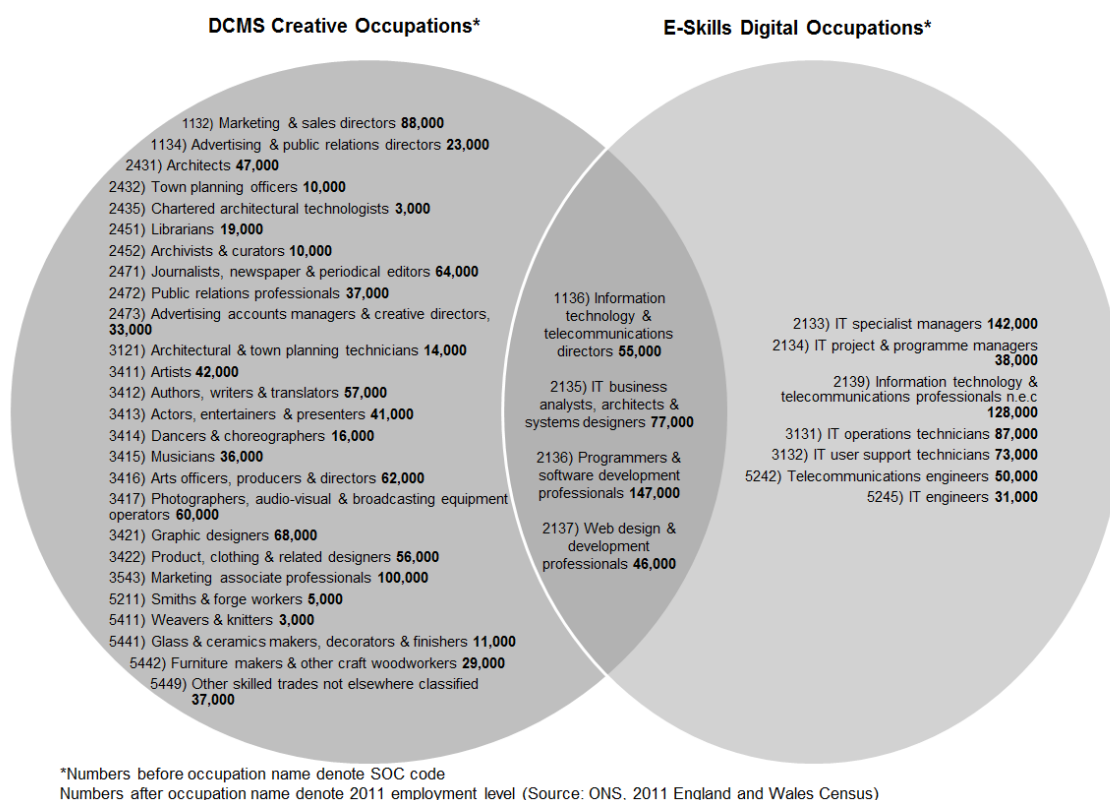
An important element of this study is to undertake a detailed analysis of skills issues in five key occupations within the digital and creative sector with the aim of identifying issues and trends that are affecting the digital and creative sector more broadly. This section outlines the approach taken to identify these occupations, and then describes the five occupations selected.

Key occupations have been identified through a two-stage approach. The first phase involved quantitative analysis to produce shortlists of candidate occupations, and the second phase factored in more qualitative considerations to select five occupations from within these shortlists. The sub-sections below describe each of these phases in turn.

3.2 Quantitative analysis to identify occupation shortlists

To identify potential occupations for detailed analysis it is necessary to consider which occupations are inherently ‘creative’ or ‘digital’. Industry stakeholders have previously given detailed consideration to this question, and the intention of this study is to build on and complement that work. As outlined in Figure 3.1 below, the starting point included consideration of the list of 30 creative occupations identified by DCMS in its *Creative Industries Economic Estimates* publication (DCMS, 2014) and the 11 digital occupations identified in *Information Economy: Economic Estimates 2013* (e-Skills UK et al., 2013). Both of these lists identify occupations based on 4-digit Standard Occupational Classification unit groups.² Similar lists are used by bodies across the UK, including Creative Scotland, as a basis for identifying creative occupations. There is some overlap between these two lists, as illustrated below.

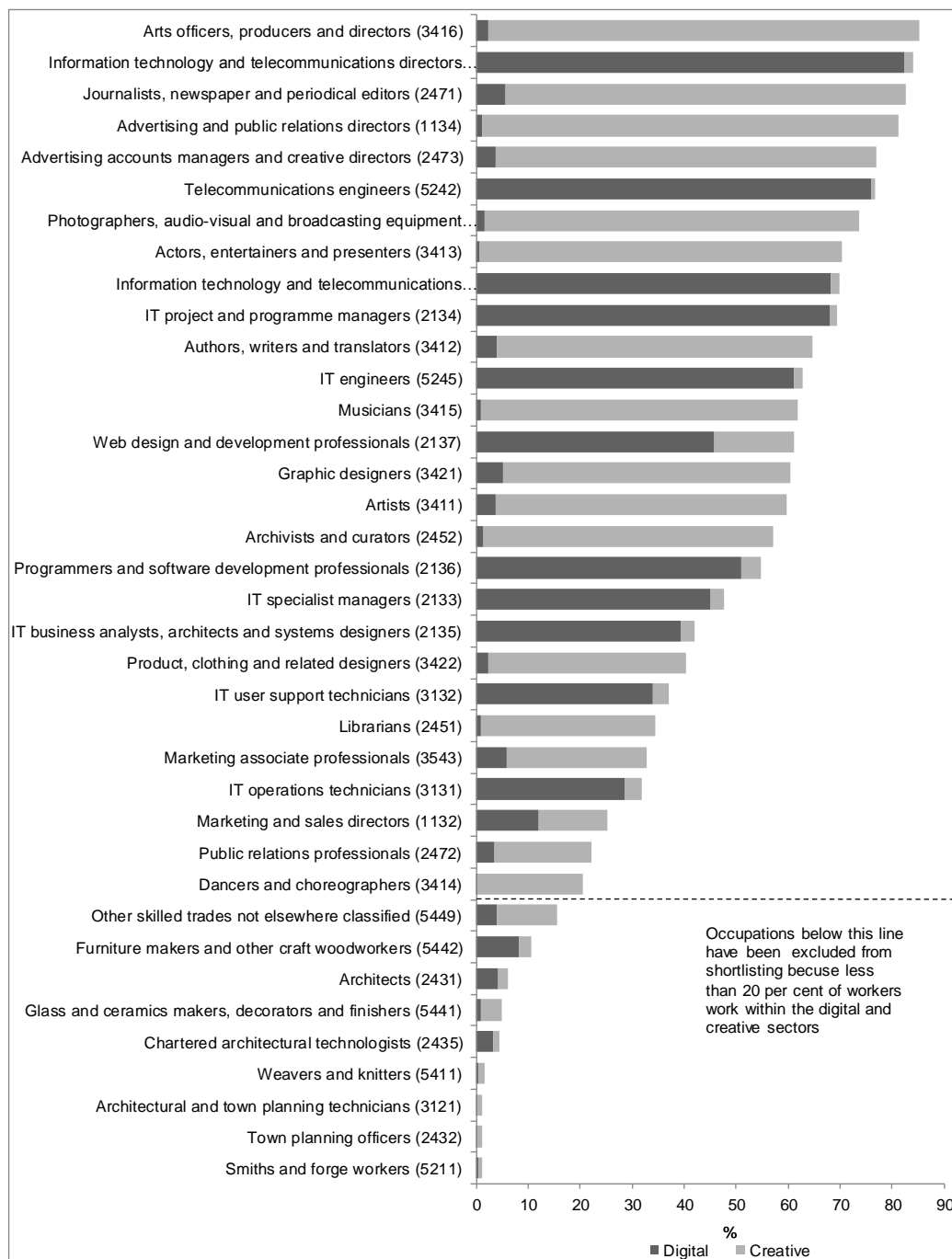
Figure 3.1 DCMS creative occupations and e-skills UK digital occupations



Removing the duplication between the two lists leaves 37 SOC unit group occupations. While individuals may work in the occupations in this list in any sector of the economy, this study is concerned with issues within the digital and creative sector. Only those occupations for which more than 20 per cent of workers are employed within the digital and creative industries are therefore considered within the shortlisting. This reduces the list to 28 occupations (those above the dotted line in Figure 3.2 below).

² Further details of Standard Occupational Classifications are available on the ONS website, at: <http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/soc2010/index.html>

Figure 3.2 Proportion of workers in digital and creative occupations that work within digital and creative sectors



Source: ONS, Census (2011) (table CT0144)

A further consideration is the extent to which analysis of the five occupations may be used to make inferences about the future skill needs of the entire digital and creative sector. Projected net occupational requirements for the UK for 2012 to 2022 (UKCES, 2014a) have been used to consider the importance of each occupation to the sector's overall recruitment needs. These data estimate the number of workers that will be needed in each occupation to both replace those that leave (for example due to retirement, career moves or mortality), and to fulfil the demand for additional workers as firms expand their workforces. These data are used to identify the ten occupations with the largest net requirements for each of digital and creative. The results are shown in Table 3.1, below.³

Table 3.1 Shortlisted digital and creative occupations with the largest net requirements, 2012 to 2022

Digital occupations	Creative occupations
Programmers and software development professionals (2136)	Marketing associate professionals (3543)
IT specialist managers (2133)	Marketing and sales directors (1132)
Information technology and telecommunications professionals n.e.c. (2139)	Graphic designers (3421)
IT business analysts, architects and systems designers (2135)	Journalists, newspaper and periodical editors (2471)
Web design and development professionals (2137)	Product, clothing and related designers (3422)
IT project and programme managers (2134)	Arts officers, producers and directors (3416)
IT operations technicians (3131)	Artists (3411)
IT user support technicians (3132)	Public relations professionals (2472)
Information technology and telecommunications directors (1136)	Authors, writers and translators (3412)
Telecommunications engineers (5242)	Photographers, audio-visual and broadcasting equipment operators (3417)

Source: Oxford Economics

³ Although the filtering has been carried out on the basis of the net requirement projections, the ranking of occupations within digital and creative is extremely similar in total employment terms.

To get an initial sense of which occupations might be of most interest to the study, the shortlisted occupations were ranked based on their economic importance to the UK and the degree of skills challenge they face using a spreadsheet tool developed by Oxford Economics for a separate UKCES study (Oxford Economics, 2014b).⁴ The ordering of the occupations in Table 3.1 reflects this initial ranking. However, the final selection of occupations also took into account a range of qualitative factors, and these are discussed in the next section.

3.3 Qualitative analysis to select a final list of five occupations

A single list of five occupations was selected from the occupations in the table above based on the following considerations:

- The greatest skills challenges might be expected to emerge in those occupations which experience the greatest changes over the coming decade, particularly as a result of technological advances. Where this is the case, training, development and recruitment infrastructure will need to be particularly responsive to employers' changing needs.
- There is a need for a balance across the digital and creative sectors, i.e. the final list should include two or three digital occupations and two or three creative occupations.
- Ideally the occupations selected should cover a range of sub-sectors within the digital and creative sector. However, there is likely to be a trade-off between this and the first criterion.⁵
- The occupations selected should rely on different types of skills and fall within different occupational groups. They should be expected to illustrate a range of skills challenges, enabling a broad range of findings and recommendations to be identified.

The occupation shortlists were reviewed in light of these considerations and following discussion between Oxford Economics, UKCES and the Sector Skills Councils, five occupations were identified.

⁴ This tool uses multi-criteria analysis to produce rankings of occupations based on criteria selected by the user. For this exercise economic importance was assessed based on current employment level; projected employment change 2012-2022; replacement demand to 2012-2022; expansion demand 2012-2022 ; and net requirement 2012-2022. Skills challenges were assessed based on skills shortage vacancies as a proportion of employment; vacancies as a proportion of employment; whether an occupation appears on the 2013 MAC shortage occupations list; and the proportion of posts filled by foreign-born workers.

⁵ For example, one stakeholder noted that the final shortlist does not include occupations associated with craft, cultural heritage or theatre. After deliberation it was decided not to include such occupations in the final list since they may be less likely to be subject to technological disruption.

3.4 Shortlisted occupations

This section describes the main features of each of the shortlisted occupations in turn. Unless otherwise stated, the information presented here is drawn from Volume 1 of the Office for National Statistics guide to the Standard Occupational Classification 2010 (Office for National Statistics, 2010).

3.4.1 IT business analysts, architects and systems designers (SOC unit group 2135)

Job roles included in this group include business analysts (computing), data communications analysts, systems analysts, systems consultants, technical analysts (computing) and technical architects. Individuals working in this role 'provide advice on the effective utilisation of IT and design IT systems in order to meet the business objectives or to enhance the business effectiveness of the organisation' (Office for National Statistics, 2010).

Office for National Statistics (2010) identifies the following tasks that are typically undertaken by workers in this occupation:

- Liaising with internal/external clients to analyse business procedures, clarify clients' requirements and define the scope of software, hardware and network provision.
- Undertaking feasibility studies for major IT developments.
- Communicating the impact of emerging technologies to clients and advising on the potential introduction of such technology.
- Providing advice and assistance in the procurement, provision, delivery, installation, maintenance and use of IT systems.
- Examining business models and flows of data; designing functional specifications; and testing plans for new systems to meet clients' needs.
- Researching, analysing, evaluating and monitoring network infrastructure and performance.
- Working closely with clients to implement new systems.

This occupation appears on both the DCMS creative occupations list and the e-skills UK digital occupations list. Stakeholders note that this group links to two areas where significant skills issues are emerging. Firstly, systems designers are needed to create the global systems needed by VFX, games and film companies. Secondly, the group includes roles related to 'big data', which is a key issue for games, television and digital companies as they measure and assess potential markets.

3.4.2 Programmers and software development professionals (SOC unit group 2136)

Job roles included within the programmers and software development professionals occupational group include analyst programmers, database developers, games programmers, programmers and software engineers. Individuals working in this role 'design, develop, test, implement and maintain software systems in order to meet the specifications and business objectives of the information system' (Office for National Statistics, 2010). They also design and develop specialist software, for example for computer games.

Typical tasks undertaken by workers in this occupation identified by the Office for National Statistics (2010) include:

- Examining existing software and determining requirements for new or modified systems in the light of business needs.
- Feasibility studies to design software solutions.
- Writing and coding individual programs according to specifications.
- Developing user interfaces.
- Testing and correcting software programs.
- Writing code for specialist programming for computer games, (for example, artificial intelligence, 3D engine development).
- Implementing and evaluating software.
- Planning and maintaining database structures.
- Writing documentation and providing support and training for users.

This occupation appears on both the DCMS creative occupations list and the E-Skills digital occupations list. Stakeholders note that industry representatives are interested in seeing skills development within this role as it is one of the fastest growing occupational groups in terms of demand, and one that is most exposed to skills shortages.

3.4.3 Graphic designers (SOC unit group 3421)

Job roles included in this group include commercial artists, designers (advertising), graphic artists, graphic designers and MAC operators. Individuals working in this role 'use illustrative, sound, visual and multimedia techniques to convey a message for information, entertainment, advertising, promotion or publicity purposes, and create special visual effects and animations for computer games, film, interactive and other media' (Office for National Statistics, 2010).

Office for National Statistics (2010) identifies the following tasks that are typically undertaken by workers in this occupation:

- Liaising with clients to clarify project briefs; discuss the media, software and technology to be used and establish project timetables and budgets.
- Researching a project, considering previous related projects and comparing the costs of using different processes.
- Preparing sketches, scale drawings, models, colour schemes and other mock-ups to show clients and obtain feedback.
- Preparing a specification and instructions for the project.
- Liaising with other parts of the production team to ensure graphic designs fit with other elements, processes and timescales.
- Producing or overseeing creation of the final product.

This occupation features on the DCMS creative occupations list. Stakeholders note that there may be overlap between this group and web design and development professionals (2137) since most graphic designers now work digitally and may well be involved in web design.⁶

3.4.4 Arts officers, producers and directors (SOC unit group 3416)

Job roles included in this group include film editors, production assistants (broadcasting), studio managers, television producers and theatrical agents. Individuals working in this role 'assume creative, financial and organisational responsibilities in the production and direction of television and radio programmes, films, stage presentations, content for other media, and the promotion and exhibition of other creative activities' (Office for National Statistics, 2010).

Office for National Statistics (2010) identifies the following tasks that are typically undertaken by workers in this occupation:

⁶ 3421 has been selected rather than 2137 to avoid orientating the list too much towards IT and computing -related roles.

- Choosing writers, scripts, technical staff and performers, and assuming overall responsibility for completion of project on time and within budget.
- Directing actors, designers, camera team, sound crew and other production and technical staff to achieve desired effects.
- Breaking a script into scenes and formulating a shooting schedule that will be most economical in terms of time, location and sets.
- Preparing rehearsal and production schedules for main events, designing sets and costumes, and undertaking technical rehearsals and dress rehearsals.
- Ensuring necessary equipment, props, performers and technical staff are on set when required.
- Managing health and safety issues.
- Selecting contracts and markets and arranging for the presentation and/or distribution of performance, visual and heritage arts.

This occupation features on the DCMS creative occupations list. Covering both the film and television sectors, stakeholders suggest this is an important occupational group to focus on given that it cuts across a range of art forms and areas.

3.4.5 Photographers, audio-visual and broadcasting equipment operators (SOC unit group 3417)

Job roles included within this occupational group include audio-visual technicians, cameramen, photographers, projectionists and sound engineers. Individuals working in this role 'operate and assist with still, cine and television cameras and operate other equipment to record, manipulate and project sound and vision for entertainment, cultural, commercial and industrial purposes' (Office for National Statistics, 2010).

Office for National Statistics (2010) identifies the following tasks that are typically undertaken by workers in this occupation:

- Selecting a subject and composing pictures, or discussing composition with colleagues.
- Arranging subjects, lighting, camera equipment and microphones.
- Inserting lenses and adjusting aperture and speed settings as necessary.
- Operating scanning equipment to transfer images to computer and manipulating images to achieve the desired effect.
- Photographing subjects or following action by moving camera.
- Taking, recording and manipulating digital images and digital video footage.

- Controlling transmission, broadcasting and satellite systems for television and radio programmes, identifying and solving related technical problems.
- Checking operation and positioning of projectors, vision and sound recording equipment, and mixing and dubbing equipment.

This occupation features on the DCMS creative occupations list. Stakeholders report that individuals who work within these roles are being dramatically affected by digitisation, and that employers had reported skills shortages for more experienced workers in roles such as camera operators, sound engineers, audio visual technicians and projectionists.

3.5 Conclusion

This chapter has set out the approach taken to identify the five key occupations considered in detail during this study, and described the types of work undertaken by individuals working in each of the selected occupations.

The starting point for selecting occupations was the e-skills UK list of digital occupations and DCMS' list of creative occupations, which include a total of 37 unique occupations. Occupations were then shortlisted based on their importance to the digital and creative sector's recruitment needs over the coming decade; their expected exposure to technological change; and with a view to obtaining representation across a range of digital and creative activities. These factors were considered through a combination of quantitative analysis and consultation with stakeholders.

The occupations selected for detailed analysis are:

- IT business analysts, architects and systems designers;
- Programmers and software development professionals;
- Graphic designers;
- Arts officers, producers and directors;
- Photographers, audio-visual and broadcasting equipment operators.

4 The sector today

Chapter summary

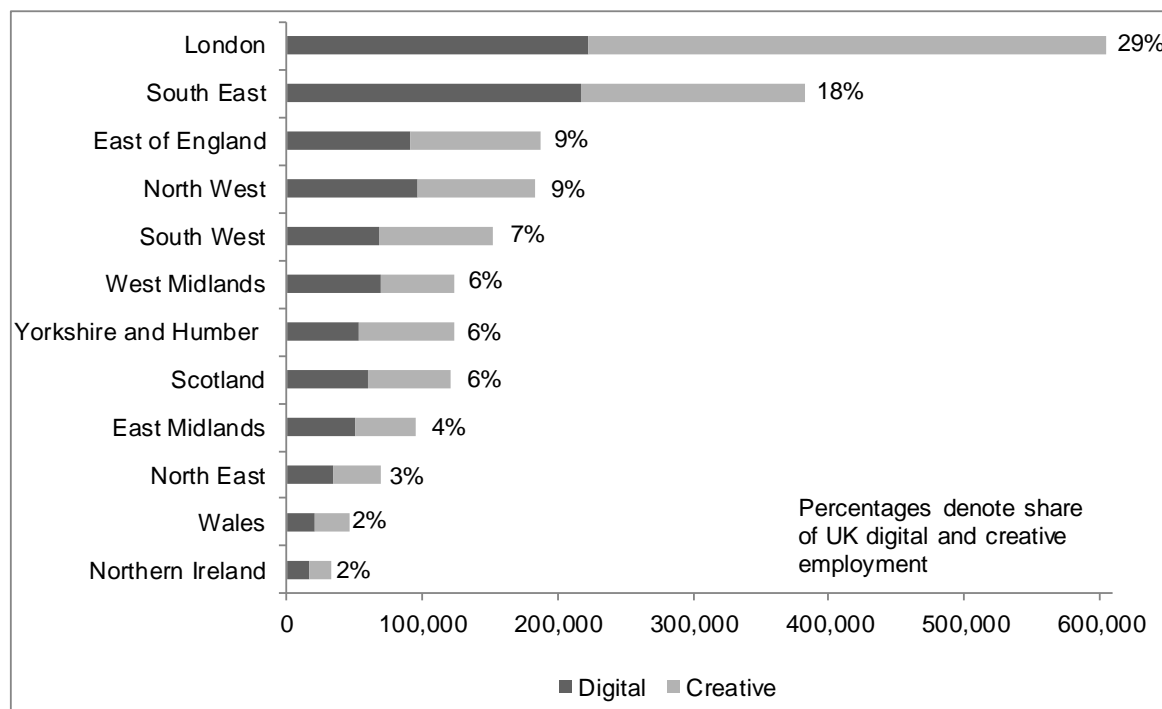
- Almost half of the 2.1 million digital and creative sector workers in the UK in 2012 were in London or the South East.
- The digital and creative sector is characterised by a high proportion of micro enterprises and self-employment. In some occupations the attractiveness of freelancing makes it difficult for employers to recruit experienced workers on permanent contracts.
- The sector faces diversity challenges. A failure to attract more females to digital roles means the sub-sector misses out on an important source of potential labour. The proportion of non-white workers in the creative sub-sector remains below average.
- The prevalence of skills gaps within the digital and creative workforce is in line with that for the economy as a whole, though skill gaps are more prevalent amongst digital occupations. Advanced IT or software skills are much more likely to be identified as lacking amongst digital and creative employees, and employers highlight the importance of workers keeping up to date with rapid advances in technology.
- Digital and creative employers face challenges filling vacancies, particularly for technical roles, such as programmers and web developers. However, there is often a wide choice of applicants for roles in some of the most attractive occupations, such as graphic designers, producers and photographers.
- Graduate recruitment plays an extremely important role given the orientation of the sector towards high-skill jobs. Employers are concerned that courses may not equip graduates with the right skills, particularly because they do not keep pace with technological change or give students sufficient practical experience. At the same time, experience and learning through doing are often more valuable to employers than formal education.
- Employers increasingly seek a 'fusion' of entrepreneurial, technical and creative skills. They often find that workers with the right technical skills may lack the business or softer skills to be effective in a role.
- Skills gaps and vacancies are harming the competitiveness of digital and creative firms. Firms are losing business, delaying the development of new products and pushing up costs.

4.1 Characteristics of the digital and creative sector and its labour market

4.1.1 Regional employment

Within the UK, the greatest concentration of digital and creative employment is within London, where the sector accounts for just over 600,000 jobs, equivalent to 12 per cent of total employment in the capital. There is also a concentration of digital and creative jobs in the South East, where there are 382,000 creative and digital jobs.

Figure 4.1 Employment in the digital and creative sector, by region, 2012



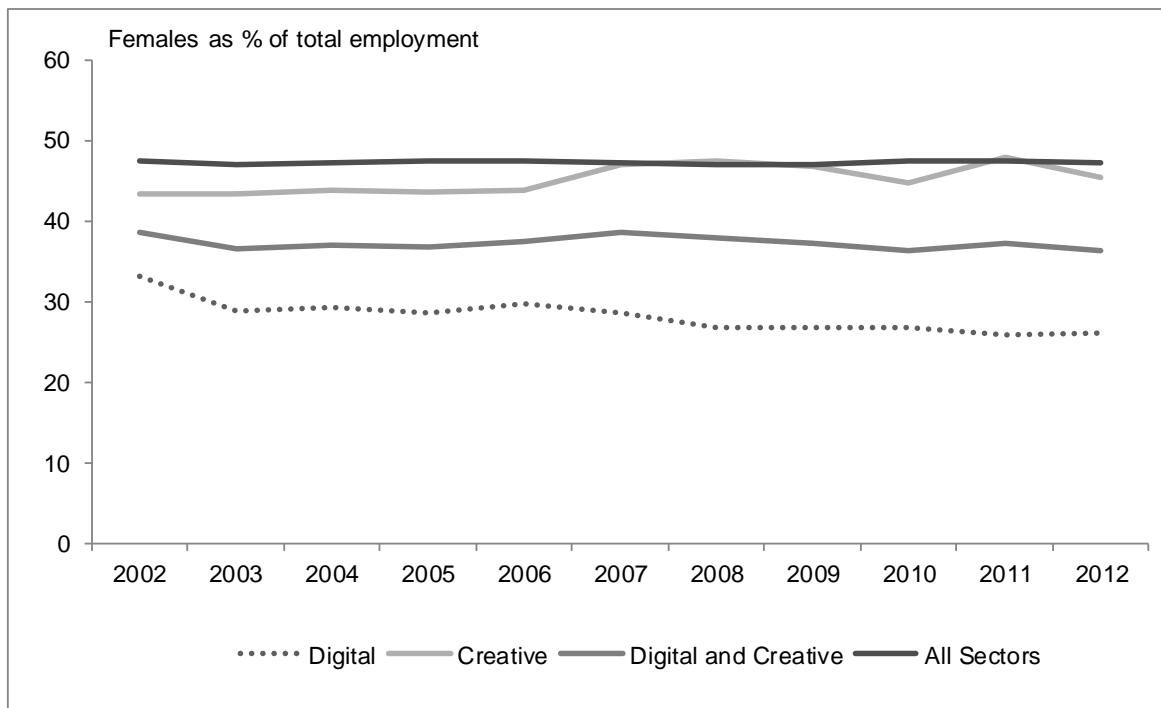
Source: UKCES Working Futures (2014a)

Figure 4.1 highlights the concentration of the digital and creative sector in London and the South East, which together account for 47 per cent of digital and creative sector jobs in the UK. Previous research by NESTA identified nine creative industry 'hotspots' outside of London: Bath, Brighton, Bristol, Cambridge, Guildford, Edinburgh, Manchester, Oxford, Wycombe-Slough (Chapain *et al.*, 2010). UKCES (2012a) also highlights recent growth in the digital and creative cluster in the North West of England, which appears to be partly related to the relocation of a substantial proportion of the BBC's operations from London to Manchester.

Stakeholders report an increasing trend to produce films and television shows outside of London, both in other English regions, and in Scotland, Northern Ireland and Wales, partially as a result of the extension of tax incentives. However, these efforts are sometimes hindered by a lack of skills away from the capital. For example, producers in Manchester often have to bring in workers from either London or overseas. Stakeholders suggest this reflects that many digital and creative sector workers prefer to be based in or close to London, where there is the greatest concentration of job opportunities, and the best opportunities for networking with potential clients and collaborators. For those who are self-employed, there is a particularly strong incentive to be based in a location where a steady stream of work is available, rather than in a part of the country where opportunities may be more intermittent, even though the nature of many digital jobs is such that the location where work is completed should not matter. One notable exception to the overall geographic distribution of activity is the computer games industry, which has long been dispersed across the UK and has a less London-centric labour market.

Figure 4.2 shows that in 2012 26 per cent of digital workers were female, substantially lower than the national average of 47 per cent, and down from 33 per cent in 2002. Previous research has highlighted the under-representation of female workers in the digital workforce. For example, UKCES (2012b) highlights that women may be both less likely to enter the sector, and progress within it. It points to low shares of female students at A Level and degree level, and notes that low numbers of women entering the sector restricts the pool of available labour and may contribute to recruitment challenges. This view was echoed by stakeholders interviewed for this study. UKCES (2012b) also cites data from the Joint Council of Qualifications and UCAS that female participation in IT related education was continuing to fall. More recently, e-skills UK (2014) shows that while the number of female applicants to computer science and IT related higher education courses increased slightly between 2007 and 2013, the rate of increase was greater amongst male applicants. As a result, females accounted for 12 per cent of applicants in 2013, down from 14 per cent in 2007.

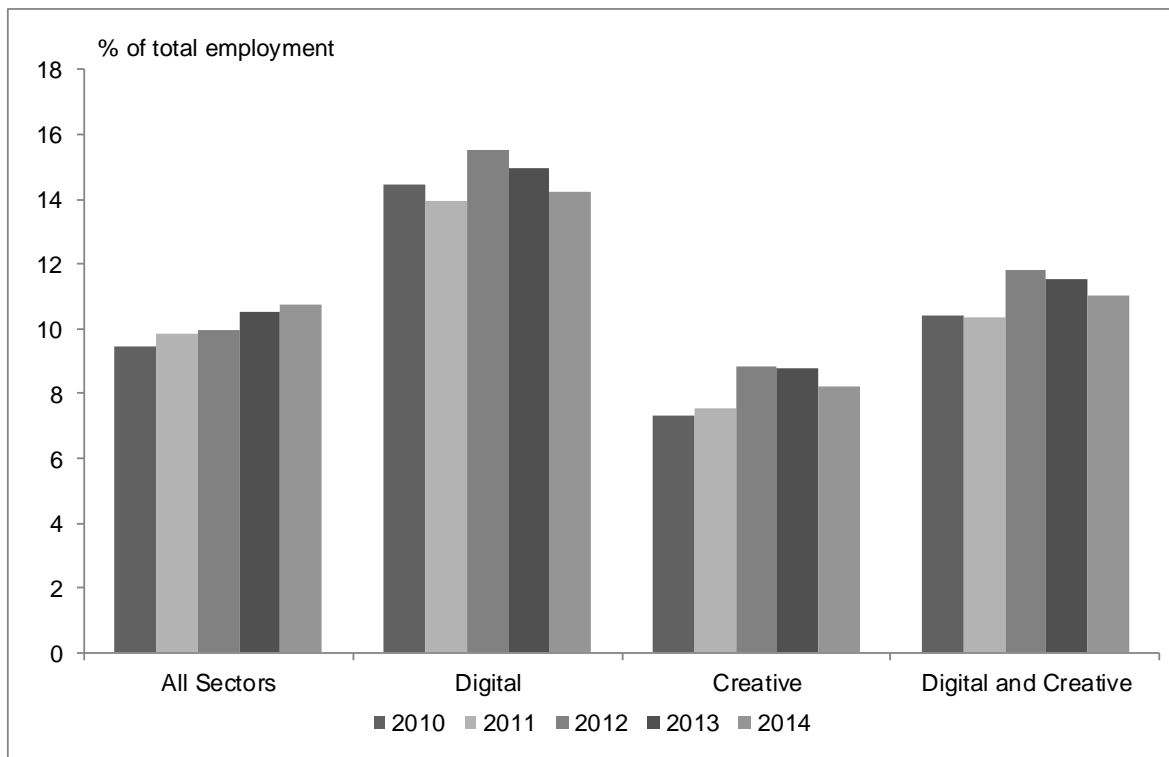
Figure 4.2 Female employment share, 2002 to 2012



Source: UKCES Working Futures (2014a)

There is a diversity challenge within the creative sub-sector (Figure 4.3), where only eight per cent of workers are non-white, compared to 11 per cent across the economy as a whole. The CBI (2014) also notes that the creative industries need to become more accessible to young people from different backgrounds. Creative and Cultural Skills and Creative Skillset (2011) highlight that routes to entry in many parts of the creative industry may relate to knowing people already working in the industry, which can reduce the diversity of recruitment. Stakeholders suggest that the large proportion of micro enterprises in the digital and creative sector means that firms often do not have the dedicated HR functions and structured recruitment processes that might be expected to support greater diversity.

Figure 4.3 Proportion of those in employment that are non-white



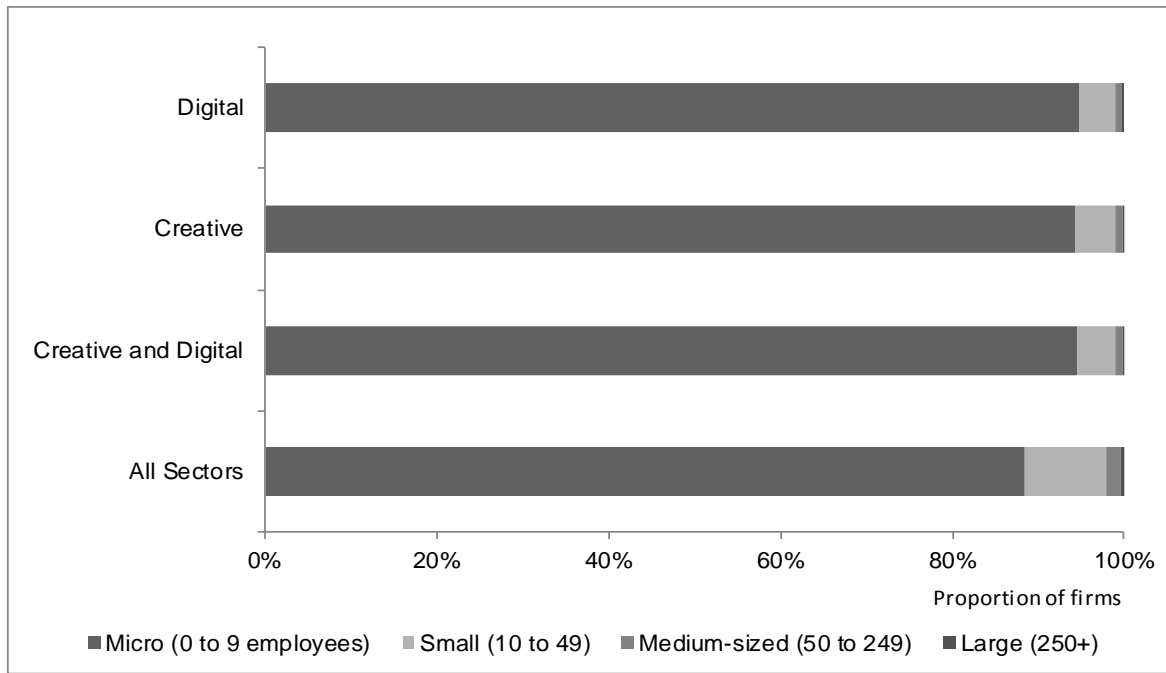
Note: Figures are for second quarter (April to June) of each year

Source: ONS, Labour Force Survey (2014a)

4.1.2 Firms

There were 303,000 firms in the digital and creative sector across the UK in 2014. Figure 4.4 below shows that there is a relatively high proportion of micro enterprises with fewer than ten employees: 94 per cent of digital creative and creative firms fall within this category, compared to 88 per cent in the economy as a whole. In contrast, the share of small, medium-sized and large firms is about half that observed for the economy as a whole.

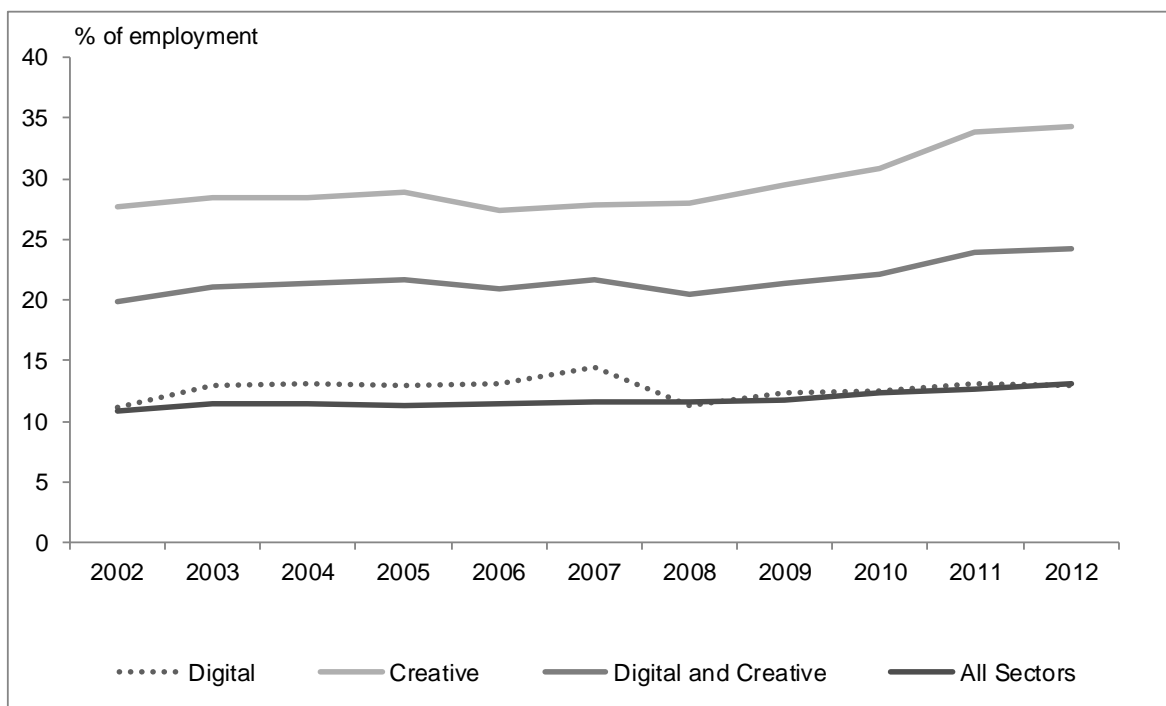
Figure 4.4 Size structure of firms by size band, 2014



Source: ONS Inter-Departmental Business Register (IDBR), UK Business Counts Database (2014c)

Another notable feature of the creative sub-sector is the high proportion of self-employed workers (Figure 4.5): 34 per cent of sector workers are self-employed, well above the national average of 13 per cent. In addition, self-employment within the creative sub-sector has noticeably increased in recent years, from 28 per cent in 2008. In comparison, the national average has increased by less than two percentage points over the same period.

Figure 4.5 Share of self-employed workers, 2002 to 2012



Source: UKCES Working Futures (2014a)

Previous research suggests that the recession led to permanent workers being laid off, and many of those individuals went on to be self-employed or work freelance (UKCES, 2012c). Data supports this hypothesis: a fall of 70,000 creative employees between 2008 and 2012 was offset by a corresponding increase in self-employed workers. Demographic trends may also be a factor in this trend: as workers reach retirement age there is an increasing tendency for some to continue working in a part-time self-employed capacity.

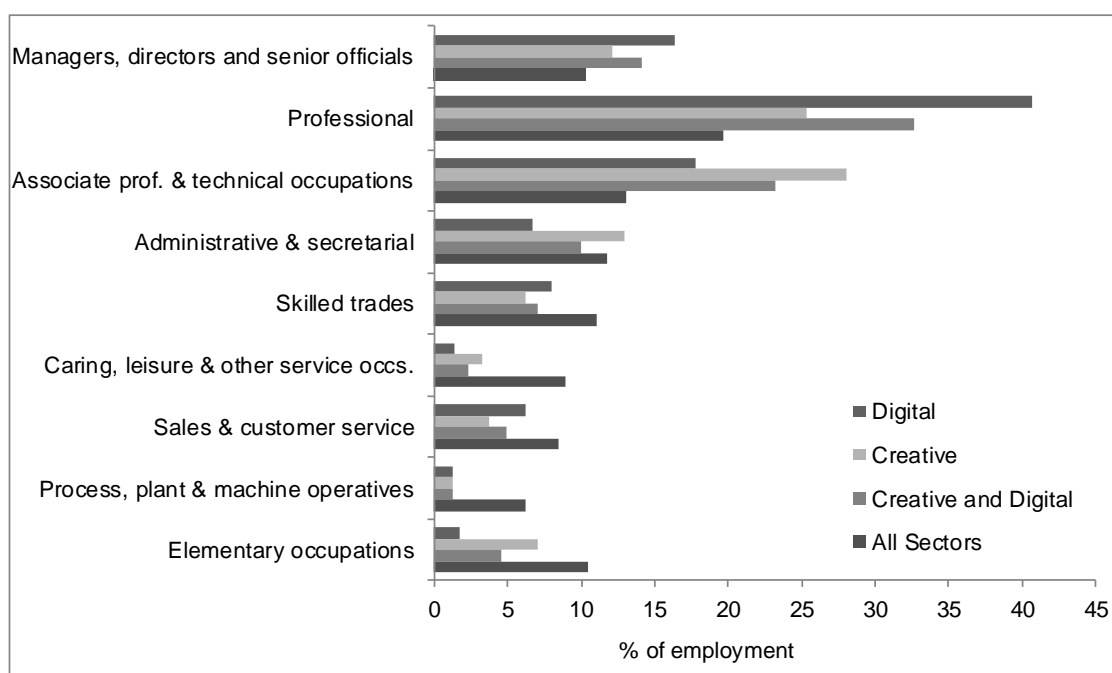
Work in the creative sub-sector often brings together a group of people with particular skills and experience to work on time-limited projects. In this context the flexibility of self-employed or freelance workers can be extremely valuable and this means it is important for self-employed workers to amass a network of contacts. However, while self-employment can bring flexibility and new opportunities for creative industry workers, it can also bring challenges in terms of personal development. Meager *et al.* (2011) suggest that self-employed workers are only half as likely as employees to undertake work-related education or training. Similarly, industry stakeholders noted that the self-employed often find it difficult to identify when to invest in additional staff or upskill themselves.

4.2 Current skills within the digital and creative sector

4.2.1 Current skills profile

Within the digital sub-sector, 41 per cent of people work in professional occupations – more than double the share for the economy as a whole (Figure 4.6, below). Similarly, 28 per cent of creative sub-sector workers are in the associate professional and technical occupational group. This is once again more than twice the national average share.

Figure 4.6 Broad occupational profile, 2012



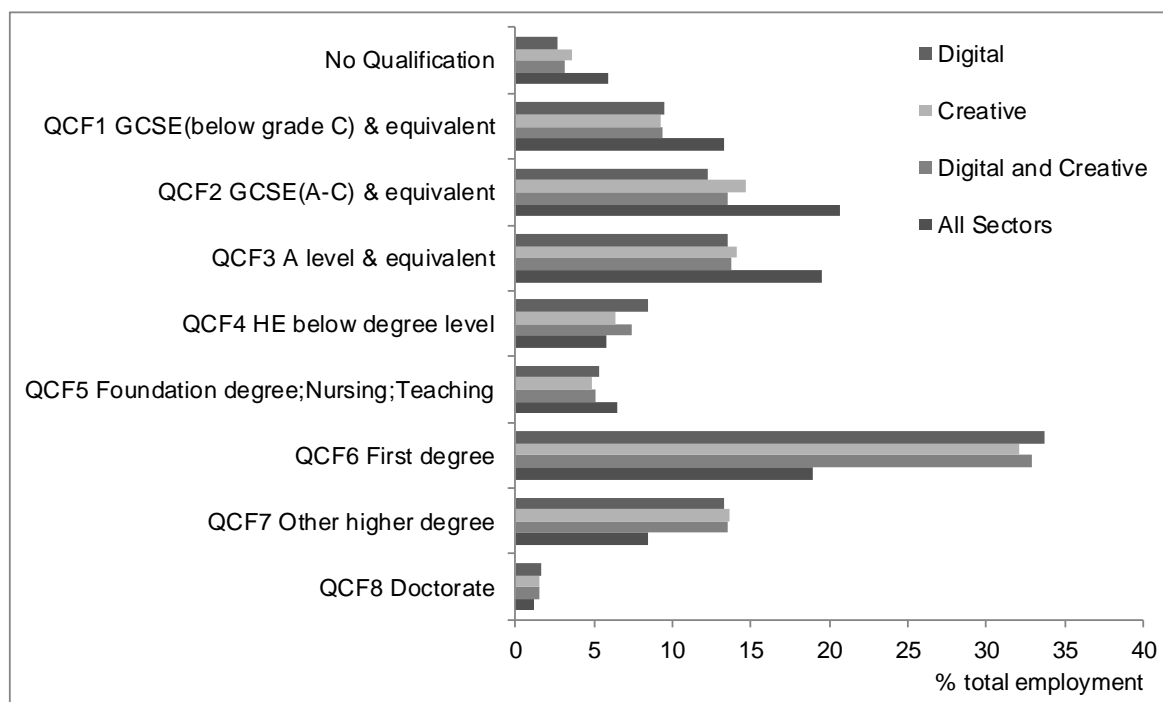
Source: UKCES Working Futures (2014a)

Consistent with the concentration of workers in higher occupational groups, the skills profile of the digital and creative sector is strongly orientated towards those with university-level education. Nearly half (48 per cent) of digital and creative sector workers are educated to first degree level or above, compared to an average of 29 per cent across all sectors.

Stakeholders and employers caution that qualifications do not always equate to the skills demanded. Digital employers, in particular, expressed concern that the content of degree courses is often not relevant to the workplace. Within the creative sub-sector a large number of people with generic university qualifications have entered the industry, but many lack the more job-specific skills that would enable them to become fully effective in a particular occupation without further training after university.

While it is understandable that employers may wish to recruit employees that are already equipped with the specific skills they need, from the individual’s perspective, specialising too early during education risks limiting employment prospects if jobs are unavailable in the chosen area after graduation.

Figure 4.7 Employment by highest level of qualification achieved, 2012



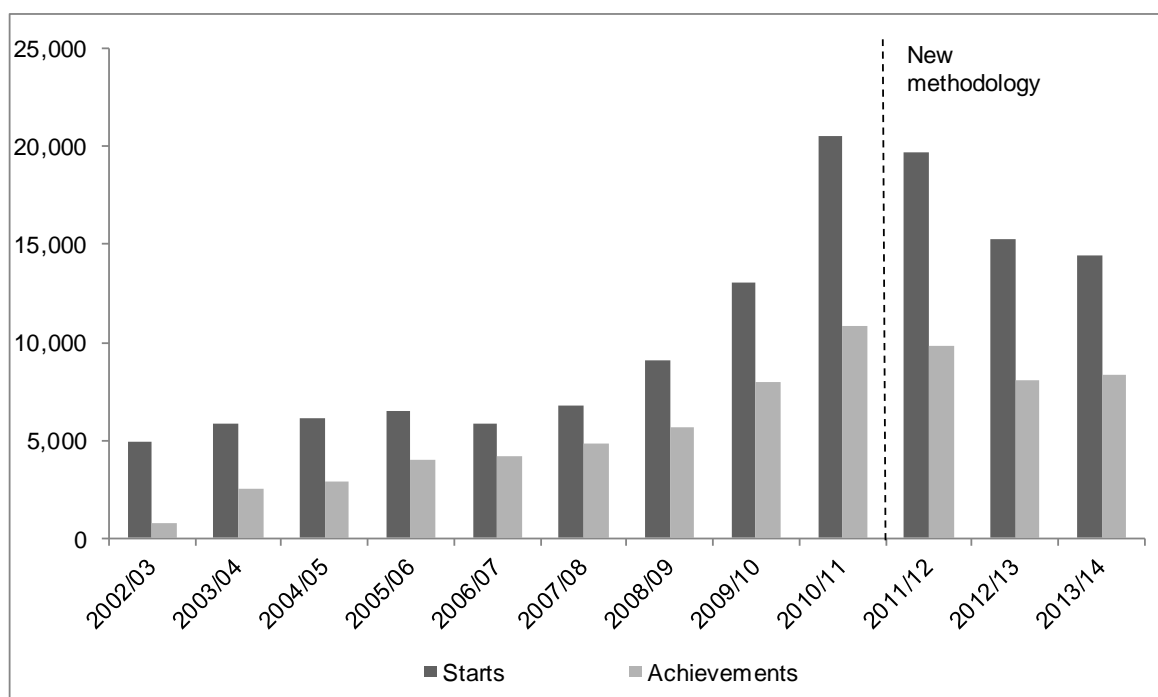
Source: UKCES Working Futures (2014a)

Digital and creative employers have historically had limited engagement with apprenticeships, but there was strong growth in the number of digital and creative apprenticeship starts 2008/09 and 2010/11, as can be seen in Figure 4.8 (data for England). A methodological adjustment in the Skills Funding Agency dataset in 2011/12 makes it difficult to identify a clear trend for the entire period since 2002/03, but in the most recent year the number of starts and achievements fell to 14,500 and 8,400 respectively, down from 19,700 and 9,800 in 2011/12. Closer inspection of the data reveals that starts for both intermediate and advanced apprenticeships fell between 2011/12 and 2013/14. Numbers starting higher apprenticeships more than tripled over this period, but remain relatively low at just 690 in 2013/14.

Creative & Cultural Skills (2013) note that apprenticeships may not be well suited to all areas of the creative industries, as the guarantee of having projects and work for long enough to sustain an apprentice in work for a full year may not be available to micro businesses or self-employed workers who wish to expand their business. Creative & Cultural Skills also note that a lack of incentives and the perception of bureaucracy may prevent some creative firms from taking on apprentices.

In England, efforts are currently underway to re-launch apprenticeships with a view to increasing quality; simplifying the system; and routing funding through employers. A key feature of the new system is that apprenticeships will be designed by employers so that training is more closely aligned with the skills needs of firms (HM Government, 2014). These changes are gradually being implemented through the 'Trailblazer' initiative, but it is too early to ascertain whether this will lead to greater take up of apprenticeships within the digital and creative sector. There are initiatives to support the take up of sector apprenticeship across the UK; for example, in Scotland, Creative Scotland has supported a Modern Apprenticeship for young people aged 16-19 since 2013. More recently it has also supported a traineeship scheme for 20-30 year olds facing barriers when trying to develop an arts career (Creative Scotland, 2015).

Figure 4.8 Digital and creative apprenticeship starts and achievements (England)



Note: The 'Arts, Media and Publishing' subject area has been selected to represent the creative sector and 'Information and Communication Technology' to represent the digital sector.

Source: Skills Funding Agency and Department for Business Innovation & Skills (2014)

4.2.2 Skills gaps within the current workforce

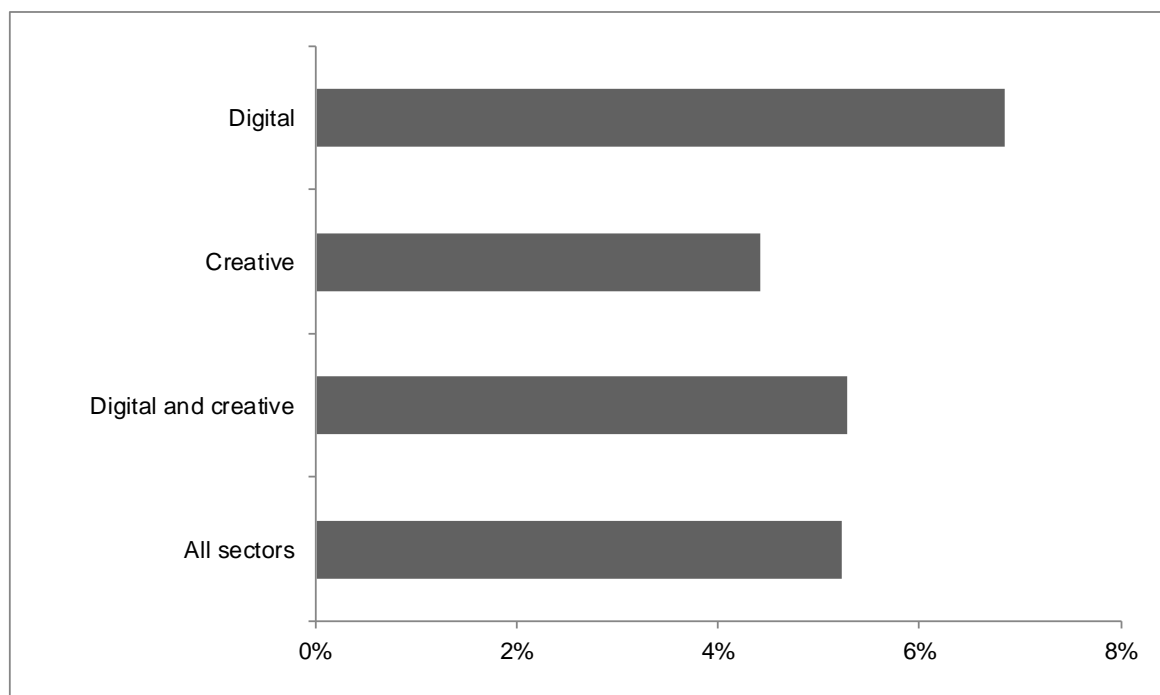
Figure 4.9, showing results from the UK Commission's Employer Skills Survey (2014b), shows that around five per cent of employees in the digital and creative sector are not fully proficient in their role, in line with the proportion across the economy as a whole. However, within the digital sub-sector the figure is almost seven per cent.

Perhaps unsurprisingly, given their importance to the core activities of the sector, when asked about the skills that need improving, digital and creative firms were much more likely to identify advanced IT or software skills than firms across the economy as a whole.⁷ Digital employers were also much more likely to point to technical, practical or job-specific skills.⁸

⁷ 37 per cent of digital and creative employers highlighted advanced IT or software skills, compared to 24 per cent across the economy as a whole.

⁸ 72 per cent of digital employers highlighted technical, practical or job-specific skills, compared to 60 per cent across the economy as a whole.

Figure 4.9 Skills gaps as a proportion of employment



Source: UKCES Employer Skills Survey (2014b)

Base: All employment

Consultation evidence provides further insight into skills gaps and is consistent with the findings discussed above. Interviewees noted that the digital and creative sector includes fast-paced industries which are rapidly changing, particularly in areas where technology plays a central role. In this context, workers often do not have the right software skills because requirements change so quickly. An individual may have the right skills when recruited, but those skills can quickly become outdated if the individual does not keep up to date with the latest advances. One employer noted that “the amount of change in this occupation [programmers] over three years is unfathomable, and can’t necessarily be planned for. If you stop your learning at any one point, you could be completely redundant within a couple of years.”

Consistent with the findings of previous research, employers also highlighted the importance of individuals possessing a mix of skills. Historically there has been a tendency to categorise workers within the digital and creative sector as either ‘creative’, ‘technical’ or ‘management’. This has been reinforced by the education system which often forces individuals to choose between the arts or sciences. Those focusing on the former may not develop technical skills, while those selecting the latter path may not be given the chance to develop their creativity.

This issue is highlighted by Universities UK (2010), which points to the false opposition between ‘creative’ subjects and science, technology, engineering and mathematics (STEM). The Council for Industry and Higher Education (CIHE) (2010) highlights the

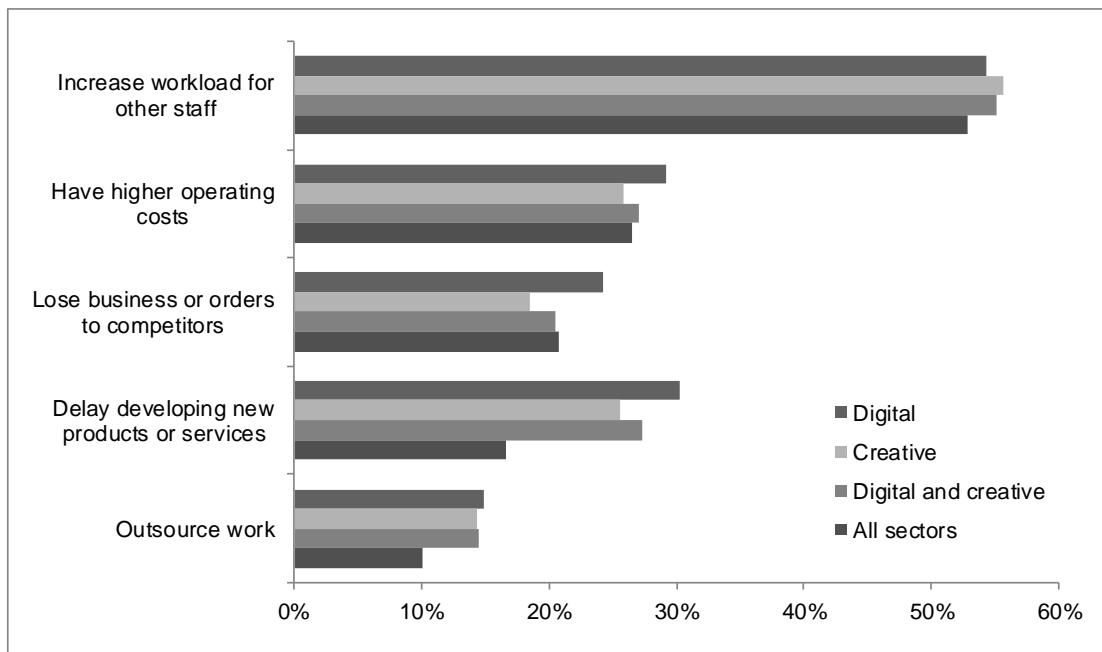
importance of individuals possessing a 'fusion' of technology, business, creative and interpersonal skills. Along similar lines, NESTA (2013) notes that creative, ICT and management skills are 'three core ingredients of a thriving economy'. Such views were strongly echoed by the stakeholders and employers interviewed for this study who explained that boundaries between 'digital' and 'creative' roles are becoming increasingly blurred as activities such as film making, communications, software and much of the creative sub-sector are now built around digital technology. Firms therefore need a blend of digital and creative skills, aligned with an ability to capitalise on them within a business context.

Teamworking was also highlighted as an important skill by a number of employers. The increasing complexity of digital and creative projects means it is important to be able to work in temporary project teams. Teamworking is an effective way of offsetting the difficulty of finding an individual with the right blend of the skills required. Evidence from the UK Commission's Employer Skills Survey (2014b) suggests that teamworking skills are slightly less likely to need improving in the digital and creative sector than across the economy as a whole.⁹

Skills gaps have real consequences for firms: 18 per cent of digital and creative firms reported that skills gaps have a major impact on performance, compared to 16 per cent in the economy as a whole (UKCES, 2014b). In common with the pattern across the economy, the most frequently cited implication of skills gaps is an increase in workload for other staff. However, skills gaps are much more likely to delay the development of new products or services amongst digital and creative firms, suggesting that a lack of workers with the right skills may be harming innovation and competitiveness.

⁹ 39 per cent of digital and creative employers highlighted teamworking when asked about skills that needed improving, compared to 44 per cent across the economy as a whole.

Figure 4.10 Implications of skills gaps



Source: UKCES Employer Skills Survey (2014b)

Base: All establishments with skills gaps

4.2.3 Current skills needs within the key occupations

IT business analysts, architects and systems designers

Those working in those role are called upon to understand a client’s requirements, and apply their technical expertise to identify and deliver a solution that meets those requirements. As one employer explained: “they need to translate their enthusiasm for technology into what their client needs.”

This calls for extremely strong and up-to-date technical skills, including knowledge of complex IT systems, and a detailed understanding of what programmers can deliver as well as the time that will be needed to implement changes so that, as one employer explained, “they know what they can commit to doing and in what timeframe”. It is also important to both anticipate where issues may arise and how they can be avoided or mitigated, and to have the ability to quickly solve unanticipated issues as they arise.

At the same time, very strong people skills are required to build relationships with clients, understand their organisation, actively listen to what is needed, and communicate potentially very technical information in a way that non-experts can understand. For some individuals there may be a sales aspect to their job, which could involve persuading clients to use particular products. Workers in this occupational group are often based at a client site for the duration of a project. One employer explained that “unlike programmers, they can't necessarily be taught their skills - they need to have some existing softer skills that make them right for the position”. Another employer noted that “they have got to be able to understand data and understand the technology that delivers the data but also have good linguistic and communication skills so that all of that information they have is usable”.

Business analysts need very strong numerical skills to be able to understand and analyse statistics. Individuals in this role may have more than one project underway at any one time, so the ability to multitask can be important. Employers noted that those working in digital agencies are likely to experience a more fast-moving environment and have a number of projects underway at once, while those working in finance, say, might work on a single big project for a longer period of time. Systems analysts, in particular, need to plan their work carefully and work through tasks in a very logical way.

Programmers and software development professionals

Individuals in this role need technical skills and a knowledge of programming. This includes an understanding of the principles of software development and design, an ability to understand project requirements, and being able to use different systems and software tools. Changing technologies mean that it is increasingly important that programmers are able to understand different systems; work with a range of existing systems; and understand how different systems can be made patched together effectively.

Programmers also need to understand the needs of users, beyond simple technical definitions of functionality. One employer described this as “understanding people and the product and not just being nerdy about code”.

Employers explained that motivation and an enthusiasm to solve problems are central to the role. One commented that “there is a level of passion and geekiness that is needed more than university [education]”. The desire to learn is also extremely important, particularly given rapid technological change which, as an employer explained, makes an individual with the “ability and desire to keep their skills up to date” essential. Another employer noted that “if we took somebody on eight years ago and they did not keep their skills up to date, they would be no use”. For some employers, attitude was more important than technical ability, since the latter can be taught relatively easily if it is lacking.

Creativity is also important in some roles, particularly for those within smaller digital agencies where an individual may work across a number of aspects of a project. Within larger organisations, programmers may be more specialised on the task of coding itself and other colleagues may work on the creative aspects of work.

Teamwork is becoming increasingly important: as projects become bigger and more complex they typically involve greater collaboration amongst workers.

Good communication skills can be desirable, but are not necessarily essential. Employers comments included: “the bonus is when you get somebody who can talk with customers - customers want to talk to the person actually doing the work” and “really good communication skills make the difference between an okay programmer and a great programmer. They need to communicate with project leads and project manager.” The extent to which communication skills are needed may ultimately depend on the type of role a programmer fulfils. Those working with others to build a user interface may need good communication skills to work alongside graphic designers, for example. Reflecting the blurring of boundaries between technical and creative roles, one employer reported that they are trying to involve programmers at earlier stages of projects, which again requires a greater degree of interaction with colleagues. Organisations that span both creative and digital activities, such as advertising agencies, increasingly seek individuals with a blend of coding and design skills. Other employers, particularly those with a narrower focus on delivering digital services, suggested that they often do not need a programmer to possess good people skills. One explained that in some roles the requirement is for someone that can “code all day long and follow instructions”.

Graphic designers

Employers reported that a combination of technical and creative skills are important for graphic designers. On the creative side, employers need individuals that can design something that is both attractive to look at, and which communicates a clear message to achieve an end result for clients. A good graphic designer has a good understanding of design principles, a good eye for detail, and the ability to solve problems. Technical skills are becoming increasingly important as design becomes more closely integrated with online content. Graphic designers need the motivation and ability to keep up to date with changing technology and software, such as page make up, illustration and photographic programmes.

Graphic designers also need strong people skills to work well in teams and with clients. One employer remarked that graphic designers need “an ability to work with customers and understand customers - where they are coming from and why they say or request certain things”.

Some employers also highlighted the importance of people skills, for both working in teams and with clients. Other generic skills are highlighted by the National Careers Service (n.d., para 'Skills, interests and qualities') which, alongside the types of skills outlined above, notes that graphic designers need the ability to manage their time, work to a budget, possess good spelling and grammar, and understand current trends and styles.

Arts officers, producers and directors

One employer succinctly summarised that the role of a producer is about "taking a vision and making it happen". This, in turn, requires knowledge of all aspects of production and the creative process within the area they are working in. Strong leadership and people skills are essential to "motivate, persuade and influence" clients and colleagues, and to work well within multi-disciplinary teams. People skills can also be valuable to help maintain a strong network of contacts within a particular industry.

Producers need to manage time, budgets and resources effectively to deliver projects on time and within budget. They need to be able to respond calmly and flexibly to issues as they arise. Creative Skillset (n.d.(a), para 'Is this role right for me?') also note that film producers need to be good at negotiating and securing finance for their production. There is often a great deal of competition for producer roles, so individuals need motivation, dedication and experience. It is also increasingly important to be able to produce outputs across different formats.

For directors, creative and technical skills are more important. In particular, directors need to develop a creative vision and have a clear idea of what they are trying to achieve. People skills play an important role because they need to be able to convey this vision to actors, scriptwriters and others involved in the production process. Directors need to remain calm under pressure, and be able to put people at ease in a high pressure environment to get the best out of them. On the technical side, directors need a good understanding of photography and camera work.

In addition to the skills and characteristics identified above, Creative Skillset (n.d.(b), para 'Is this role right for me?') notes that film directors need good attention to detail; the ability to work intensively for long hours; and be determined to succeed and have a strong sense of self-belief.

Photographers, audio-visual and broadcasting equipment operators

At a basic level, equipment operators need to be able to operate the audio visual equipment assigned to them and use associated computer hardware and software. This includes being able to repair equipment when it goes wrong. As one employer explained “when you are shooting, there cannot be any setbacks so they hold a lot of responsibility. They have to be very calm under pressure”.

Employers also highlighted the importance of team work, and one explained that “you tend to have equipment operators working in teams and taking responsibility for working different parts of the equipment. This means that they need to work together to ensure all components work together when required”.

Some employers suggested that they also valued individuals who can suggest how systems and the application of technology can be improved.

Employers suggested that teaching the technical skills required for the position is generally not difficult, but there is a creative element to equipment operation that is more difficult to pick up. One employer explained:

The final thing needed is creative knowledge which takes a bit more time. This is where they watch and listen to what they are capturing and learn from it. We call it Quality Control. It's about being aware and being able to recognise a glitch or a problem. They have to veer into the creative side for this.

For photographers it is important to be able to understand a client's needs; work to a brief; and understand how the pictures will ultimately be used, such as on a website, in a social media campaign, in printed media, and so on. This detailed understanding of what is required is essential to ensure that shots are composed in the right way to achieve the best possible results for the client. Photographers need a good eye for detail and an understanding of how to produce the best results for a given situation. One employer explained that “the skills vary by the type of photographer. For example, you can get documentary photographers, creative photographers, fashion photographers, etc. all of which require a different eye for detail”. Creative Skillset (n.d.(c), para ‘Is this role right for me?’) notes that photographers may also come to specialise in areas including corporate photography, advertising, editorials, forensics, medical, media and science. Once an area of specialism has been selected, a photographer will need to develop their specialist skills accordingly.

People skills are important, particularly as a photographer becomes more experienced. They may need to spend a lot of time with clients and manage others involved in a shoot, such as hair and make-up artists. The competitive nature of the photography profession means that people skills are also valuable to build a client base. It is also increasingly important for photographers to be skilled in image manipulation and image management software to manage and refine photos after they have been taken.

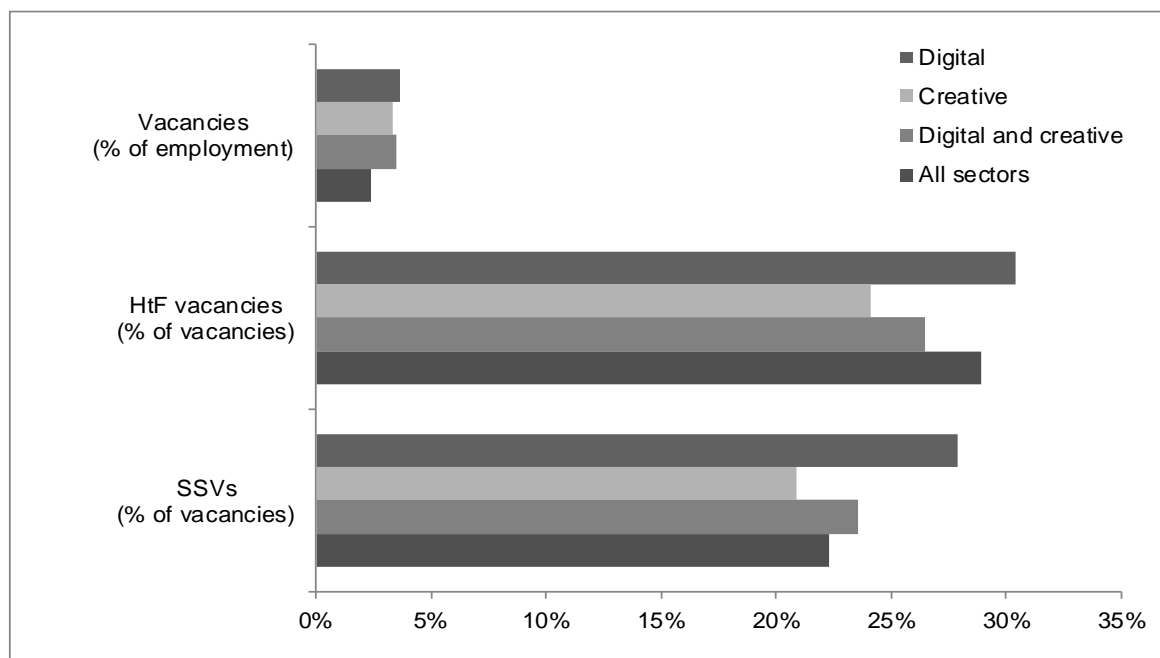
4.3 Recruitment

4.3.1 Overview of recruitment across the digital and creative sector

Figure 4.11 highlights that there are 35 vacancies per 1,000 jobs in the digital and creative sector, compared to 24 per 1,000 jobs across the whole economy. There is a particular challenge in the digital sub-sector where 28 per cent of vacancies are skills shortage vacancies.¹⁰

Employers explained that the digital sub-sector, in particular, faces challenges in recruiting the quantity and quality of workers needed and there is a pressing need to attract more workers into the sector. Stakeholders explained that there are challenges in identifying candidates for high-value digital skills areas, such as cyber security and high-end business analysts. Those with expertise in such areas can command extremely high salaries.

Figure 4.11 Density of vacancies, hard to fill vacancies and skills shortage vacancies



Source: UKCES Employer Skills Survey (2014b)

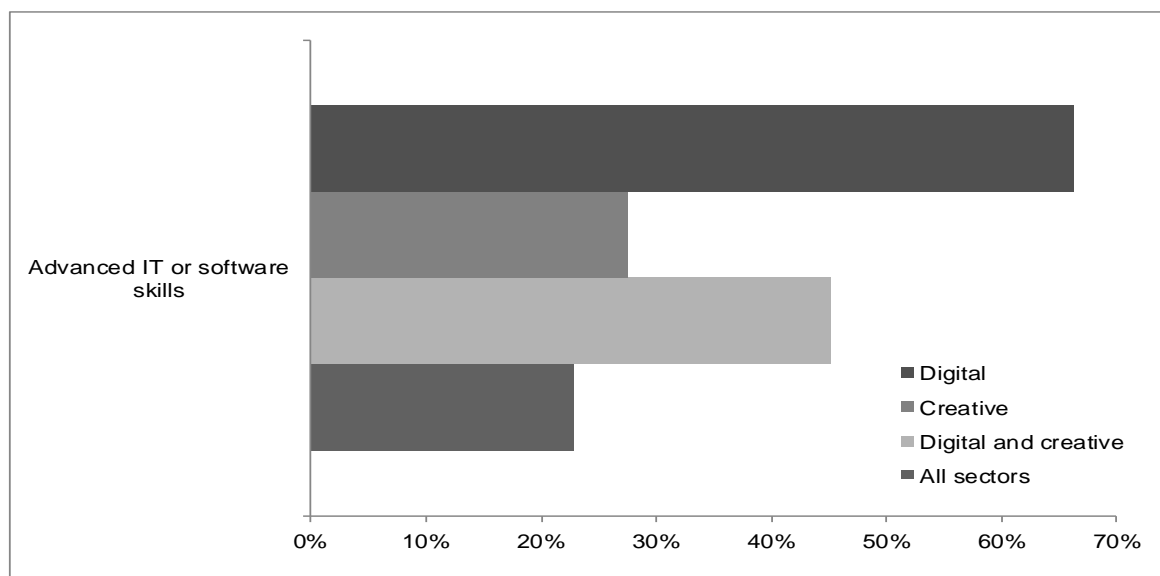
Base: All employment

¹⁰ A skills shortage vacancy arises when a vacancy is hard to fill because applicants lack the skills, experience or qualification the company seeks.

Within the creative sub-sector there are 33 vacancies per 1,000 jobs which, while lower than in the digital sub-sector, is still above the national average of 24 per 1,000 jobs. Stakeholders again pointed to the introduction of tax relief in areas such as TV, video games and regional theatres as having stimulated extremely strong demand for workers. They reported that their own sector-specific research has highlighted that recruitment challenges can be much greater in those sub-sectors which have most directly benefitted from the recent introduction of tax credits. Reduced tax rates mean that projects in these areas become more financially attractive and, all else equal, this would be expected to lead to some projects going ahead that might previously have not been financially viable. In addition, the tax relief measures enhance the international competitiveness of the UK in the areas affected and work may be coming to the UK that would otherwise have been undertaken in another country.

Previous research has highlighted that the relatively small average size of firms in the creative sub-sector means that employers often need individuals with a broad range of skills that can take on a wide variety of responsibilities outside of their core area of expertise (Creative & Cultural Skills and Creative Skillset, 2011). The difficulty of finding an individual with the precise blend of skills needed may also be contributing to an above-average vacancy rate in the creative sub-sector.

Figure 4.12 Skills found difficult to obtain from applicants



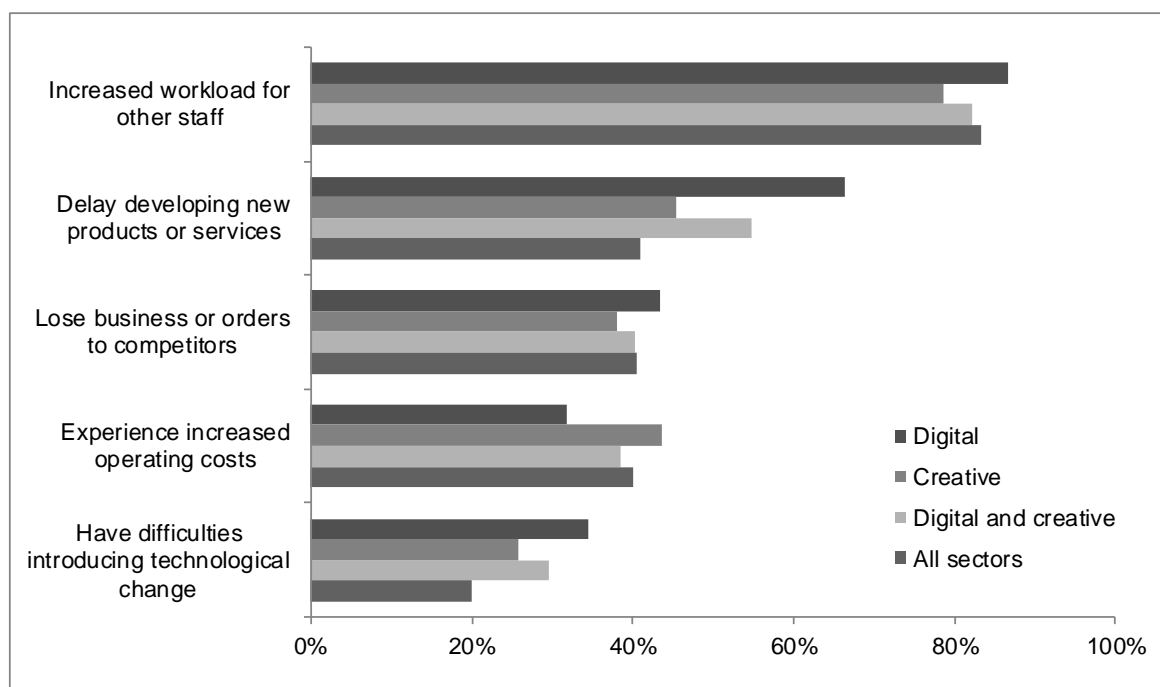
Source: UKCES Employer Skills Survey (2014b)

Base: All establishments with skill shortage vacancies

Consistent with the consultation evidence, respondents to the UK Commission’s Employer Skills Survey (2014b) were much more likely than average to highlight advanced IT or software skills when asked about the skills they find difficult to obtain from job applicants (Figure 4.12). This is particularly true of the digital sub-sector, where two-thirds of employers cited this type of skill.

The survey undertaken for this study also asked employers which roles they find it most difficult to recruit to. This yielded a range of responses, but there was a clear bias towards more technical roles such as programmers and web developers. Some firms in the creative sub-sector noted that it can be particularly difficult for them to recruit to digital roles since those with the requisite skills might not typically think of seeking a career in a more creative environment. Stakeholders noted that the situation is further complicated for employers because people with the necessary IT skills may often lack the business and interpersonal skills needed to fulfil their role.

Figure 4.13 Implications of hard to fill vacancies



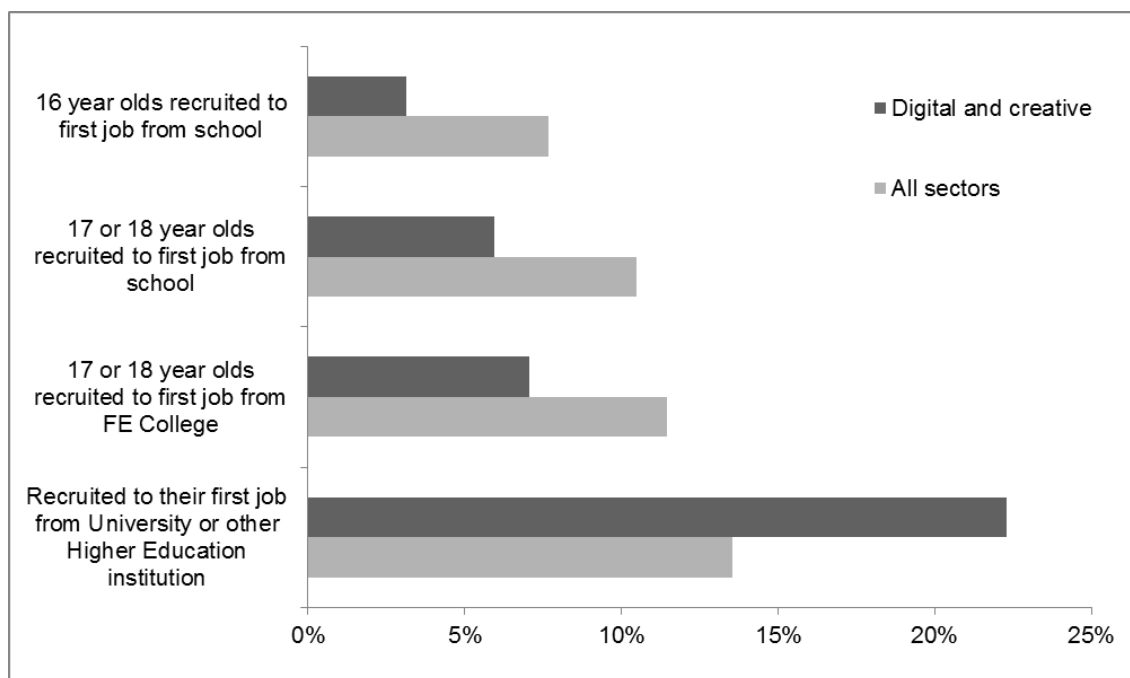
Source: UKCES Employer Skills Survey (2014b)

Base: All establishments with hard to fill vacancies

The implications of hard to fill vacancies, shown in Figure 4.13, above, are similar to those for skills gaps amongst the current workforce. Digital and creative employers are more likely than average to delay new products or services and encounter difficulties introducing technological change as a result of hard to fill vacancies. It is also important to note that 40 per cent of firms report that they have lost business to competitors as a result of being unable to fill posts.

The high proportion of degree-educated workers in the digital and creative sector means that graduate recruitment plays a much more important role than across the economy as a whole. One in five (22 per cent) digital and creative firms have recruited an individual into their first job from university or other higher education institution within the last three years, compared to 14 per cent across all sectors. Conversely, digital and creative firms are much less likely to have recruited individuals from school or FE college.

Figure 4.14 Whether a firm has recruited anyone to their first job on leaving school, college or university in the last 2-3 years

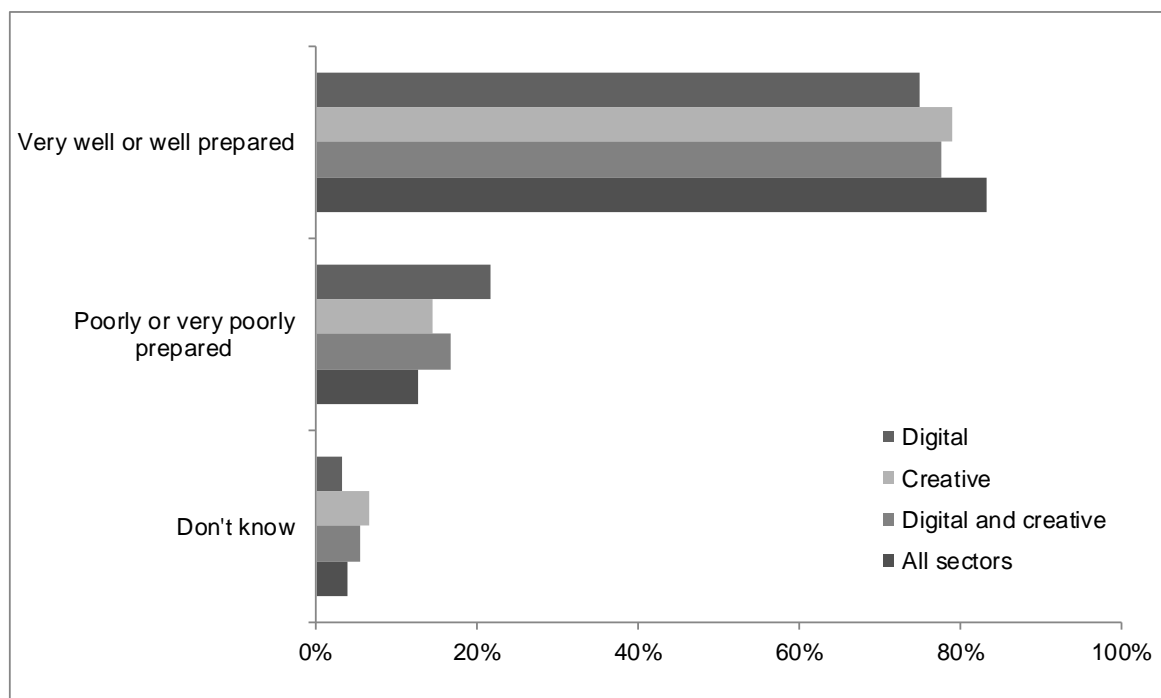


Source: UKCES Employer Skills Survey (2014b)

Base: All establishments in England, Northern Ireland and Wales

Figure 4.15 shows that 78 per cent of firms hiring graduates felt they were either very well or well prepared, slightly below the average of 83 per cent across the economy as a whole. Digital employers had the greatest concerns about the preparedness of graduates: 22 per cent felt graduates were poorly or very poorly prepared for work, compared to just 13 per cent across the economy as a whole.

Figure 4.15 Preparedness of graduates



Source: UKCES Employer Skills Survey (2014b)

Base: All establishments in England, Northern Ireland and Wales that have recruited university or higher education leavers in the last 2-3 years

UKCES (2012a) note concern amongst employers that higher education institutions find it difficult to keep pace with technological changes. NESTA (2013) note that “most universities have not been producing the kind of talent that the creative industries demand”. That research cited evidence on employment outcomes, including that only 12 per cent of graduates from computer games courses secured employment in the games industry within six months of graduating. In a survey undertaken for a 2011 NESTA study, 58 per cent of video game firms reported that they found it difficult to recruit graduates with appropriate skills straight from education. More recently, the National Centre for Universities and Business (2015) highlighted that unemployment rates amongst computer science graduates six months after graduation are the highest amongst graduates from all degree subjects. In addition, student numbers in some areas are falling: the Scottish Government notes the numbers of students following ICT related courses at school and in FE colleges has been dropping over the past decade (although applications to IT related university courses in Scotland have recently increased, following a decline from 2002-2010) (Scottish Government, 2013).

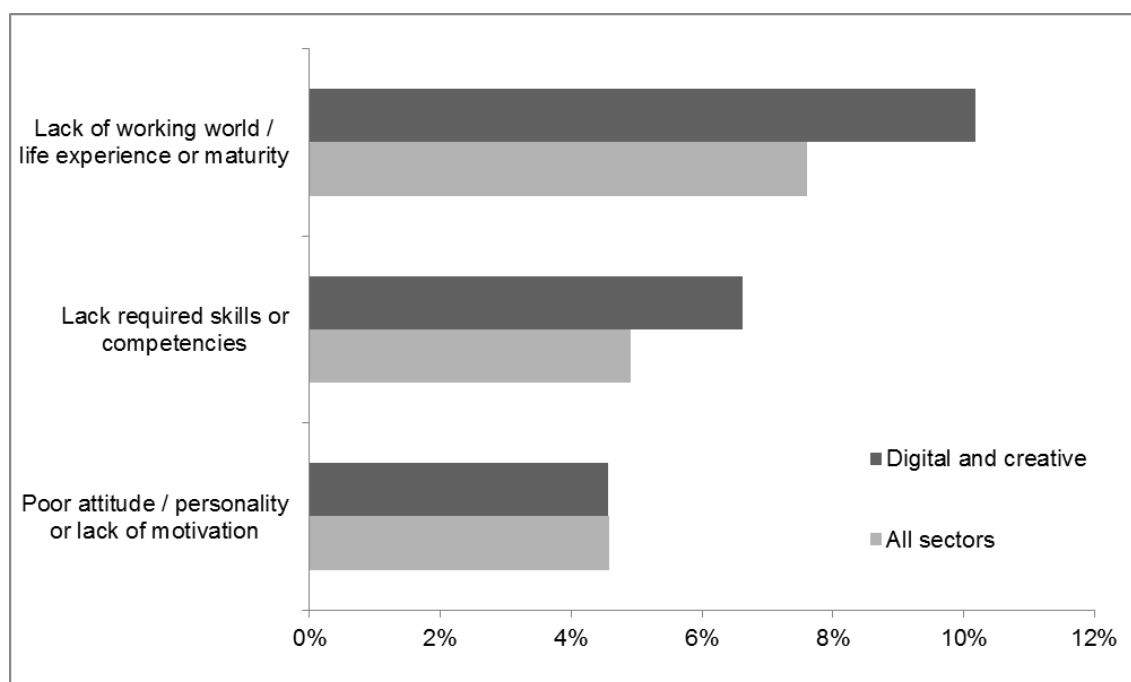
The employer interviews for this study also identified concerns about the extent to which university courses deliver the skills that digital firms need. One employer suggested that some universities still teach aspects of programming that are no longer widely used, and another highlighted that course content does not keep up with the rate of technological change: “one of the disconnects is that by the time graduates finish university and begin work everything has changed again”. A third employer commented that there is too much reliance on teaching programming skills through textbooks, rather than practical experience. The fact that a high unemployment rate amongst computer science graduates co-exists with skills shortages in digital roles suggests that employers’ concerns about the work readiness of graduates in digital subjects should be taken seriously.

Technological change can also affect the preparedness of graduates in less direct ways: one employer noted that journalism graduates can lack the ability to write in the less formal writing styles required for their digital publications.

NESTA (2011) found that many school leavers applying for specialist courses lacked the ability to work in multidisciplinary teams. They also found that many young people applying to university and FE college courses lack knowledge of how the industries work and what a job in the industries involves. NESTA (2013) cite the example of producing a short film, which involves a wide range of specialists with different types of creative expertise, including scriptwriting, photography, acting and visual effects production. Individuals working in these areas therefore need strong communication and teamworking skills to work effectively with colleagues with different types of expertise.

Evidence from the UK Commission’s Employer Skills Survey (2014b) also suggests that broader skills are a concern for employers. Although there are concerns about skills and competencies, education and literacy, and numeracy, the skills most frequently identified as lacking are softer skills such as a lack of life experience; having a poor attitude or a lack of motivation; and a lack of common sense. In the survey for this study, employers highlighted the importance of blending technical skills with creativity, a positive attitude and softer skills. One employer suggested that attitude and people skills were, in many ways, a more important consideration for them because it is relatively easy to train someone in technical skills, but people skills and attitudes are less easily added to someone with strong technical skills.

Figure 4.16 Skills lacking amongst university or higher education leavers



Source: UKCES Employer Skills Survey (2014b)

Base: All establishments in England, Northern Ireland and Wales that have recruited university or higher education leavers in the last 2-3 years

Previous research has considered the underlying reasons for a lack of work readiness amongst graduates. NESTA (2013) highlights that the focus of primary schools on English, science and mathematics has meant that the skills needed by the creative economy, such as computer science, design and technology, and art have received less focus. CIHE (2010) point to a decline of work placements during university courses, and cite evidence suggesting that in 1998 around 30 per cent of IT graduates had undertaken some form of work placement as part of their degree, but that had fallen to 20 per cent in 2004, and below 20 per cent in subsequent years.

4.3.2 Recruitment to the five key occupations

IT business analysts, architects and systems designers

There is mixed evidence on firms' experience of recruiting into this role. Those reporting that recruitment was difficult highlighted that they are often competing with financial sector employers and major consultancy firms that can pay extremely high salaries. On the other hand, digital agencies can often offer many non-financial benefits compared to a financial company, such as more interesting work; a lack of fixed hours; a relaxed working environment; and, in one case, even a free bar. Some firms therefore find that they take on individuals seeking to escape from the more rigid working environment of a financial services firm.

Programmers and software development professionals

The UK Commission's Employer Skills Survey (2014b) suggests there are 12 vacancies per 1,000 employees in this role, which is substantially greater than five per 1,000 employees across the economy as a whole. The shortage of programmers has also been highlighted by previous research. For example, NESTA (2011) report that many video games and visual effects firms are forced to recruit from overseas.

At the same time, however, unemployment rates amongst computer science graduates six months after graduation are the highest amongst graduates from degrees in all subjects (National Centre for Universities and Business, 2015). This suggests a significant mismatch between the skills employers need and the skills taught at university.

Further insight in the types of recruitment difficulties faced by employers are provided by the research for this study. Some employers suggested that they find it difficult to find individuals with the right combination of soft or creative skills to complement their technical ability. Others suggested that many programmers want to work on a freelance basis and that it can be difficult to recruit them into a permanent job. Another employer explained that there is huge competition for talented programmers from start-up companies, which can offer large salaries and exciting and innovative projects: "there are a lot of funded start up agencies and enterprises, as well as disruptive new products. This is taking really talented programmers out of the digital talent pool because they are being attracted to start-up companies with these cool and well-funded products".

Retention can also be challenging. Smaller firms that recruit graduates may lose individuals to larger firms or those offering more innovative work after around 18 months of training. One interviewee highlighted that the shortage of good programmers has created an important role for recruitment agents who work to identify individuals that can be persuaded to move to another organisation for a larger salary. This frees up a post in their current organisation and sustains movement within the industry.

Graphic designers

Employers reported that there is generally a large pool of graphic designers available from which to recruit, but some found it difficult to recruit individuals with the combination of skills or ability level they require. One employer remarked that "there are loads of designers in the market, but it's because it is so easy to buy an apple mac, stick it in a room and call yourself a designer - but it doesn't make them a good designer."

Retention can also be an issue for some employers, and this seems to be at least partially related to the fact that once a designer is experienced and qualified it can be beneficial for them to become freelance.

Arts officers, producers and directors

Employers report that it is generally not difficult to find applicants for this role within the UK. One employer suggested that there are almost too many people to choose from in areas such as production. Nonetheless, finding individuals with the precise mix of skills required can be challenging in some areas, such as animation directors. There may also be geographical differences. One employer in Wales explained that people tend to leave to work in London for opportunities in the creative sector. They suggested that it can be extremely difficult to find individuals within Wales with experience of producing programmes for network broadcasters.

Photographers, audio-visual and broadcasting equipment operators

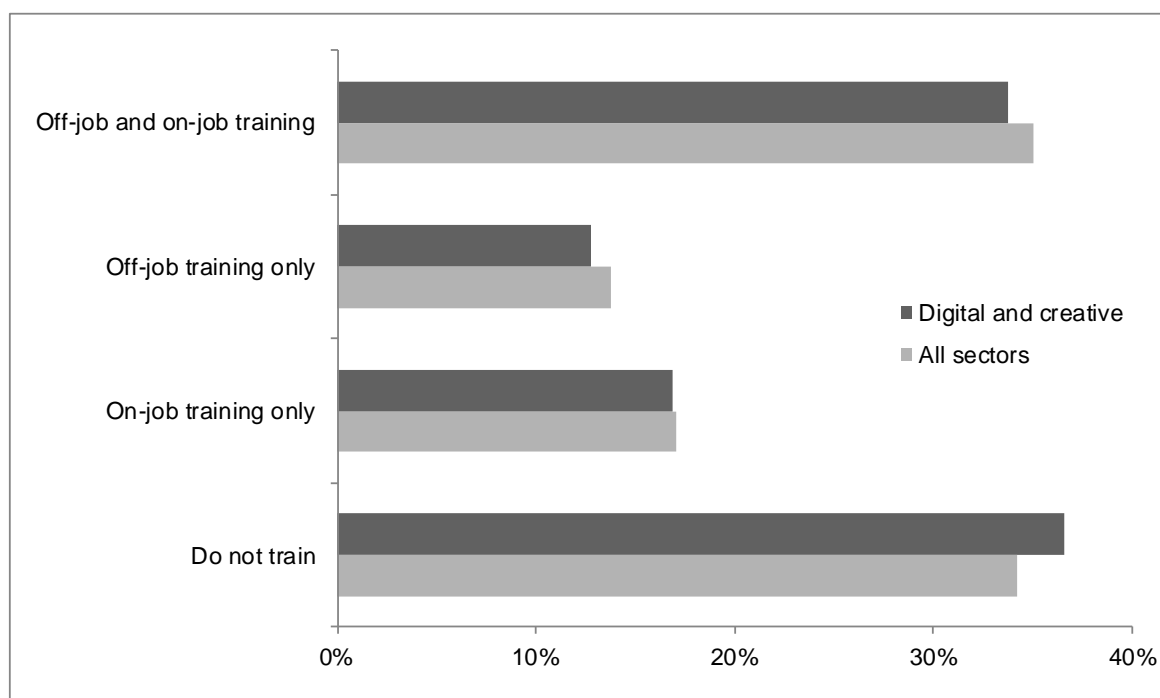
In general employers do not find it difficult to recruit to this role, but some note that it can be difficult to find individuals with a good mix of technical skills, dedication and enthusiasm. Recruiting experienced operators can be more difficult than new graduates: “the good people are generally employed all year round whereas entry level is very easy to recruit to because it is a case of employing somebody eager to learn and throwing them in with the more experienced people”. Some individuals may also be skilled in one type of equipment, whereas employers increasingly need people with expertise across different types. For photographers, in particular, the internet has made it easy to identify a wide range of photographers with expertise in different areas, and review their previous work.

4.4 Staff development

4.4.1 Overview of staff development across the digital and creative sector

Training and development activity may offer a solution to many employers experiencing skills gaps or recruitment difficulties. However, digital and creative employers are slightly less likely to have arranged training over the last 12 months than firms across the economy as a whole, as shown in Figure 4.17 below.

Figure 4.17 Whether establishment has funded or arranged training for staff over the last 12 months



Source: UKCES Employer Skills Survey (2014b)

Base: All establishments

Previous research suggests that a below-average proportion of employers providing training may reflect small average firm size (UKCES, 2012c). The authors cite research by Creative Skillset (2010) showing that large employers are more likely to fund or arrange learning and development. The high proportion of freelancers working in the creative sub-sector creates a particular challenge: the research suggests that only 59 per cent of employers extend training provision to freelancers on short-term contracts. At the same time, those working as freelancers are particularly likely to find that cost is a barrier to training; fear losing work through committing time to training; and find it difficult to identify suitable training opportunities. Recent research by Brighton Fuse (2015) finds that learning on the job is the most important form of skills acquisition for almost half of freelancers. The research highlights the benefits freelancers derive from ‘sideways learning’ as they gain experience of working with different clients on different types of projects.

The employer and employee consultations for this study suggest that most firms do offer some kind of training through a range of media. Relatively few of the employers interviewed send employees on formal training courses, but most firms encourage and enable workers to undertake personal development through online resources, on-the-job training and support from peers. Employees noted that it is often up to the individual whether to take up these opportunities.

Some employers also take a proactive approach to ensuring their staff stay up to date with technological developments. One employer explained that one day each week is dedicated to R&D and training. For the latter, staff are encouraged to use an online resource which provides video lectures on technology topics, which is considerably more cost effective than bringing in a specialist trainer. Another employer highlighted the importance of remaining at the forefront of thinking in the industry, and that the internet is the best source of documents and webinars for this purpose.

4.4.2 Staff development and career progression within the five key occupations

IT business analysts, architects and systems designers

Employers explained that there is significant investment in training for this role. The range of skills needed mean that training is often closely tailored to individuals' needs, and delivered through both on and off-job training, and mentoring. There can also be a need for training that is specific to the applications and software that are being deployed. Such training is most often undertaken at facilities belonging to the software supplier. Overall, employers did not report any difficulties identifying suitable training, although some highlighted the cost and time away from work as barriers to providing more training.

Employees suggested that work experience (including work placements) and learning from others played more important roles in their development than the knowledge gained from university courses.

Employers explained that an individual in this role typically works their way up from junior to senior roles. One employer explained that there are not really degree courses targeted at those looking to become business analysts, and often people move across from another role. At higher levels a mix of both programming and systems analyst experience is necessary to develop further and take more responsibility.

Programmers and software development professionals

Employers explained that there are two typical routes into programming: the self-taught and those that come from a computer science degree. There were mixed views on the importance of a computer science degree: some employers suggested enthusiasm and a willingness to learn were more important, while others suggested that those who hold computer science degrees have a better understanding of programming languages, enabling them to quickly learn new languages as they emerge. Stakeholders report that individuals are also recruited into programmer roles from non-specialist courses in subjects such as maths, physics and engineering, consistent with the findings of the NESTA (2011) research into the video games and visual effects sub-sector.

A typical career path for a programmer would be to start as a junior and work up to mid-level roles, and then to a senior position. Beyond that, some go on to become a 'solutions architect' to design and implement solutions from scratch. Some programmers move across to leading teams, though only those with the strongest people skills typically take this route.

Programmers and developers are generally keen to solve problems and keep their expertise up to date. As one employer explained: "for programming, you need somebody that is a self-starter, and if they are a self-starter they will just go and learn it themselves anyway". Nonetheless, some employers undertake initiatives to encourage learning. One firm explained that each week they bring in a speaker from another company to run sessions to ensure staff's skills are up-to-date. Another firm runs 'hack days' whereby individuals work over the course of a day to develop innovative ways of addressing a particular issue or challenge.

Graphic designers

Employers suggested that it is generally not difficult to train people in graphic design skills, and external training providers are readily available. In any case, much of the role involves learning by doing, and learning from others. One employer explained that they team up a junior designer with someone more experienced who can mentor them and bring them up to standard. This can, however, lead to concerns about retention, because there is a significant cost of bringing someone to the point of being productive on their own, and there is a risk that they may leave at that point.

Given the need to implement skills through on the job experience, some questioned the value of training courses. They did, nonetheless, suggest that there can still be value in courses on practical skills such as project management. Software can change very quickly, and firms may organise in-house training to ensure employees remain up to speed.

There were mixed views on the importance of a university degree. It is not viewed as essential by all employers, and those with a degree are still likely to need to spend a significant amount of time learning on the job. A university degree may, nonetheless, be a useful indicator that an individual has the capability to succeed. One employer suggested that it may be possible for universities to do more to equip graduates with the practical skills they need in the workplace.

There is a fairly clear career path from junior designer, to mid-level designer (in which people are given small projects to work on individually) and then to senior designer. The latter will take on higher profile projects and manage other designers. Beyond that, some go on to become a creative or art director.

Employees highlighted the support they had received from more experienced colleagues throughout their career as one of the most helpful factors in their progression. For example, one said:

When I look back on the advice and the informal mentoring that I've had from various employers and colleagues, having the ability to take time out of your day in order to be trained either formally or informally is important. I look back at those experiences as the things that really stayed with me and they are more specific to the day to day running of a business than anything you might learn in formal education.

Employees also suggested there may be scope for design firms to engage more with young people at an earlier stage, either at school or university, to help them gain an understanding of what is required in the workplace. Most of the employees interviewed explained that they had made a conscious decision to enter a design-related career, though they did not necessarily have a clear idea of specific roles at the outset.

Arts officers, producers and directors

Employers reported that the attractiveness of careers in this area means that employees are typically enthusiastic and keen to learn through a combination of formal training courses and on the job training. One employer mentioned that high costs can be a barrier to training, and they welcomed the support received from the Sector Skills Council and the government.

Employers suggested that formal education does not tend to equip individuals in this group with the skills they need: "a degree... is not necessary in my opinion - it is more about proving yourself and getting experience". Learning tends to be through a combination of learning by doing and workplace training. This was confirmed by employees, who explained that education has had little bearing on their career. They have learnt from others through shadowing, on the job learning and mentoring.

The importance of learning through experience is reflected in career paths. Individuals tend to start off in a junior role as a runner or researcher, progressing to assistant producer and then producer. Directors may be more interested in the technical side and progress through camera work. However, the distinction between producers and directors can be blurred in some cases: some individuals work as producer-directors. Employees highlighted the importance of taking any entry level position in their field of interest, and using it as an opportunity to prove themselves.

Photographers, audio-visual and broadcasting equipment operators

Employers do not generally encounter difficulties in providing training, either through courses or knowledge-sharing amongst colleagues. Equipment operators often learn through on the job training, though there is more formal training on the post-production side. As operators become more experienced they may become more involved in the creative aspect of production, but one employer explained that it is extremely difficult to train individuals to make this step: “the creative element is something that can't be trained - it is more about doing things for a long time and gaining experience. So it is not cost effective to train the creative element of this role. It is something they have to absorb”.

The main training need for photographers is to remain up-to-date with the latest equipment developments, and employers reported that most photographers will tend to do this themselves and without more formal support.

An audio-visual engineer might start in a low-paid role, such as a runner in a post-production facility or a camera assistant. They then might train in a particular aspect of equipment and, as they acquire experience, become more involved with the creative process. A typical career path for a photographer will involve creating a portfolio, promoting their work and then winning work through an agency. They may then choose to work on commissioned projects, or carry on as a freelancer with a view to selling whichever pictures they take.

4.5 Conclusion

Almost half of the 2.1 million digital and creative sector workers in the UK in 2012 were in London or the South East. In some cases, this geographical concentration of the sector's skills in London and the South East can create challenges for those seeking to undertake work elsewhere in the country. There is also a very high proportion of micro enterprises and self-employment within the digital and creative sector. This may create challenges in terms of personal development, since small organisations and the self-employed may be less likely to undertake training (although for freelancers this may be offset by the benefit of working with a range of clients on different types of projects). In some occupations the attractiveness of freelancing makes it difficult for employers to recruit experienced workers on permanent contracts. The digital and creative sector also faces diversity challenges: a failure to attract more females to IT and technical roles means the sub-sector misses out on an important source of potential labour and the proportion of non-white workers in the creative sub-sector remains below average.

The overall prevalence of skills gaps within the digital and creative sector's current workforce is in line with that for the economy as a whole, though skill gaps are more prevalent amongst digital occupations. Advanced IT or software skills are much more likely to be identified as lacking amongst digital and creative employees, and employers highlight the importance of workers keeping up to date with rapid advances in technology. Skills gaps present a number of challenges, but for digital and creative firms there is a particular risk that innovation and competitiveness may be harmed.

Digital and creative employers face challenges filling vacancies, particularly for technical roles, such as programmers and web developers. Two-thirds of digital employers pointed to advanced IT and software skills when asked about the types of skills that are difficult to obtain from job applicants. Digital and creative firms are particularly likely to have to delay new products or services as a result of unfilled vacancies. Two in five (40 per cent) digital and creative firms have lost business to competitors due to being unable to fill posts. In sharp contrast to the situation for technical roles, there is often a wide choice of applicants for roles in some of the most attractive creative occupations, such as graphic designers, producers and photographers.

Graduate recruitment plays an extremely important role given the orientation of the sector towards high-skill jobs. Employers are concerned that some university courses may not equip graduates with the right skills, particularly because they do not keep pace with technological change or give students sufficient practical experience. At the same time, experience and learning through doing are often more valuable to employers than formal education. However, employers reveal a strong preference for employing graduates across the digital and creative sector, which suggests that they may perceive other benefits to hiring graduates over non-graduates. Employers increasingly seek a 'fusion' of entrepreneurial, technical and creative skills.

5 Future skills

Chapter summary

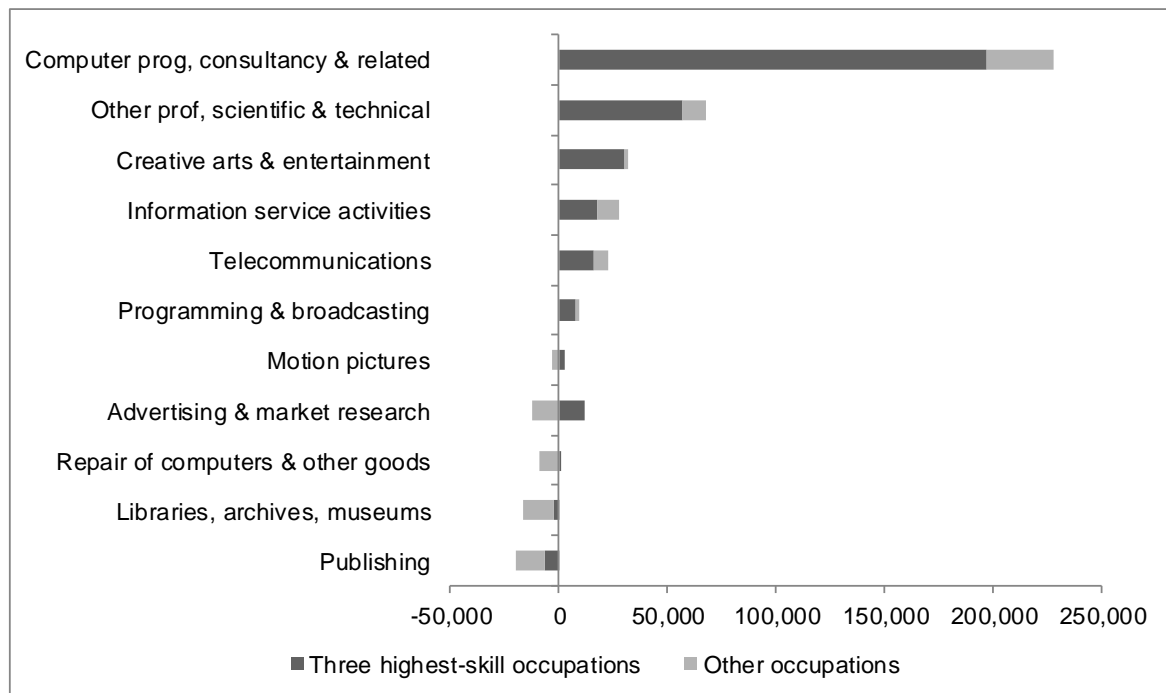
- The digital and creative sector is projected to need 1.2 million new workers between 2012 and 2022 - approximately half the level of current employment again. Just over three quarters of the workers needed will be in the three highest skilled occupational groups.
- There is particular concern about the quantity of graduates needed by the digital IT sub-sector. The sector will need to become much better at attracting highly skilled workers.
- The digital and creative sector is at the forefront of technological change and further changes in technology will be the key driver of the number of workers needed, and the types of skills that will be in demand. Employers and employees will need to work together to develop innovative ways of constantly renewing their skills.
- Employers will increasingly seek staff who can think strategically to capitalise on the opportunities provided by new technologies, and who possess skills in areas at the forefront of technological change, such as: cyber security; the ability to develop content across multiple platforms; mobile and cloud computing; and big data.
- Regulatory factors such as changes to rules on the ownership and use of data and tax incentives could also impact on the number and type of workers needed. The sector will need regulatory and legal expertise to help shape and comply with new regulations.
- New and more proactive human resources functions may be needed to meet the pressing need to recruit large numbers of new workers, particularly to digital roles, and to encourage greater workforce diversity.
- Demographic factors could influence demand for digital goods and services in areas such as health technologies. Stronger people management skills may be needed as older workers work alongside young 'digital natives' with very different skillsets.
- Increasing globalisation presents an opportunity to sell into new and fast-growing markets, but also brings a threat of greater competition and the outsourcing of more activities to lower cost nations. This suggests a growing need for those with the skills to develop international networks and develop strategies to maximise the UK's share of the global market for digital and creative outputs
- Employers and sector bodies are aware of the challenges the sector faces and have put in place a range of initiatives to start to address them. They are increasingly seeking to engage earlier and to a greater extent with young people and providing training opportunities for the current workforce. The industrial partnerships for the digital and creative sub-sectors are likely to play an important role in leading such initiatives.

5.1 Demand for workers to 2022

5.1.1 Employment growth (expansion demand)

The Working Futures dataset (2014a) provides projections of employment growth by sector and occupation. This enables analysis of future employment growth in the creative and digital sectors, and the occupations that will be needed. Employment is expected to increase by a total of 340,000 within the digital and creative sector between 2012 and 2022. Of this total, a net increase of 331,000 is expected within the three highest-skill occupational groups, and computing and related activities account for almost 200,000 of this change (Figure 5.1, below). Large increases are also expected in two creative sub-sectors: other professional, scientific and technical, and creative arts and entertainment.

Figure 5.1 Net change in employment by sector and occupation, 2012 to 2022



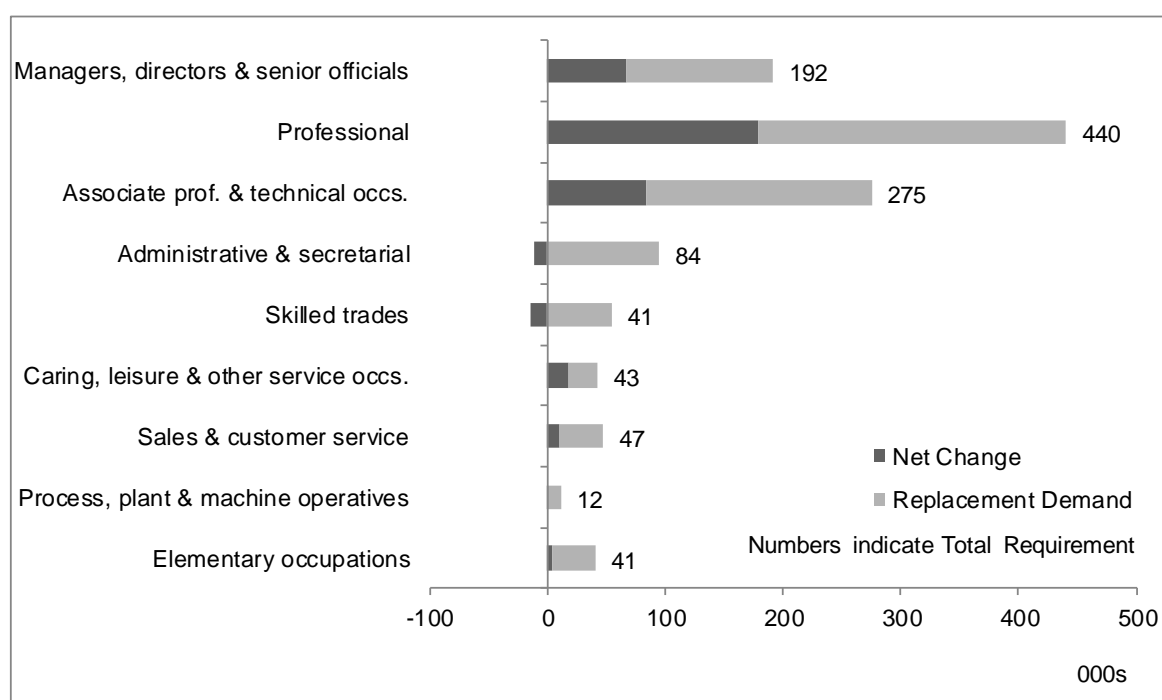
“Three highest skill occupations” include the following 1-digit SOC groups: managers, directors and senior officials; professional; associate professional and technical.

Source: UKCES Working Futures (2014a)

5.1.2 Total requirements

The projections presented above are helpful in identifying which activities and occupations are expected to experience strong growth in the years ahead. However, the net change in employment is only part of the story. The digital and creative sector’s total demand for workers will also depend on how many workers leave the sector due to retirement, career moves, mortality or other reasons (this is known as ‘replacement demand’). To understand this, the Working Futures dataset (2014a) also includes projections for ‘replacement demand’ (Figure 5.2). Adding these to the net change in employment indicates the sector’s ‘total requirement’ for workers.

Figure 5.2 Net change, replacement demand and total requirement by broad occupation, 2012 to 2022



Source: UKCES Working Futures (2014a)

Figure 5.2 suggests that in addition to the 340,000 net change in employment in the digital and creative sector between 2012 and 2022, more than 834,000 posts will need to be filled to replace workers that leave the sector. This means that the digital and creative sector will need a total of 1.2 million new workers over the period. Just over three quarters of these workers will be in the three highest skilled occupational groups (managers, directors and senior officials; professionals; and associate professionals and technical occupations).

An important source of the highly skilled workers that the sector needs will be university graduates. The total requirement for 2012 to 2022 for the creative sub-sector within the three highest-skill occupational groups is 389,000 workers. Over the last ten years 350,000 individuals graduated from a first degree in creative arts and design.¹¹ These two numbers are not directly comparable because many people will enter the creative sub-sector from other sectors or courses, and some creative graduates will enter work outside of the creative sector. Nonetheless, in very broad terms it appears that the UK higher education system has capacity to produce the *quantity* of graduates that the creative sub-sector needs.

Following a similar approach suggests that the digital sub-sector will need 518,000 workers for roles in the three highest skilled occupational groups. However, over the last ten years only 164,000 individuals graduated from a first degree in computer science. Once again, these figures are not directly comparable, but they do indicate that there may be a sizeable gap between employers' demand for digital graduates and the ability of the higher education system to fulfil that *quantity* of demand. This is particularly concerning because consultees also expressed concern about the *quality* of the skills held by computer science graduates. The digital sub-sector is acutely aware of this challenge and some of the steps it is taking to address it are set out later in Chapter 5.

5.2 Future drivers of skills demand in the digital and creative sector and sector-wide impacts

5.2.1 Rationale and approach

The analysis and discussion above primarily relates to the *quantity* of workers that the digital and creative sector is envisaged to need over the coming years. But it is also important to consider the types of skills that digital and creative occupations will need. This sub-section identifies the main technological, regulatory, economic and demographic drivers of skills demand in the digital and creative sector, and sets out the sector-wide skills implications of these trends. Some of these drivers could affect the quantity of workers required, but the main focus is on the implications for the *types* of skills that workers will need. Section 5.3 considers the skills implications of the trends identified within the context of the five key occupations.

The drivers of skills demand outlined in this section were primarily identified through discussions with stakeholders and employers, and the literature review.

¹¹ Source: Higher Education Statistics Agency (HESA) Qualifiers by Subject and Level data tables (1994/95 – 2013/14). Qualifiers of 'Creative Arts and Design' degree. First degree qualifiers only. <https://www.hesa.ac.uk/content/view/1973/239/>

5.2.2 Technological drivers

The digital and creative sector is at the forefront of technological change. The sector is itself an innovator of technological change, and is also subject to broader trends that influence the sector's work and the types of skills it needs.

Continued rapid technological change

The majority of consultees and survey respondents highlighted technological change as the key driver of changing skills needs in the digital and creative sector over the coming years. This was true for firms from both the digital and creative sub-sectors. At the same time, however, there was often a reluctance to suggest exactly how technology might change. Given the rapid advances over the last ten years this reticence is understandable. While the discussion below sets out the main technological changes that are anticipated, the speed of technological change itself creates skills challenges.

Continuous technological change suggests that the need for continuous personal development may be greater in the digital and creative sector than in parts of the economy which are less directly exposed to technology. As the creative sub-sector becomes increasingly digitised there will be a need for an even larger proportion of digital and creative workers to become accustomed to the ongoing need to update skills. This may create management challenges for employers who will increasingly need to build time into planning to allow staff time to update their skills. Employers may find it advantageous to build stronger relationships with local educational institutions and training providers to enable employees to undertake modular training without the need to travel too far from the workplace.

However, it is not sufficient for the digital and creative sector to simply respond and react to technological change. Firms will only remain competitive if they proactively embrace new technologies and exploit them to deliver new goods and services, and increase efficiency. There will be an increasing need for staff who can think strategically and identify how organisations can capitalise on new technologies as they emerge.

Economy-wide digitisation

The majority of businesses right across the economy need to be technologically enabled and have an online presence. The internet and digital services provide a powerful and efficient way of enabling firms to access new markets and expand their business, and those without an online presence find it increasingly difficult to remain competitive. These trends are driving huge demand for technology services and workers with technological expertise and will continue to do so.

Across the entire economy a larger proportion of workers will need digital skills to move up the career ladder. To prepare for this, the country needs to equip people with a foundation of digital skills, including coding, from school age. In addition, the digital and creative sector will need to become better at attracting highly skilled workers. This will require the sector to engage more with young people at an earlier age. As noted by UKCES (2012b), this will also involve taking more innovative and skilful approaches to recruitment and HR management.

Increasing risk of cyber threats

Stakeholders identified a growing online threat from criminals, terrorists and state-sponsored cyber attacks. As well as the national security implications of this, cyber attacks can prove extremely damaging to commercial interests. For example, research by Oxford Economics and the Ponemon Institute (2014) found that cyber attacks are a common problem in the UK. Three in five (60 per cent) survey respondents¹² had experienced a cyber attack within the past year. It is estimated that the average reputation or branding loss from such attacks was equivalent to £2.9 million. Firms that fell victim to cyber attacks also incurred costs for: clean-up and remediation; lost productivity amongst workers; disruption; and damage or theft of IT assets. During the last 24 months, 20 per cent of respondents had lost intellectual property or commercially sensitive information due to a cyber attack, and around two-thirds of those who had lost information felt they were damaged by it.

The threat of cyber attacks is recognised by the government in its Cyber Security Strategy (HM Government, 2011). This outlines objectives to ensure the UK is one of the most secure places in the world to do business online and make the UK more resilient to cyber attacks, but also to put in place the skills needed to reach these goals. The increasing cyber threat was also identified by UKCES (2012b), which suggests there may be an increase in pre-emptive security operations by analysts and advanced software to identify threats.

It will become increasingly important for digital and creative workers to develop a basic knowledge of good practice in cyber security. There will also be a need for cyber security experts with extremely advanced technical knowledge. UKCES (2013a) notes that in addition to this technical knowledge, cyber security skills needs include an understanding of industry standards, analytical skills and risk analysis and management skills. The UK potentially has a competitive advantage in this area, but there is a need to develop more individuals with high-level technical cyber security skills. In addition, to realise the sector's full potential there is a need for individuals with the vision and commercial leadership to capitalise on the anticipated rapid growth in demand for cyber security services.

¹² The survey was answered by 427 individuals who work as IT professionals, IT security practitioners or in other IT-related roles.

Convergence of content across platforms

The Technology Strategy Board (2013)¹³ highlights the increasing convergence of media content across networks and platforms, such as the streaming of video and audio. Stakeholders cited the example of producing a film, which typically now involves not only producing the film itself, but producing related content for an interactive website, mobile apps, and so on.

This trend is playing an important role in driving the convergence between digital and creative activities. Employers are increasingly seeking individuals with a breadth of knowledge to deliver outputs across different platforms. There is also a need for those with strategic thinking skills to identify how outputs can best be delivered across platforms. Leadership skills will also be increasingly important to ensure the larger number of people involved in delivering content are collaborating effectively.

Mobile and cloud computing

Stakeholders also expect continued growth in the popularity of mobile computing using phones, tablets and laptops. Data from ONS suggest that 58 per cent of adults accessed the internet using a mobile phone in 2014, up from 24 per cent in 2010. What is more, 96 per cent of people aged 16 to 24 accessed the internet through any mobile device in 2014.¹⁴ Within the workplace the popularity of Bring Your Own Device, or BYOD, is increasing (UKCES, 2013a).

UKCES (2013a) finds that agile techniques, sales, marketing, account management and good understandings of client markets are the main skills needs for mobile technology. There is also a need for close interaction between those with technical expertise, those focusing on user experience, and the end user or customer.

The popularity of cloud-based computing is also expected to continue to increase. Under this approach, computing software and services are consumed as a service over the internet, rather than being based on a user's computer. This allows companies to simplify in-house systems and derive cost savings.

UKCES (2013a) finds that the main skills requirements for cloud computing include security, networking, virtualisation skills and big data analytics. In common with this study, that report also highlights the importance of aligning technical skills with business skills, such as risk management and business stakeholder management, to ensure that IT solutions work as effectively as possible within the business context.

¹³ The Technology Strategy Board is now known as Innovate UK

¹⁴ Data from ONS, Internet Access - Households and Individuals, 2014: <http://www.ons.gov.uk/ons/publications/reference-tables.html?edition=tcn%3A77-322080>

Growth in mobile and cloud computing, allied with the greater availability of super-fast broadband connections, will enable workers right across the economy to work more flexibly. New approaches to people management may be needed to reap the full benefits of this trend.

Big data

The Technology Strategy Board (2013) highlights that the huge quantities of data now available are creating new opportunities for firms to capture value. The digital sub-sector, in particular, will benefit from increased demand for services that make use of the data held by companies right across the economy. UKCES (2012b) suggests there are opportunities to develop services to enter new markets, cut costs and improve customer service. Stakeholders also note that big data offers opportunities for creative firms to better understand customers and audiences and tailor their output accordingly.

Marr (2013) highlights that current uses of big data analytics include:

- counter-terrorism efforts by US National Security Agency;
- the prediction of criminal activity by local police forces;
- the development of models by companies to predict which products will sell and the profile of the likely customer base.

Research for Forfas (Oxford Economics, 2014c) in Ireland identifies three types of skills associated with big data:

- ‘deep analytical talent’, based on a combination of advanced statistical, analytical and machine learning skills;¹⁵
- ‘big data and analytics savvy roles’ for individuals that understand the value that can be extracted from big data, interpret results and use them to inform business decisions;
- ‘supporting technology roles’ fulfilled by those who develop and implement the hardware and software.

Digital and creative firms need to understand data on customers and audiences with a view to allocating budgets across different media channels, such as broadcast television, video-on-demand, internet, social media, and so on.

¹⁵ Machine learning skills involve the ability of a machine to improve its own performance through the use of software that employs artificial intelligence techniques to mimic the ways by which humans learn, such as through repetition and experience.

Increased automation of routine tasks

As technology becomes increasingly sophisticated, some routine tasks that are currently undertaken by lower skill workers, may become automated. One example is a basic IT support service which operates on the basis of a series of scripted questions. A high proportion of calls to such a service may relate to a finite number of issues that can be resolved relatively simply, reducing the need for human operators in many cases. Such changes form part of a broader trend for the increasing automation of more tasks as computing becomes increasingly sophisticated, including through advances in areas such as sensors, big data analytics and user interfaces (Deloitte, 2014a).

To the extent that greater automation is possible, it implies an even greater focus on higher skilled activities, and fewer roles with lower level digital skills. The Deloitte research is based on an assumption, supported by survey evidence, that roles combining technical, creative and social skills are least at risk from automation.

Social media

Firms are increasingly using social media for customer service. For example, companies such as Nike and Starbucks have established social media accounts that are used only to address customer queries and complaints.¹⁶ There is also a growing trend for firms to use social media for their internal needs, such as to increase collaboration amongst staff. Towers Watson (2013) reports that just over half of employers use social media tools for internal communication.¹⁷

This suggests there will increasingly be a need for individuals with a deep knowledge of using and manipulating social media. There may also be new specialist roles such as 'brand community managers' to provide firms across the economy with social media strategies and the management of content.

Increasing use of social media for client management does, however, create a risk that it becomes more difficult for younger workers to gain experience of working directly with clients. It may become necessary to provide additional training in more traditional forms of client management to ensure individuals have the requisite skills on the rarer occasions when face to face contact is essential.

¹⁶ <http://www.businessnewsdaily.com/7578-social-media-customer-service.html>

¹⁷ Based on a survey of 290 large and medium sized organisations in North America, Europe and Asia.

New business models and collaborative platforms

The Technology Strategy Board (2013) highlights new business models that bypass or adapt traditional retail channels. The authors cite the examples of Amazon and ebay, which have become online markets for selling directly to consumers, which artists and publishers can use to sell outputs and content to consumers. Other creative businesses have used new pricing structures, such as subscriptions or charging for premium content, to create income streams. Such developments suggest a growing need for analysts with expertise in consumer behaviour and pricing strategies.

New business models are also emerging as a result of collaborative platforms which link up those who need a service directly with a service provider. Stakeholders cited the example of Uber, a mobile phone app which links up taxi drivers with passengers without the need to hail a taxi in the street or use a centralised booking service.

As such platforms develop and challenge traditional ways of doing business there may be a need for digital and creative firms to commission regulatory and legal expertise to ensure collaborative models are consistent with laws and regulations designed for the analogue economy.

5.2.3 Regulatory drivers

Changes to rules on the ownership and use of data

As noted above in the context of big data, businesses have amassed huge amounts of data over recent years and there are unexploited opportunities to extract value from this. However, in future there may be stricter regulation of the ownership and use of data, particularly that relating to individuals. It will be important to find a level of regulation that puts in place the measures necessary to protect individuals, but which is not overly restrictive in allowing firms to innovate and extract value from data in ways that can be beneficial to society.

Changes to rules and regulations will create a need for individuals with the legal and regulatory expertise to help firms shape and comply with new legislation. If new regulations result in greater restrictions on data usage, there is a risk that the demand for workers skilled in big data analytics may be lower than would otherwise have been the case.

Intellectual property

The CBI (2014) notes that digital platforms have made it much more difficult for the creative industries to control how their content is accessed, threatening revenue streams. Industry stakeholders report that people often do not know how to make the most of their intellectual property (IP), particularly in areas such as games and animation. In some cases too much content is given away for free, allowing others to realise the value from it. In others too much focus is put on protecting IP, which prevents companies from obtaining full value from it. Creative Industries (2014) recognises the importance of IP and suggests that efforts should be made to increase the awareness of intellectual property rights, and to put in place a stronger licensing and enforcement framework. Such an approach could require digital and creative firms to either develop or commission a greater degree of expertise in the area of IP laws.

Employment law and workforce diversity

There is a risk that employment laws could be adjusted to outlaw the use of unpaid interns, which could raise costs for many creative firms. This study has also highlighted the important role played by self-employed and freelance workers. Stakeholders suggested there is a risk of greater regulation of self-employed workers in future in response to media coverage of the tax advantages of self-employed and freelance working.

There was a sense amongst stakeholders that the current low of representation of female workers and of non-white employees in specific areas of the sector is unsustainable. While it seems unlikely that formal regulation would be introduced to tackle these challenges, it is likely that employers and stakeholders will re-double efforts in this area, both because of a perceived need for the sectors to become representative, and because of the business imperative of recruiting the number of workers needed.

Such changes could create a need to put in place more formal HR functions within a wider range of firms to develop and maintain formal processes for recruitment of interns and permanent staff, and the management of self-employed and freelance workers.

Tax incentives

Favourable taxation rules have supported extremely strong growth in the creative industries in recent years. If these tax incentives were removed, there is a threat that the rate of growth in the affected industries could slow.

Taxation policy in other countries also poses a potential threat to the competitiveness of UK creative industries. For example, the number of people employed in the Canadian computer games industry increased by one third between 2008 and 2010 following the introduction of generous tax breaks (Gibson *et al.*, 2012). It is extremely difficult to predict such changes since they relate to the policy decisions of foreign government, but this could influence the growth of some of the most internationalised areas of the creative industries in the years ahead.

5.2.4 Economic and demographic drivers

Population ageing

As the population ages new opportunities are expected to emerge for the digital sub-sector in areas such as health technologies. This will be directly driven by larger numbers of people needing healthcare, and indirectly by the need for governments to seek savings in the healthcare budget. Deloitte (2014b) notes that 'digital health information technologies' are changing the way doctors, patients and other stakeholder interact through the use of electronic medical records, telemedicine, mobile health applications and electronic prescriptions. PwC (2012) notes that six in ten clinicians and payers (the NHS, insurers and those paying for private healthcare) believe that the widespread adoption of mobile health ('mHealth') is inevitable in the near future. The report cites NHS plans to roll out telehealth and telecare technology to three million patients with long-term conditions.

Population ageing will also affect the digital and creative workforce, with employees likely to continue working longer. UKCES (2012b) highlights the role that later retirement ages could play in reducing skills shortages, but also the implications in terms of a greater demand for flexible working, and ensuring there are sufficient training opportunities to help older workers become familiar with new technologies.

There may also be opportunities to make better use of older workers in the digital and creative labour force. Employers value their life and business experience, which can make older workers particularly well suited to client management. However, older workers are often excluded from training schemes due to their existing qualifications, making it more difficult for them to keep up to date with developments in technology and working practices.

'Digital natives'

Some employers highlighted the concept of the 'digital native' – the generation born into a digital world that does not remember analogue. Individuals in this group could have an extremely intuitive and detailed ability to apply digital technologies. While these individuals will be an important future source of labour for the digital and creative industry, UKCES (2012b) points out that managers will face new people management challenges. For example, they will need to become adept at managing groups of people who may have very different capabilities, and may face greater technical complexity.

Globalisation

Ever-closer global economic integration is expected to continue to drive the demand for content, particularly as wealth levels increase in developing countries. This represents an opportunity for content creators within the UK to sell their output to larger audiences, but there is also a threat of greater competition from overseas producers selling content into the UK market. It may also become increasingly difficult to retain the model of national broadcasting and regional releases as content flows more freely across international borders.

UKCES (2012b) points out that the UK has already seen lower cost activities move overseas and increased focus on high value activities. Further globalisation could also see higher value activities move overseas in future, particularly to countries such as China and India where there is a large supply of very highly qualified graduates. While this represents a threat to some UK-based digital and creative activities, the most likely outcome is a further shift towards the highest-skill, highest value activity.

Deepening globalisation implies a growing need for people with the skills to develop international networks to promote and sell UK digital and creative outputs overseas, and to identify competitive threats. There will also be a greater need for business strategy experts to identify how best to respond to increased international competition and maximise the UK's share of the global market for digital and creative content and services.

5.3 Future workforce and skills challenges: potential implications for the key occupations

5.3.1 IT business analysts, architects and systems designers

Employers do not expect substantial changes to their skills needs for individuals in this occupational group. They will continue to centre around a blend of business, problem-solving and communication skills, alongside extremely strong technical skills. However, it will be essential for business analysts to keep up to date with developments in programming and other technological advances. Some employers suggested that business analysts may need to become more agile and increase their breadth of knowledge to enable greater integration with user experience consultants.

Business analysts, architects and systems designers will need to develop expertise in cyber security, and there will be a greater demand for those who hold deep expertise in this area. The growth of big data suggests that it will also become increasingly important to have the ability to work with and analyse extremely large datasets, implying a need for workers with expertise in statistical analysis.

5.3.2 Programmers and software development professionals

Rapid technological change means that continuous personal development is particularly important for programmers and developers. One employer suggested that “if you stop your learning at any one point, you could be completely redundant within a couple of years”.

Technological progress has led to an increase in expectations, such that users expect websites and software to both look good and operate effectively (previously there was a greater acceptance that there are likely to be trade-offs between these two characteristics). Global competition is also driving a need to find cost savings and ensure programmers can quickly respond to client requests to change programmes or websites. Employers are therefore increasingly looking for coding expertise aligned with design and implementation skills to ensure that outputs are effective for their intended audience.

The convergence of content across platforms will increase demand for individuals able to work across multiple platforms and formats. The ability to develop mobile apps is also likely to continue to increase in importance. As with business analysts, architects and systems designers there will be a need for greater expertise in cyber security, and the growth of big data will increase demand for programmers and developers with advanced analytical skills.

5.3.3 Graphic designers

Employers explained that there will be a continuing need for graphic designers to adapt their skills to different digital platforms and adapt to emerging technologies. For example: “They [the skills and attributes required] are going to be broadly similar but it would just be about staying up to date with the software. The core creative side will always be the same”.

Another example of the impact of technological change is that graphic designers need to understand how websites look on different platforms. Similar to computer programmers, user experience design will become a more important consideration for graphic designers.

Increasing digitisation may pose a threat to designers working in traditional print-based media as that part of the sector becomes increasingly marginalised as more and more content moves online. However, one employer highlighted the risk of focusing too much on digital. Some clients are starting to request more direct mail to differentiate themselves from the majority of companies using e-mail. While it is difficult to predict such trends, it will be important for graphic designers to maintain the flexibility and adaptability to respond to market demand for outputs in different formats.

5.3.4 Arts officers, producers and directors

Employers explained that the core functions of this role are unlikely to change significantly, although it will be necessary for individuals to keep up to date with changes in technology. Production will remain an extremely attractive work area.

Interactive elements are likely to become increasingly important. A film no longer exists in isolation – it also needs an app, an interactive website and social media coverage to publicise it. It will be increasingly important for producers and directors to understand their audience and how these alternative platforms may be deployed to maximise the impact of creative projects.

5.3.5 Photographers, audio-visual and broadcasting equipment operators

As with the other occupations, it will be necessary to ensure that photographers and equipment operators keep up to date with technological developments and are able to operate and maintain the equipment in use at any given time. But even though technology will change, employers expect the blend of technical ability, creativity and people skills needed for roles in this occupation to remain unchanged.

Cinemas are increasingly employing people to undertake multiple roles. For example, a digital projection equipment operator may also work in the shop or sell tickets. In this situation there may be a risk that the level of core technical ability is seen as less important, and so equipment operators may be less able to resolve issues when they arise. Similarly to graphic designers, there is also a risk that a focus on digital leads to a loss of skills in older technologies. For example, some directors prefer to the 'look and feel' of celluloid, but many cinemas will not have the equipment or skills to display films in this format.

Cinemas also face renewed competition from live streaming in the home and in future people may only go to the cinema for a big event or blockbuster releases. Some film studios are considering 'instant release', whereby films are released for home streaming at the same time as in the cinema. Cinemas may be forced to innovate, such as through 3D and 4D, to give a richer experience than people are able to enjoy at home. This suggests that cinema staff may need to develop skills in new types of equipment, but also develop expertise in marketing to encourage attendance at events.

Technological advances also pose a threat for photographers. Clients are increasingly demanding video content for websites, rather than photos. The demand for low-cost video production could therefore increase and there may be scope for photographers to diversity into this area. The widespread use and increasing sophistication of camera phones and wearable cameras is also reducing demand for traditional photography services.

In light of these threats, self-promotion and relationship-building are likely to become even more important skills for photographers in future.

5.4 Employer responses

The issues outlined above mean that there is a strong and ongoing need for skills development. Evidence from the consultations suggests that employers tend to monitor the situation and identify training needs as they arise, but they do not usually attempt to predict what will happen in the industry and then train people with the skills they think will be needed. Technological change is too fast and too uncertain to make accurate prediction possible, and so such an approach would risk investing in future skills that turn out not to be needed. This finding is consistent with earlier research, which found that employers in the creative and cultural industries do not necessarily think strategically about staff development and tend to train as and when necessary (Creative & Cultural Skills and Creative Skillset, 2011).

As discussed in Section 4, the research for this study has found that employers generally appreciate the importance of staff development, and encourage and facilitate learning. This often takes the form of on the job or informal learning, rather than formal training, but there is a feeling that this is more effective for many digital and creative roles.

Nonetheless, there are also a number of over-riding issues that need to be tackled at the industry level and this section outlines some of the main initiatives put in place by the industry to address them.

5.4.1 Addressing the skills gap through engagement with young people and efforts to increase diversity

To increase the supply of workers with digital skills, there is a need to engage with individuals from a younger age, and ensure that everyone has a basic knowledge of digital subjects, regardless of their education or degree path.

In recognition of this, **Next Gen Skills**¹⁸ campaigns for the introduction of a computer science course within the National Curriculum (in England, Wales and Northern Ireland); the embedding of essential ICT skills across the wider curriculum; and promotion of a mix of subjects which are crucial to the future success of the UK's digital and creative sector, notably maths, physics, art and computer science. The campaign is backed by the Association for United Kingdom Interactive Entertainment (UKIE), and is supported by a coalition of employers and professional bodies. An important driver of the campaign was research by NESTA (2011), which identified that computing in schools focused on the use of office software, rather than the computing and coding skills that the digital and creative industry needs.

The campaign has recently achieved some success. For example, since September 2014 computing has replaced ICT on the National Curriculum (which applies in England, Wales and Northern Ireland) and computer science will be regarded as science subject within the English Baccalaureate. Alongside these changes, the government has pledge to invest in teacher training for the new subjects.

The Tech Partnership **TechFuture Girls**¹⁹ initiative consists of after school clubs designed to encourage girls aged 10 to 14 to stay engaged in IT. The programme aids the development of IT skills through a number of challenges on themes such as fashion, music, sport and celebrity. Since 2005, more than 150,000 girls from more than 4,500 schools across the UK have participated in the programme and 84 per cent of participants suggest they are more likely to consider further education or a technology career as a result of taking part. The Tech Partnership also runs **TechFuture Classroom**²⁰ which provides teaching resources based on real life challenges provided by industry.

¹⁸ <http://www.nextgenskills.com>

¹⁹ www.techfuturegirls.com

²⁰ <http://www.techfutureclassroom.com>

In Northern Ireland, the Arts Council's **five year strategy for the arts** identifies a number of initiatives which support the creative industries. These include working with relevant SSCs to develop an apprenticeship scheme for the creative industries, with a pilot covering 50 young people from disadvantaged areas in 2014-15, with future increases in numbers planned (Arts Council Northern Ireland, 2013).

Ravensbourne College runs **{CODEZONERS}**,²¹ a nine month foundation level computer programming and work placement scheme for 17 to 19 year olds that are not in education, employment or training. The course is aimed at individuals who already have some coding skills, or an interest in coding or design, and addresses the need to blend coding and design skills that has been identified elsewhere in this study. The work placement element ensures that individuals are able to apply their skills within a real-world context.

Creative Access²² aims to widen access to the creative industries for young people from a broader range of backgrounds. The scheme provides opportunities for young people from black, Asian and minority ethnic (BAME) backgrounds to undertake paid internships with major creative sector organisations. The scheme also provides careers advice, help with CVs and interview preparation, and training courses.

The Creative and Cultural Skills (CCS) **Building a Creative Nation**²³ campaign is calling upon creative sub-sector employers to create jobs and promote responsible and sustainable recruitment practices. The campaign is particularly focused on addressing the issue of unpaid internships, which restrict recruitment to those who can afford to undertake an unpaid placement. CCS is aiming to create 6,500 work opportunities through paid internships and apprenticeships and, to date, over 2450 jobs and apprenticeships have been created through the scheme.²⁴ An important aspect of working towards this objective is the CCS **Creative Employment Programme**,²⁵ which is a £15m fund to support traineeships, formal apprenticeships and paid internships in England for young unemployed people aged 16-24. Similar schemes are also being run in Northern Ireland, Scotland and Wales.

²¹ <http://www.ravensbourne.ac.uk/courses/short-courses/codezoners>

²² <http://creativeaccess.org.uk>

²³ <http://ccskills.org.uk/>

²⁴ Source: <http://ccskills.org.uk/supporters/building-a-creative-nation>. Figure correct as of 15 January 2015

²⁵ <http://ccskills.org.uk/supporters/funding/details/the-creative-employment-programme>

5.4.2 Ensuring education equips students with the skills employers need

Many of the employers that have contributed to this study have commented that formal education is failing to equip young people with the skills they need to be successful in the workplace. Along similar lines, Creative & Cultural Skills and Creative Skillset (2011) suggest that qualifications and training courses have been shaped more by student demand than employer need. This has resulted in a wide choice of general courses in creative subjects, but fewer that equip students with the specialist technical skills that employers need.

It is important to recognise that education institutions cannot, on their own, be expected to deliver education that is precisely aligned with employers' requirements – there is a need for employers to engage with education providers and help them to understand the skills and attributes that are important in the workplace. CIHE (2010) suggests that universities are keen to work with employers to develop initiatives that both enable them to attract the best candidates, and better meet the needs of firms. Consistent with this, stakeholders highlighted that recent rises in tuition fees mean that prospective students are increasingly considering employment prospects after graduating when selecting an institution, which may provide a further incentive for universities to ensure they are equipping students with the right skills.

Some of the employers interviewed for this study are taking their own steps to engage with education institutions. One creative firm explained that they tend to hire designers from two specific universities because the course content at those universities aligns well with their requirements. The employer is seeking to work even more closely with these two universities to understand why things are taught in a particular way and identify where there could be scope to make further improvements. Another employer explained that they are proactively identifying schools and universities that they believe produce students with the right skills, and are forming relationships with those institutions. In another case, an employer explained that they engage with the creative units within local universities to source individuals for short and long term placements. They also go to the university to critique students' work and give presentations to teach students about the role, including the importance of softer skills such as communication and presentation.

Such actions rely on the initiative of firms and education institutions' willingness to participate, but this type of informal engagement could become difficult to manage if large numbers of employers followed this type of approach. Nonetheless, a number of broader industry-wide initiatives are also underway.

The **Creative Skillset Tick**²⁶ is an industry-led accreditation scheme for courses and apprenticeships that best meet employer needs. This acts as a signalling mechanism for students concerned about their future employability, and can help firms identify graduates with the skills they need. Courses or institutions are assessed by experts that work in the creative industries to ensure that content keeps up with developments in the industry. Students benefit from access to the latest technologies and opportunities to work with industry throughout their studies. More than 200 higher education courses and apprenticeship programmes have achieved accreditation under the Creative Skillset Tick initiative (Creative Industries, 2014). Graduates from Ticked courses are also eligible for participation in the **Trainee Finder**²⁷ scheme, the advanced paid traineeship programmes which matches trainees with companies in animation, games, film, high-end TV and VFX industries – tax incentives areas.

UKCES (2012a) highlights the role that **National Skills Academies** can play in facilitating collaboration between employers and education providers. For example:

- **The National Skills Academy for IT**²⁸ provides access to online courses and resources, and acts as a broker for apprenticeships. Employers have created the Academy to help attract more people into the sector; provide a means for making strategic interventions in the areas of greatest skills need; and encourage both individuals and employers to take up high quality training.
- The **National Skills Academy for Creative & Cultural** runs careers events and information sessions across the UK. Comprising of over 500 employers from the creative industries and more than 40 Further Education colleges, the Academy aims to ensure that students on creative courses gain realistic experience of working in the arts and can develop the skills they need.
- The **Creative Skillset Film Academy Network**²⁹ includes educational institutions that have been identified by the UK film industry as centres of excellence in film education and training.

The Tech Partnership runs the **Professional Placement Scheme**³⁰ to enhance the employability of students. Under the scheme, the student, employer and university commit to following a set of best practices, which have been defined by employers, and which are designed to enhance employability. They cover areas such as interpersonal skills, communication skills and business awareness. For employers, the scheme offers the opportunity to identify the best students before they graduate.

²⁶ http://courses.creativeskillset.org/pick_the_tick_degree_courses/what_is_the_tick

²⁷ http://creativeskillset.org/who_we_help/creative_businesses/access_new_talent/trainee_finder

²⁸ <http://www.e-skills.com/nsa>

²⁹ http://courses.creativeskillset.org/pick_the_tick_degree_courses/skillset_academy_network/skillset_film_academies

³⁰ http://www.e-skills.com/Com/internship%20documents/Why_e-skillsinternship.pdf

The Tech Partnership has also led development of the **IT Management for Business degree**³¹ (ITMB) to combine technological expertise with business skills. Employers have both contributed to the design of the course and deliver some of the content. The course is currently offered at 19 UK universities.

5.4.3 Employer involvement in apprenticeships

The profile of current digital and creative sector workers is heavily orientated towards those with a university level education. However, many employers report that learning through doing is more important than knowledge gained through a university course in many areas, suggesting there could be potential to open up more digital and creative roles to individuals that do not go to university.

Creative Skillset's Tick accreditation for Apprenticeship programme signposts employers to industry-approved training providers who could assist them with the recruitment and training of their Apprenticeships³².

The Scottish Government's ambition is to ensure that 'Scotland continues to produce and attract the skills necessary to promote Scotland's digital economy'. It notes that gaps in vocational training should be met, including through developing apprenticeships (Scottish Government, 2013).

The 'Trailblazers' initiative in England aims to make apprenticeships more attractive to employers by simplifying the system, and ensuring that standards are ensuring content is more closely aligned with employer needs. To achieve this, employers will collaborate to produce a description of what an apprentice in a particular occupation should be able to do by the end of their apprenticeship.

The digital sub-sector is one of the first sectors to develop apprenticeships under this new approach, and the new apprenticeships will start during 2015. The Tech Partnership is coordinating a 'Trailblazer Employer Steering Group' to oversee the development of apprenticeship standards for the digital sub-sector, and there are employer sub-groups to develop individual standards. More than 50 major digital and creative sector employers are involved in this process.³³

The Tech Partnership also coordinates the **Tech Industry Gold apprenticeships** scheme, under which a panel of employers designs course standards and accredits training providers to signal quality apprenticeships to other employers.³⁴

³¹ <http://www.itmb.co.uk/>

³² http://courses.creativeskillset.org/pick_the_tick_apprenticeships

³³ <https://www.thetechpartnership.com/our-work/trailblazer-apprenticeships/>

³⁴ <http://www.e-skills.com/apprenticeships/for-employers/tech-industry-gold-apprenticeships/>

5.4.4 Workforce training

Section 4 of this report outlined how employers enable and encourage development of their employees. The focus of this sub-section is industry level initiatives that employers are involved with to help meet future skills needs.

Stakeholders explained that many firms in the creative sub-sector, in particular, look to the government to fund training. At the same time the government is increasingly seeking to encourage firms to invest more. While few disagree that formal and informal training bring benefits, firms' willingness to train can be tempered by a fear that workers will move to another organisation before they have reaped the full return on their investment.

To help overcome this situation, and to support ongoing training within the creative workforce, Creative Skillset coordinates training initiatives through **Skills Investment Funds (SIFs)**, which are funded through voluntary levies and other collective arrangements on firms and co-investment from the Government. The SIFs currently support skills in film, high-end TV, animation, games and visual effects.

Training is provided through SIFs to address priorities that have been identified and agreed by each sector, and can include³⁵:

- boot camps, work experience, internships or apprenticeships for young people entering the industry;
- bursaries for craft and technical, management and leadership, health and safety and international training;
- subsidised training schemes;
- shadowing and mentoring programmes to support career progression;
- short courses to address specific skills shortages.

The Tech Partnership coordinates the **Tech Partnership Training Fund**³⁶ to support greater training in the digital sub-sector. This allows employers to access up to half of the cost of:

- providing additional training for IT apprentices, over and above that which is incorporated within their standard programme;
- running short courses to develop skills that are important to the future of the industry, in areas such as cyber security, big data, mobile and cloud computing and e-commerce.

³⁵ Source: http://creativeskillset.org/who_we_help/creative_businesses/skills_investment_funds

³⁶ <https://www.thetechpartnership.com/our-work/tech-partnership-training-fund/>

5.5 Supporting and promoting the sector

The Department of Culture, Arts and Leisure (DCAL) notes that creative industries employs up to 36,000 people in Northern Ireland. The Arts Council's five year strategy for the arts identifies a number of initiatives which support the creative industries. These include the £4.5 million Creative Industries Innovation Fund (CIIF) which supports the growth of the sector and encourages businesses to export (Arts Council Northern Ireland, 2013).

Invest NI also promotes Northern Ireland as a location for digital innovation, with over 900 employers in the ICT sector and 13 HEI ICT research centres covering areas including security and digital media. It notes that, as well as being the leading FDI area in Europe for 'software development centres and IT technical support centres', with over 100 international investors, 'one in five of the world's computer drives has a part created in Northern Ireland by Seagate Technology' (Invest NI, 2015).

The Welsh Government runs the Digital Development Fund, which aims to support businesses in the creative industries to exploit new and global markets. The fund was launched in 2011 as a £2 million pilot, and has now been extended until March 2016. Businesses can apply to the fund for grants of up to £50,000 for projects including: research into new business models or markets; developing video games or creative software; copyright protection or exploitation; and developing internal digital systems.

Other initiatives include Wales Screen, a national film and TV location services; and the media investment budget fund for film and TV production. Qualifying film, TV and animation project can also receive tax credits on their UK spend (Welsh Government, 2015).

5.5.1 Industrial partnerships

The recently formed industrial partnerships will play an important role in shaping and leading employers' efforts to address skills challenges at the sector level. Industrial partnerships comprise groups of employers working together to promote growth and competitiveness in a particular sector through skills. These groups build on existing collaborations where they exist. All of the partnerships are chaired by a major employer and while the scope varies between sectors, all aim to address skills shortages and test innovative approaches to training. Industrial partnerships are supported by Trade Unions, trade and professional bodies and Sector Skills Councils (HM Government, 2015). While some projects are nation-specific, industrial partnerships work on issues which affect all parts of the UK.

The industrial partnership for the digital economy is the Tech Partnership³⁷, which is taking forward the work of e-skills UK, and is leading a number of the digital skills initiatives across the UK described in this chapter. The Tech Partnership has four objectives, many of which are closely related to issues identified in this study:

- 'It addresses pipeline issues that hamper the supply of motivated and well-prepared people, and particularly women, into digital careers.'
- 'It creates new routes into digital employment, through industry-led apprenticeships and degrees, and cost effective, high quality in-work training programmes.'
- 'It promotes investment in education and training that delivers the skills industry needs, with a particular focus on strategically important skills like big data and cyber security.'
- 'It raises quality by setting industry standards and accrediting education and training that meets them.'

(HM Government, 2015)

The Industrial Partnership (IP) for the Creative Industries is managed through and building on the work of Creative Skillset, and supports the implementation of Create UK industrial strategy³⁸. The industrial partnership is UK-wide and includes, but is not limited to, media, games, fashion, publishing, advertising, and marketing and communications; it includes over 500 employers (mainly SMEs), Trade Associations & Unions, industry support bodies, training providers (including HE) and key LEPs.

In order to create an industry-led, end-to-end skills system that reflects the size and diversity of businesses in this sector, the partnership works towards:

- developing an education and careers system that inspires and supports the next generation of workers exhibiting fused skills (combining creative, technical and entrepreneurial);
- signposting quality skills development provision to help individuals and employers make informed choices on relevant, quality training;
- inspiring greater employer investment and ownership of skills development at all levels meaning more and better ladders of opportunity for individuals and more successful companies;

³⁷ <https://www.thetechpartnership.com/>

³⁸ Create UK is the industrial strategy published by the Creative Industries Council in July 2014 and it has identified education and skills as one of the key factors for future growth in the industries

- owning and managing industrial growth by focusing on clusters in the nations and core cities and regions, and with strategic partners define and address short, medium and long term challenges, support SMEs, collaborate, share best practice and agree joint action plans.

5.6 Conclusion

The digital and creative sector is expected to need 1.2 million new workers between 2012 and 2022 to support growth and replace workers that leave the sector. This number is equivalent to around half of the current employment level. Reflecting the orientation of the digital and creative sector towards higher skill roles, just over three quarters of the workers needed will be in the three highest skilled occupational groups. There is particular concern about the quantity of graduates needed by the digital sub-sector, which is expected to need more than half a million new highly skilled workers between 2012 and 2022. This is far in excess of the number of students currently graduating from computer science courses. The sector will therefore need to become much better at attracting highly skilled workers to meet this demand.

A range of technological, regulatory, economic and demographic drivers will influence the demand for skills within the digital and creative sector. Perhaps unsurprisingly given that many parts of the digital and creative sector are at the forefront of technological change, there was a strong consensus amongst the digital and creative firms interviewed that technological factors will have the biggest impact on the number of workers and the types of skills the sector needs over the coming decade.

Further rapid advances in technology mean that it will be essential for digital and creative workers to keep their skills up to date. The need for continuous personal development may be greater in the digital and creative sector than in parts of the economy less directly exposed to technology. Employers and employees will need to work together to develop innovative ways of constantly renewing their skills, for example through even greater use of online resources and by building stronger links with local educational institutions and training providers. There will also be an increasing need for staff who can think strategically and identify how to best capitalise on new technologies as they emerge.

Employers will increasingly seek workers that possess specific skills in areas at the forefront of technological change, such as cyber security; the ability to develop content across multiple platforms; mobile and cloud computing; big data; new applications of social media; and new business models.

Regulatory factors may also influence the demand for skills within the digital and creative sector. In many cases, regulatory change will be driven by the need to adjust rules and legal frameworks to reflect the modern digitised economy, such as through changes to rules on the ownership and use of data and intellectual property (IP) frameworks. This suggests there may be a need for regulatory and legal expertise to help organisations shape and comply with new rules on IP and data protection. New and more proactive human resources functions may be needed to meet the pressing need to recruit large numbers of new workers, particularly to digital roles, and to encourage greater workforce diversity.

Demographic factors could influence demand for digital goods and services in areas such as health technologies, and create new management challenges as workforces incorporate a combination of older workers and ‘digital natives’ – young people born into the digital work who have developed an extremely intuitive and detailed ability to apply digital technologies.

Increasing globalisation presents an opportunity for UK content creators to sell into new and fast-growing markets, but brings a threat of greater competition and the outsourcing of more higher-value activities to lower cost nations. This suggests a growing need for those with the skills to develop international networks; promote and sell UK outputs overseas; identify competitive threats; and develop strategies to maximise the UK’s share of the global market for digital and creative outputs.

Employers tend to monitor skills needs and identify training needs as they arise, but technological change creates too much uncertainty for them to predict future skills needs and train people accordingly. More broadly, employers and sector bodies are aware of the challenges the sector faces and have put in place a range of sector-wide initiatives to address them. They are increasingly seeking to engage earlier and to a greater extent with young people, and running initiatives to increase the diversity of the workforce. Both sector bodies and individual employers are seeking to work increasingly closely with education providers to ensure students are better equipped for the workplace. Employers are also collaborating to develop new apprenticeship standards and provide training for the current workforce. The new industrial partnerships for the digital and creative sub-sectors are likely to play an important role in leading such initiatives in future.

6 Current and future interest in National Occupational Standards

Chapter summary

- Awareness of National Occupational Standards (NOS) is lower in the digital and creative sector than across the economy as a whole and only 13 per cent of sector employers have knowledge of what NOS include.
- Only five per cent of digital and creative employers make use of NOS, half the proportion reported across the economy as a whole.
- There may be a greater role for NOS in the digital sub-sector, where standards can provide a valuable benchmark to enable employers to understand an individual's capabilities, even if the employer does not possess technical expertise in the relevant area.
- In the creative sub-sector it is easier to assess an individual's capabilities from their portfolio of work and employers often face a ready supply of young people willing to undertake an unpaid internship, providing further opportunities to assess potential.
- NOS could be made more relevant and useful to the digital and creative sector by:
 - using them to ensure that those leaving college and university are equipped with the skills employers need;
 - focusing on core skills, rather than more specific technical skills that may quickly become outdated;
 - reducing the detail level;
 - improving the NOS database;
 - developing a clearer narrative on the rationale and advantages of using NOS.

6.1 Introduction to National Occupational Standards

National Occupational Standards (NOS) describe the knowledge, skills and understanding an individual needs to be competent at a job. They are UK-wide, demand-led, evidence-based benchmarks of competent performance which underpin vocational learning and development, apprenticeships and qualifications across all sectors, occupations and parts of the UK.

NOS can be used in many different ways. For example:

- awarding bodies can use NOS to create qualifications (such as those used in Apprenticeships) to train individuals for a job;

- employers can use them create a job description to recruit new staff or a training plan to develop their skills;
- individuals can research and identify different types of jobs which match their skills and experience.

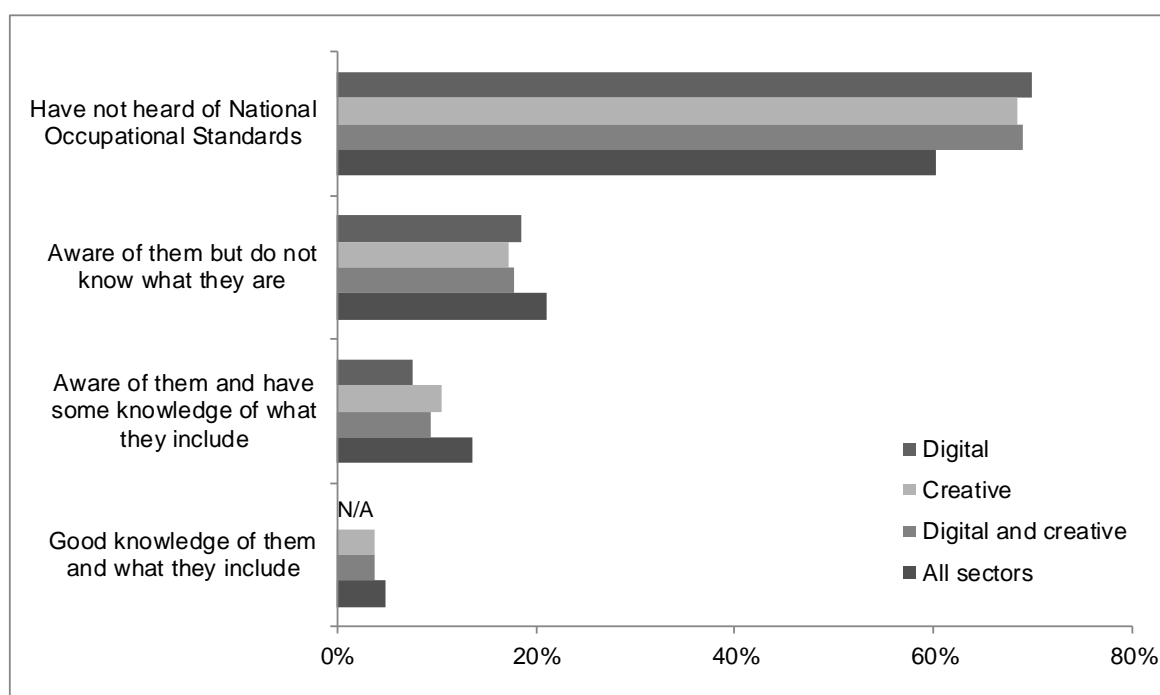
The vision for NOS is to ensure they are employer demand driven and based on informed analysis of current and future labour market need. UKCES is working with networks of employers (including through professional bodies, sector skills organisations and industrial partnerships) to ensure that NOS articulate the ambition and aspiration of their workforces clearly and effectively

6.2 National Occupational Standards in the digital and creative sector

6.2.1 Employer awareness and use of National Occupational Standards

Figure 6.1 highlights that levels of awareness of NOS are lower in the digital and creative sector than across the economy as a whole. Two thirds (69 per cent) of employers have not heard of NOS, compared to 60 per cent in the economy as a whole. Only 13 per cent of digital and creative employers have at least some knowledge of what NOS include, compared to 18 per cent overall. The proportion of employers with some knowledge of what NOS include is slightly higher in the creative sub-sector (14 per cent) than in the digital sub-sector (11 per cent).

Figure 6.1 Awareness of NOS by sub-sector

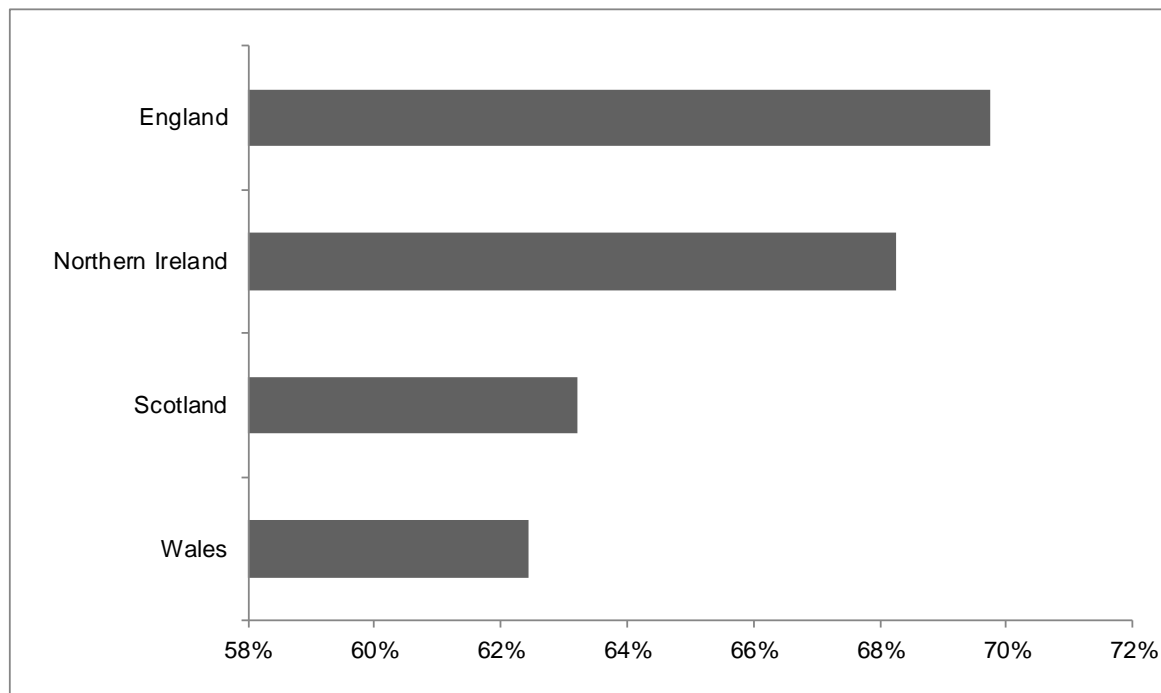


Source: UKCES Employer Perspectives Survey (2014c)

Base: All establishments

Awareness of NOS within the digital and creative sector is slightly lower in England than in other UK nations. Figure 6.2, below, shows that approximately 70 per cent of digital and creative establishments in England have not heard of NOS, compared with approximately 68 per cent in Northern Ireland, 63 per cent in Scotland and 62 per cent in Wales.

Figure 6.2 Proportion of digital and creative establishments that have not heard of NOS by UK nation



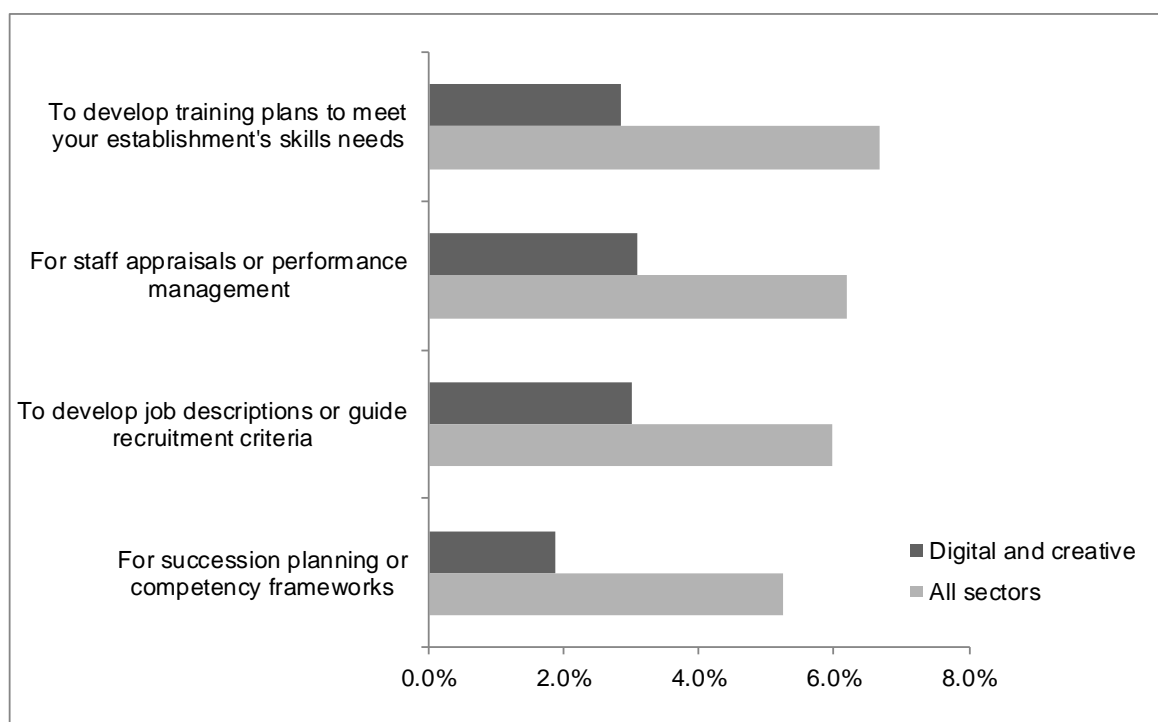
Source: UKCES Employer Perspectives Survey (2014c)

Base: All establishments

Across the economy, 10 per cent of employers reported that they make some use of NOS, but amongst digital and creative firms the rate was only five per cent. NOS are used by three per cent of digital and creative firms for each of the following reasons: to develop training plans; for staff appraisals; or to develop job descriptions.³⁹

³⁹ These categories sum to more than five per cent as firms may fall within more than one category.

Figure 6.3 Use of NOS



Source: UKCES Employer Perspectives Survey (2014c)

Base: All establishments

Stakeholders explained that firms may use apprenticeships or other vocational training based on NOS without realising that NOS have been used to inform course content or standards. The UK Commission's Employer Perspectives Survey 2014 found that 82% of employers which had or offered formal Apprenticeships (which were based on NOS) said they did not use NOS. To the extent this is the case, the chart above may under-estimate NOS usage in the digital and creative sector. Evidence from other sectors studied with the sector insights research programme suggests that this issue may be common across sectors, and it is difficult to ascertain whether it may be more or less of a problem within digital and creative firms.

6.2.2 Evidence from the digital sub-sector

Within the digital sub-sector, stakeholders report that major employers are keen to set standards and accredit training providers that deliver to those standards. This reflects that the nature of work in the digital sector makes it difficult to determine at the point of recruitment whether someone can do the job they are applying for. In this context, standards provide a valuable benchmark that enable employers to understand an individual's capabilities, even if the employer does not possess technical expertise in the relevant area.

During 2014 the Tech Partnership developed new NOS to address the skills needed for big data and data analytics. More than 50 employers contributed to this process, either directly or through the consultation. Larger firms are often better able to get involved in such initiatives because they are more likely to have dedicated HR and development personnel who can contribute the time needed. Some employers expressed concern that this could lead to standards designed to meet the needs of larger employers, but less well suited to smaller firms.

Stakeholders explained that it is extremely difficult to monitor use of NOS, although some insights are provided by monitoring data for NOS websites. The NOS for digital skills are available on the UKCES NOS database, and the IT Professional Standards site. Detailed monitoring data are not available from the UKCES site, but the Tech Partnership gathers usage information from the Professional Standards site which suggests that since January 2014 there have been:

- 3,364 unique visitors to the online IT Professional Standards section incorporating National Occupational Standards;⁴⁰
- 275 downloads of the IT Professional NOS pdf booklet, of which 59 were by employers;
- 394 downloads of the IT User NOS pdf booklet, of which 62 were by employers;
- 2,300 registered users of the 'IT Professional Profile' function on the Tech Partnership website⁴¹ use NOS, of which just over 400 registered in the 12 months to January 2015.

NOS for digital skills are also used to underpin apprenticeships and vocational qualifications. In all, 665 users have downloaded materials relating to the frameworks for England and Wales, and 93 users have downloaded materials relating to Scottish Modern Apprenticeship Frameworks.

The NOS for information security skills uniquely define the range of skills areas as recognised by the Institute of Information Security Professionals (IISP) and GCHQ in an integrated set of NOS. The first Learning Pathways have been developed in the information security field. These are based on new national skills standards for information security, created through the alignment of NOS with the IISP skills framework and the CESG⁴² certification for information assurance professional standards. During 2014 there were 4655 page views to the cyber security learning pathways pages.

⁴⁰ <https://www.e-skills.com/professional-development/it-professional-standards/standards/>

⁴¹ Individuals can use this function to capture and visualise their technical skills on a single page. This was first developed using the NOS and has been extended to incorporate Skills for the Information Age

⁴² CESG is the information security arm of GCHQ

The Tech Partnership is integrating NOS with the SFIA (Skills for the Information Age) framework to build upon the success of SFIA. The Tech Partnership reports that more than 2,500 organisations use the SFIA skills framework worldwide. Within the UK this includes the UK government, which based its Government IT Profession on SFIA, major companies and professional bodies.

Accordingly, data on access and downloads of SFIA information are extremely high:

- there have been 80,000 downloads of the SFIA skills framework for the ten months January to October 2014;
- there were around 8,500 unique visits to the SFIA site in October 2014 and nearly 5,000 downloads of the SFIA skills framework;
- 13,000 people registered on the site in the ten months to October 2014.

While these data do not provide a comprehensive picture, they do suggest that reasonable numbers of digital employers may be using NOS in some way, particularly those standards that have been incorporated within the SFIA framework.

6.2.3 Evidence from the creative sub-sector

There is perhaps less incentive for creative firms to get involved in the setting of standards. Many face a ready supply of young people willing to undertake an unpaid internship, and there is little risk attached to taking them on for a trial period. In addition defining standards for creativity is inherently difficult.

Trade bodies and membership bodies tend to be the most interested in NOS within the creative sub-sector. Stakeholders again report that it is generally easier for larger companies to participate as they have training staff or operational managers that can attend workshops (although consultations are also opened online to enable all types of firm to contribute if they wish). Some employers perceive NOS as bureaucratic, which could make them unattractive in a creative context.

The number of employers involved in developing NOS can depend on the nature of the specialism and size of the sub-sector the NOS is addressing, and stakeholders suggested that the level of experience and expertise of contributors should be considered, as well as their number.

For example, around 50 large and smaller employers participated in the recent development of a NOS for laundry, wet and dry cleaning.⁴³ In contrast, a much smaller number of employers contributed to the development of the Broadcast Engineering NOS, which is likely to reflect that demand for people with skills in this area is dominated by a small number of large companies, such as the BBC, Sky, ITV and Channel 4. Similarly, in 2013 the Hair and Make Up Film and TV review attracted involvement from a relatively small steering group of individuals drawn from a small and specialised element of the creative sector, where most of the professionals are freelancers, but the calibre of participants was extremely high – participants included BAFTA and Oscar winners and nominees - coordinated by Creative Skillset.

While evidence from stakeholders appears to suggest that there may be less interest in NOS within the creative sub-sector than within the digital sub-sector, this is not apparent from the Employer Perspectives Survey (2014c) evidence presented in Section 6.2.1. This suggests that five per cent of digital firms and six per cent of creative firms make some use of NOS. It is difficult to be certain why consultation evidence from the sector does not align with the survey findings, but it is possible that a different picture could emerge from data based on the proportion of employees that use NOS, rather than the proportion of firms.

6.3 Potential improvements to National Occupational Standards

A third of respondents answered the survey question asking whether they would be willing to be involved in designing new standards. Two respondents indicated they would be willing to do this. Amongst those that answered 'no', smaller firms suggested that they did not feel national standards would be relevant to them, or that they might not have time to participate.

Employer consultees were more positive about NOS: around half of respondents suggested they would be willing to get involved. Those that responded positively could see the value in having defined criteria of competence when recruiting, and when writing job descriptions. There was some caution, however, that it may be challenging to keep standards up to date in a fast-moving industry.⁴⁴

Employers were also asked how NOS could be made more relevant and useful. The main suggestions were:

- using NOS to ensure that those leaving college and university courses are equipped with the skills employers need;

⁴³ Creative Skillset has responsibility for the fashion and textiles sector. While this falls outside of the digital and creative sector as defined for this study, the example provides a useful indication of recent employer interest in NOS.

⁴⁴ Findings from the survey and consultations should be treated with caution and are not directly comparable. They are based on extremely small sample sizes, and those interviewed by phone had a greater opportunity to ask questions to develop a better understanding of NOS before responding.

- focusing NOS on core skills, rather than more specific technical skills that may soon become outdated as technology progresses;
- reducing the detail level of NOS to make them easier for employers to understand and engage with;
- improving the NOS database to make it more easily accessible and understandable;
- developing a clearer narrative on the rationale and advantages of NOS.

6.4 Conclusion

This chapter has found that awareness of NOS is lower within the digital and creative sector than across the economy as a whole. More than two-thirds of digital and creative employers have not heard of NOS; only 13 per cent of digital and creative employers have at least some knowledge of NOS; and just five per cent actually use NOS (although some may use apprenticeships or other vocational training based on NOS without realising that NOS have informed course content or standards).

There is potentially a greater role for NOS within the digital sub-sector, where written standards can provide a useful basis for understanding an individual's capabilities, even if an employer does not possess the same level of technical expertise in that area. Stakeholders report that larger digital employers, in particular, have been keen to be involved in initiatives to set standards and accredit training providers.

Increasing take up of NOS may be more challenging in some parts of the creative sector, where potential employers often have the option of reviewing an individual's portfolio of work, or assessing an individual's performance through an unpaid internship. It is also inherently difficult to capture some types of creative abilities through written statements. Trade and membership bodies tend to be the most interested in NOS within the creative sub-sector and, once again, initiatives to involve employers in NOS are typically better supported by larger organisations.

The research identified a number of suggestions for making NOS more useful and relevant for the digital and creative sector, most notably by:

- using them to ensure that those leaving college and university are equipped with the skills employers need;
- focusing on core skills, rather than more specific technical skills that may quickly become outdated;
- reducing the detail level;
- improving the NOS database;
- developing a clearer narrative on the rationale and advantages of using NOS.

7 Conclusions and implications

7.1 Current workforce and skills challenges

The UK digital and creative sector has grown rapidly in recent years, contributes almost none per cent of total UK GVA and employs 2.1 million people. Digitisation of the entire economy is driving strong demand for digital services and workers with digital skills, and the recent widening of tax relief has stimulated strong growth in some parts of the creative industries.

Employers often have difficulty filling vacancies in more technical roles. There are also concerns that graduates do not leave university with the right skills as technology changes more quickly than the content of degree courses. High vacancy rates for digital roles coexist with high rates of unemployment amongst computer science graduates. Technological advances also lead to skills gaps amongst the existing workforce as employees find it difficult to keep up to date with the latest developments.

At the same time, certain creative roles remain extremely attractive to prospective employees and employers have few difficulties finding the workers they need. However, it would be wrong to draw a simple distinction between the digital and creative sub-sectors. The boundaries between digital and creative are becoming increasingly blurred and firms often do not see themselves as either 'digital' or 'creative'. Moreover, employers are increasingly seeking a fusion of creative and technical skills within a single individual, alongside the business and softer skills required to operate effectively in a commercial environment.

The structure of businesses within the digital and creative sector creates specific challenges. The business stock includes a very high proportion of micro businesses and a high proportion of workers are self-employed. Many firms may not have dedicated HR capabilities and structured approaches to recruitment and development. This is particularly apparent in the creative sub-sector where entry routes often still involve unpaid internships, which may be contributing to a lack of ethnic diversity within the creative workforce. A failure to attract more females to digital roles means the sub-sector misses out on an important source of potential labour.

7.2 Outlook for the digital and creative sector

Technological change, in particular, is expected to continue to drive further strong growth across the digital and creative sector. The sector is expected to need 1.2 million new workers between 2012 and 2022, both to expand and to replace departing workers. Just over three quarters the workers needed will be in the three highest skilled occupational

groups. There are particular concerns about the ability of the education system to supply the quantity and quality of workers needed for digital roles.

There is a clear consensus amongst both digital and creative firms that technological factors will be the most important influence on the development of the digital and creative sector and its future skills needs. The precise nature of these changes is more uncertain, but the following trends are expected to play an important role:

- further strong growth in demand for technology services and expertise from most sectors of the economy;
- the increasing importance of cyber security;
- the convergence of content across multiple platforms;
- mobile and cloud computing;
- big data and analytics;
- the automation of routine tasks;
- new applications of social media;
- new business models and collaborative platforms.

These trends represent opportunities for the digital and creative sector. However, a number of potential regulatory trends have also been identified which could threaten the degree of freedom and flexibility currently enjoyed by digital and creative firms. These could include:

- changes to rules governing the ownership and use of data which could limit the extent to which digital and creative companies are able to innovate and extract value from the information they hold;
- changes to intellectual property legislation;
- new labour market regulations that force firms to adopt more formal HR practices; limit the ability of creative firms to take on unpaid interns; and impose additional costs on self-employed workers. There may also be even greater pressure to tackle workforce diversity issues;
- changes to tax incentives, either within the UK or overseas, which influence the relative attractiveness of undertaking digital and creative work within the UK.

There is a high degree of uncertainty around such factors. While some could represent a threat to the sector's current ways of working, there is an opportunity for the sector to engage in the debate and implement changes that are in its long-term best interests.

The final set of trends considered relates to economic and demographic factors. Four factors were identified:

- population ageing, which will create opportunities in new business areas, such as healthcare technologies, and enable digital and creative firms to benefit from the life and business experience of individuals that choose to work for longer;
- the entry of young 'digital natives' into the labour force, bringing a deep and intuitive understanding of the application of digital technologies;
- the threat of further government spending reductions, which could reduce public sector demand for digital services and the availability of funding for training;
- a further deepening of globalisation which will offer content creators the opportunity to sell into new and fast growing markets, but bring the threat of increasing competition and a risk that higher value activities may move overseas.

7.3 Future skills needs

Rapid technological change and the ongoing trend towards digitisation in many parts of the economy means that employers will increasingly seek workers able to adapt and respond to technology. Firms will also need to be able to respond quickly to client needs, and face greater competition. Smaller organisations, in particular, will need workers able to combine technical expertise with creativity, entrepreneurship and soft skills. There will also be a need for those who can think strategically to identify how firms can exploit and adapt new technologies to benefit from them to the greatest possible extent. This applies most directly to workers such as programmers and business analysts, but there will be an increasing need for digital skills right across the digital and creative sector.

Specific technological trends will call for individuals with specialised knowledge in areas such as cyber security, mobile and cloud computing, big data, and social media. At the same time, however, workers right across the digital and creative sector, and beyond, will need some degree of knowledge in these areas; an understanding of how such trends may impact on their work; and an ability to capitalise on the opportunities they offer. Progress in some areas may be offset by a reduction in demand for those with skills in older technologies. Where this is the case, individuals will need to adapt, and/or become even better at promoting themselves and their work to appeal to a declining audience.

As technology continues to change how the economy works, the digital and creative sector will need the analytical expertise to anticipate how markets and consumers may respond to new business models, and regulatory and legal expertise to help shape and comply with new and existing rules and regulations.

As the digital and creative sector grows ever larger, it is also likely to be subject to greater labour market regulation. Alongside the pressing need to recruit large numbers of new workers, particularly to digital roles, there will be a need for more formal and proactive human resources functions. Demographic changes suggest a need for more advanced people management skills to manage greater diversity of expertise in the workforce as older workers find themselves working alongside 'digital natives' with a deep and intuitive understanding of digital technologies.

Ever-closer global economic integration suggests a growing need for those with the skills to develop international networks; promote and sell UK outputs overseas; identify competitive threats; and develop strategies to maximise the UK's share of the global market for digital and creative outputs.

7.4 Employer actions to address future challenges

Employers in the digital and creative sector recognise the importance of personal development. They tend to monitor the situation and identify training needs as they arise, but they do not necessarily predict what will happen in the industry and then train people with the skills they think will be needed. Although many employers question the value of formal training courses, most encourage and enable personal development through a range of means. This may involve learning through, doing or the provision of online training materials, but some employers undertake more innovative approaches, such as the use of 'hack days', or dedicating time each week to innovation and personal development.

Nonetheless, many of the challenges identified in this paper require sector-wide action and sector bodies have worked with employers to put in place a wide range of initiatives to address them. These include:

- efforts to engage with young people of school age to encourage the development of digital and creative skills and promote careers in the sector;
- engagement with educational institutions and training providers to better align the content of courses with business needs;
- the brokering of work placements and internships;
- designing new apprenticeship standards;
- workforce training;
- forming industrial partnerships to foster growth and competitiveness through skills.

7.5 Current and future interest in National Occupational Standards (NOS)

Awareness and use of NOS is lower in the digital and creative sector than across the economy as a whole. In the digital sub-sector, standards can provide a useful benchmark to enable employers to understand an individual's technical capabilities. There may be more challenges in using NOS in some more creative areas, where levels of competence are difficult to objectively capture in written statements, and where employers are easily able to view an individual's portfolio of work.

Nonetheless, employers in both the digital and creative sub-sectors do engage in initiatives to develop NOS. Larger organisations are better able to contribute, but Sector Skills Councils should remain vigilant that standards are also suitable for the needs of smaller employers.

NOS could be made more useful and relevant to digital and creative firms by:

- using them to ensure that those leaving college and university are equipped with the skills employers need;
- focusing on core skills, rather than more specific technical skills that may quickly become outdated;
- reducing the detail level;
- improving the NOS database;
- developing a clearer narrative on the rationale for and advantages of NOS.

7.6 Implications for the supply of skills

Encouraging more people to join the digital and creative sector

It will take time for participants in current initiatives to move through the education system and the effectiveness of such efforts may not become apparent for many years. The sector should therefore consider what else might be done to not only promote digital and creative careers, but also to help young people identify the skills they will need and how they might obtain those skills. This may suggest a greater role for specialist careers guidance.

Creative roles are generally very attractive, and low starting salaries are seemingly not a barrier for those seeking to join the industry. There may be value in considering whether any lessons can be learned from this to help make digital roles more attractive. The increasing convergence of digital and creative may help with this process if those keen to join the creative industries can be shown that gaining digital expertise will provide a significant advantage when they are seeking to enter the sector.

The lack of females in digital roles is widely recognised and there is a need to consider whether more might be done to address this. This could involve marketing the sector to a wider field of potential recruits with different educational and professional backgrounds. There may also be a greater role for conversion courses that enable individuals with different educational and professional backgrounds, both male and female, to move into digital careers.

Some parts of the digital and creative sector are experiencing extremely strong growth following the introduction of new tax breaks. There is a need to consider whether additional skills initiatives are needed in the short term to alleviate shortages in these areas and ensure that the maximum possible benefit is obtained from the tax changes.

Accessing and fostering expertise in other parts of the economy

Chapter 6 identified that the digital and creative sector will increasingly need to draw on expertise from other sectors of the economy. It will have a growing need for expertise in legal and regulatory issues to shape and comply with a changing regulatory landscape; human resource and people management experts to recruit and manage a more diverse workforce; analytical skills to develop and optimise new business models; and business strategy experts to help the UK maximise its share of the international market for digital and creative content and services.

Organisations within the digital and creative sector will decide for themselves whether such expertise is best accessed by developing in-house capabilities, or purchased from consultancy providers. Nonetheless, the sector may wish to consider whether sufficient expertise in these areas is available, and whether there is a need for skills initiatives to tailor such expertise to the specific and rapidly evolving needs of digital and creative employers.

Ensuring graduates have the right skills

While a number of employers expressed dissatisfaction with the work-readiness of graduates, digital and creative firms display a strong preference for recruiting graduates. It will always take an individual time to settle into a job straight after university, and the preparedness of graduates entering the digital and creative sector is not substantially different to other sectors of the economy.

Nonetheless, the high rate of unemployment amongst computer science graduates is a concern given the difficulties employers encounter when recruiting to digital roles. Further research should be undertaken to better understand this issue and how it might be addressed.

There is a shared responsibility for employers and universities to widen and deepen engagement to explore where course content can be improved to better align with employer needs, and be adapted as technology changes (while ensuring that the needs of a single or small group of firms do not exert too great an influence). This will be particularly important as students increasingly seek to ensure they obtain value for money from tuition fees and more closely scrutinise graduate employment rates.

There is also a need for firms to engage more and earlier with students, to help them understand the skills needed for the types of career they are interested in. Equipping young people with that knowledge at an earlier age will empower individuals to take more responsibility for ensuring they acquire the skills employers need during their education. Increasing the proportion of courses that include work placements could support this.

The growing intersection of digital and creative skills suggests a need for a greater choice of courses that do not force students to choose either a digital or a creative path. There are opportunities for universities to develop new courses that combine the technical and creative skills employers need. Such courses should also include modules on the business and softer skills, such as project management, working with clients, and teamworking.

The sector should also work with universities and other education providers to ensure that digital students pick up at least a basic knowledge of issues such as cyber security, intellectual property and data protection.

Apprenticeships and Further Education

Many of the employers interviewed felt that on-the-job learning is more important in some roles than knowledge gained from degree courses, potentially suggesting a greater role for apprenticeships and Further Education.

Expansion of apprenticeships is hindered by structural barriers such as the high proportion of micro businesses and the short-term nature of projects and contracts. There is also a need to address negative perceptions of apprenticeships in some parts of the sector. In the context of the current re-launch of apprenticeships, the sector might consider whether there is scope to tailor apprenticeships to better suit the profile of digital and creative employers.

It may also be possible for Further Education (FE) to play a greater role. Ireland has created institutes of technology which sit between FE and Higher Education, and which have proved very popular with employers. The UK digital and creative sector might consider whether a similar approach could be effective in the UK.

Training of the current workforce

Rapid technological change implies that there may be a greater need for ongoing workforce training than in other sectors of the economy. However, the prevalence of training amongst digital and creative employers is slightly below the national average. There is therefore a need to identify how the sector can increase training provision, and particularly continuous professional development (CPD) to ensure workers' skills are updated in line with technological developments.

Individuals, employers and sector bodies all have responsibility for ensuring such training is undertaken and other new approaches to personal development may be needed. In addition to greater use of online resources, employers may find it beneficial to build stronger relationships with local educational institutions and training providers to enable employees to undertake modular training with minimal disruption to work.

There is a particular need to consider how such training may be supported within smaller firms and amongst self-employed workers, where financial and time barriers may be most likely to interfere with staff development.

Appendix A: Detailed tables

Table A.1: Employer interviews (key occupations)

Sector	Sub-sector		Employer size band					Total
			1 - 9	10 - 49	50 - 249	250 - 999	1000 +	
Digital	61	Telecommunications					1	1
Digital	62	Computer programming, consultancy and related activities	1		1			2
Digital	63	Information Service activities		1		1		2
Digital	95	Repair of computers and other goods						0
Creative	58	Publishing	1					1
Creative	59	Motion pictures		1				1
Creative	60	Programming and broadcasting		1	3			4
Creative	73	Advertising and market research			2	2		4
Creative	74	Other professional scientific and technical activities (nb: includes design, photographic, translation)	1	2				3
Creative	90	Creative arts and entertainment	2					2
Creative	91	Libraries, archives, museums etc.						0
Total			5	5	6	3	1	20

Source: Oxford Economics

Table A.2: Net change in employment by sector and occupation, 2012 to 2022

		Managers, directors and senior officials	Professional	Associate prof. & technical	Administrative & secretarial	Skilled trades	Caring, leisure & other service	Sales & customer service	Process, plant & machine operatives	Elementary occupations
Digital sub-sector										
61	Telecommunications	6,000	6,000	4,000	1,000	- 5,000	1,000	9,000	-	-
62	Computer programming, consultancy and related activities	41,000	114,000	42,000	11,000	5,000	7,000	5,000	3,000	1,000
63	Information service activities	4,000	9,000	5,000	2,000	-	2,000	1,000	-	4,000
95	Repair of computers and other goods	- 1,000	2,000	-	-	- 3,000	-	- 4,000	- 1,000	-
Creative sub-sector										
58	Publishing	- 2,000	- 1,000	- 4,000	- 5,000	- 6,000	-	- 2,000	- 1,000	- 1,000
59	Motion pictures	-	2,000	1,000	- 3,000	- 2,000	1,000	-	-	1,000
60	Programming and broadcasting	1,000	3,000	3,000	-	-	1,000	-	-	-
73	Advertising and market research	3,000	6,000	2,000	- 11,000	- 1,000	-	- 1,000	-	-
74	Other professional scientific and technical activities (includes design, photographic, translation)	10,000	29,000	18,000	1,000	-	3,000	2,000	-	4,000
90	Creative arts and entertainment	4,000	10,000	17,000	-	- 1,000	3,000	1,000	-	-
91	Libraries, archives, museums	-	-	- 3,000	- 7,000	- 2,000	-	- 1,000	-	- 4,000
Digital and creative		67,000	179,000	85,000	- 11,000	- 14,000	18,000	11,000	1,000	4,000

Increases of more than 10,000 highlighted in grey

Source: UKCES Working Futures (2014a)

Bibliography

Arts Council Northern Ireland (2013) *Ambitions for the Arts: A Five Year Strategic Plan for the Arts in Northern Ireland 2013-2018*. Arts Council Northern Ireland, Belfast.

Brighton Fuse (2015). *Freelancers in the Creative Digital IT Economy*, Brighton UK.

Available via: <http://www.brightonfuse.com/brighton-fuse-freelancer-final-report/>

[Accessed 19th February 2015].

CBI (2014). *The Creative Nation: A Growth Strategy for the UK's Creative Industries*. CBI and Ernst and Young. CBI, UK. Available:

http://www.cbi.org.uk/media/2535682/cbi_creative_industries_strategy_final_.pdf.

[Accessed 6th October 2014].

Chapain, C. et al. (2010) *Creative clusters and innovation: Putting creativity on the map*.

NESTA, London. Available:

http://www.nesta.org.uk/sites/default/files/creative_clusters_and_innovation.pdf.

[Accessed 17th February 2015].

Council for Industry and Higher Education (CIHE) (2010). *The Fuse: Igniting High Growth for Creative, Digital and Information Technology Industries in the UK*. CIHE, London, UK.

Creative Industries (2014). *Create UK: Creative Industries Strategy*. The Creative Industries Council UK. Available:

http://www.thecreativeindustries.co.uk/media/243587/cic_report_final-hi-res-.pdf

[Accessed 5th November 2014].

Creative & Cultural Skills (CCS) (2013). *Building a Creative Nation: Evidence Review*. CCS and The National Skills Academy, London. Available:

http://ccskills.org.uk/downloads/Building_a_Creative_Nation_-_Evidence_Review.pdf. [Accessed 5th November 2014].

Creative & Cultural Skills (CCS) and Skillset (2011) *Sector Skills Assessment for the Creative Industries of the UK*. Skillset and Creative and Cultural Skills. Available:

http://creativeskillset.org/assets/0000/6023/Sector_Skills_Assessment_for_the_Creative_Industries_-_Skillset_and_CCSkills_2011.pdf. [Accessed 6th October 2014].

Creative Scotland (2014) *Creative Scotland Annual Plan 2014-15*. Creative Scotland, Edinburgh.

Creative Scotland (2015) *Youth Employment Programme – Traineeships*
<http://www.creativescotland.com/funding/funding-programmes/targeted-funding/youth-employment-programme>

Creative Skillset (2010) *2010 Creative Media Employer Survey*. Creative Skillset, London.
Available:

http://creativeskillset.org/assets/0000/6002/Skillset_Employer_Survey_2010.pdf.

[Accessed 17th February 2015].

--- (n.d. (a)). *Job roles: Producer*. Paragraph reference: 'Is this role right for me?'

Available: http://creativeskillset.org/job_roles_and_stories/job_roles/757_producer.

[Accessed 11th March 2015].

--- (n.d.(b)). *Job roles: Director*. Paragraph reference: 'Is this role right for me?'

Available: http://creativeskillset.org/job_roles_and_stories/job_roles/758_director.

[Accessed 11th March 2015].

--- (n.d.(c)). *Job roles: Assistant photographer*. Paragraph reference: 'Is this role right for me?'. Available:

http://creativeskillset.org/job_roles_and_stories/job_roles/374_assistant_photographer. [Accessed 11th March 2015].

Deloitte (2014a). *London Futures - Agiletown: the relentless march of technology and London's response*. Deloitte Touche Tohmatsu Limited. Available: <http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/uk-futures/london-futures-agiletown.pdf>. [Accessed 18th February 2015].

(2014b). *2014 Global Health Care Sector Outlook*. Deloitte Touche Tohmatsu Limited. Available: <http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/dttl-lshc-2014-global-health-care-sector-infographic.pdf>.

[Accessed 18th February 2015].

Department for Culture, Media and Sport (DCMS) (2014) *Creative Industries Economic Estimates*. DCMS Statistical Release. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/271008/Creative_Industries_Economic_Estimates_-_January_2014.pdf. [Accessed 2nd January 2015]

e-Skills UK. et al. (2013) *Information Economy: Economic Estimates Report 2013*, e-skills UK / The Tech Partnership, Intellect and BCS. Available: <http://www.e-skills.com/research/research-publications/information-economy-economic-estimates/>. [Accessed February 2015].

- (2014) *The Women in IT Scorecard*, e-skills UK and BCS. Available: <http://www.bcs.org/upload/pdf/Women%20in%20IT%20scorecardv2.pdf>. [Accessed 13th February 2015].
- Gibson et al. (2012). *Making Games in the UK Today*. Gibson, Gibson and Wilson. The Independent Games Developers Association (TIGA). Kent.
- Higher Education Statistics Authority (HESA) (2015). *Qualifiers by Subject and Level data tables*. Available: <https://www.hesa.ac.uk/content/view/1973/239/>. [Accessed 10th February 2015].
- HM Government (2011). *The UK Cyber Security Strategy: Protecting and Promoting the UK in a Digital World*. HM Government. London. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60961/uk-cyber-security-strategy-final.pdf. [Accessed 18th February 2015].
- (2014). *The Future of Apprenticeships in England: Guidance for Developers of Apprenticeship Standards and related Assessment Plans*. HM Government. London. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/366063/bis-14-p194b-Guidance-for-developers-of-apprenticeship-standards-and-related-assessment-plans.pdf. [Accessed 13th February 2015].
- (2015). *Industrial partnerships: an overview. Detail on industrial partnerships, the sectors covered and their remit*. HM Government, London. Available: <https://www.gov.uk/industrial-partnerships-an-overview>. [Accessed 16th March 2015].
- Invest Northern Ireland (2015) ICT and electronics <https://www.investni.com/invest-in-northern-ireland/sectors-and-opportunities/ict-and-electronics.html>
- Marr, B. (2013). *The Awesome Ways Big Data Is Used Today To Change Our World*. Available: <https://www.linkedin.com/pulse/20131113065157-64875646-the-awesome-ways-big-data-is-used-today-to-change-our-world>. [Accessed 16th March 2015].
- Meager, N., Martin, R. and Carta, E. (2011) *Skills for Self-employment. Evidence Report 31*. UK Commission for Employment and Skills, Wath Upon Dearne.

Migration Advisory Committee (MAC) (2013). *Skilled Shortage Sensible - Full review of the recommended shortage occupation lists for the UK and Scotland, a sunset clause and the creative occupations*. London. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/257241/mac-report.pdf. [Accessed 12th January 2015].

National Careers Service (n.d.). *Job profiles: Graphic Designer*. Paragraph reference 'Skills, interests and qualities'. Available: <https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/pages/graphicdesigner.aspx>. [Accessed 12th February 2015].

National Centre for Universities and Business (2015). *Growing Experience: A review of Undergraduate Placements in Computer Science*. NCUB and BIS, London. Available: <http://www.ncub.co.uk/reports/computing-placements.html>. [Accessed 18th February 2015].

NESTA (2013). *A Manifesto for the Creative Economy*. NESTA, London. Available: <http://www.nesta.org.uk/publications/manifesto-creative-economy>. [Accessed 6th October 2014].

--- (2011). *Next Gen*. NESTA, London. Available: <http://www.nesta.org.uk/publications/next-gen>. [Accessed 6th October 2014].

ONS (Office for National Statistics) (2011) Census: Aggregate data (England and Wales) [computer file]. UK Data Service Census Support. Downloaded from: <http://infuse.mimas.ac.uk>. This information is licensed under the terms of the Open Government Licence [<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2>].

--- (2009). *UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007), Structure and explanatory notes*. ONS Government Statistical Service, Colchester, Essex. Available: <http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/standard-industrial-classification/index.html> [Accessed 6th February 2015].

--- (2010). *Standard Occupational Classification 2010: Volume 1, Structure and descriptions of unit groups*. ONS Government Statistical Service, Colchester, Essex. Available: <http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/soc2010/soc2010-volume-1-structure-and-descriptions-of-unit-groups/index.html#1> [Accessed 6th February 2015].

- (2014a). Social Survey Division and Northern Ireland Statistics and Research Agency. Central Survey Unit, *Quarterly Labour Force Survey*, January - March, 2014. 3rd Edition. Colchester, Essex: UK Data Archive [distributor], February 2015. SN: 7501, <http://dx.doi.org/10.5255/UKDA-SN-7501-3>
- (2014b). *Annual Survey of Hours and Earnings*, 1997-2013. 6th Edition. Colchester, Essex: UK Data Archive [distributor], November 2014. SN: 6689, <http://dx.doi.org/10.5255/UKDA-SN-6689-5>
- (2014c). *The Inter-Departmental Business Register (IDBR). UK Business Counts Database – Enterprises*. ONS via Nomis. Colchester, Essex: UK Data Archive [distributor], 2014.
- (2014d). *Internet Access - Households and Individuals, 2014*. ONS. Colchester, Essex: UK Data Archive [distributor], 2014. Available: <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcn%3A77-322080>. [Accessed 18th February 2015].

Oxford Economics (2014a). *Oxford Economics UK Regional Forecasting Model*. GVA and Employment data. Oxford Economics. Oxford, UK.

--- (2014b) *Occupational Skills Challenges Tool* [Unpublished paper].

--- (2014c). *Assessing the Demand for Big Data and Analytics Skills, 2013 – 2020*. Executive Summary. Forfas. Ireland. Available: http://www.forfas.ie/media/07052014-Assessing_the_Demand_for_Big_Data_and_Analytics_Skills-Publication.pdf. [Accessed 5th April 2014].

Oxford Economics and the Ponemon Institute (2014). *Cyber-attacks: Effects on UK Companies*. Oxford Economics and Ponemon institute, a report for the Centre for the Protection of National Infrastructure (CPNI). Oxford, UK. Available: <http://www.cpni.gov.uk/documents/publications/2014/oxford-economics-cyber-effects-uk-companies.pdf?epslanguage=en-gb>. [Accessed 16th March 2015].

PwC (2012). *mHealth in the UK: Paths for Growth*. PricewaterhouseCoopers LLP. London. Available: <http://www.pwc.co.uk/government-public-sector/publications/mhealth-in-the-uk-paths-for-growth.html>. [Accessed 18th February 2015].

Scottish Government (2013) *Scotland's Digital Future Supporting the Transition to a World-leading Digital Economy: Emerging Findings: April 2013*. Scottish Government, Edinburgh.

Skills Funding Agency and Department for Business Innovation & Skills (2014). *FE data library: Apprenticeships*. Breakdown by geography, equality & diversity and sector subject area: starts and achievements 2002/03 to 2014/15. Available: <https://www.gov.uk/government/statistical-data-sets/fe-data-library-apprenticeships>. [Accessed January 2015].

Technology Strategy Board (TSB) (2013). *Creative Industries Strategy 2013-2016*. Technology Strategy Board / Innovate UK, Wiltshire. Available: <https://connect.innovateuk.org/documents/3220887/3676376/Creative%20Industries%20Strategy%202013-2016> [Accessed 2nd January 2015].

Towers Watson (2013). *The 2013 Global Change and Communication ROI study*. Towers Watson, Press release available: <http://www.towerswatson.com/en/Press/2013/05/just-over-half-of-employers-using-social-media-tools-for-internal-communication>. [Accessed 13th March 2015].

UKCES (UK Commission for Employment and Skills) (2012a) UK Commission's 2012 *Sector Skills Insights: Digital and Creative*. UKCES Evidence Report no. 49. UKCES, Wath-upon-Deane. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304485/Sector_Skills_Insights_Digital_and_Creative_evidence_report_49.pdf. [Accessed 6th October 2014].

--- (2012b) UK Commission's *Information and Communication Technologies: Sector Skills Assessment 2012*. UKCES Briefing Paper. UKCES, Wath-upon-Deane. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/306419/briefing-paper-ssa12-information-communication-technologies.pdf. [Accessed 2nd January 2015].

--- (2012c) UK Commission's *Creative Media and Entertainment: Sector Skills Assessment 2012*. UKCES Briefing Paper. UKCES, Wath-upon-Deane. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/306379/briefing-paper-ssa12-creative.pdf. [Accessed 2nd January 2015].

--- (2014a) *UK Commission's Working Futures 2012-2022*. UKCES Evidence Report No. 83. UKCES, Wath-upon-Deane. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/298510/working-futures-2012-2022-main-report.pdf. [Accessed 6th October 2014].

- (2014b) *UK Commission's Employer Skills Survey 2013: UK Results*. UKCES Evidence Report No. 81. UKCES, Wath-upon-Deerne. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/327492/evidence-report-81-ukces-employer-skills-survey-13-full-report-final.pdf. [Accessed 6th October 2014].
 - (2014c) *UK Commission's Employer Perspectives Survey 2014: UK Results*. UKCES Evidence Report No. 88. UKCES, Wath-upon-Deerne. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373769/14.11.11_EPS_2014_-_Main_Report_full_V2.pdf. [Accessed 6th October 2014].
 - (2013a) *UK Commission's Technology and skills in the Digital Industries*, UKCES Evidence Report No. 73. UKCES, Wath-upon-Deerne. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305376/evidence-report-73-technology-skills-digital-industries.pdf. [Accessed 18th February 2015].
 - (2013b) *UK Commission's Review of Adult Vocational Qualifications in England*. Whitehead. UKCES, Wath-upon-Deerne. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/303906/review-of-adult-vocational-qualifications-in-england-final.pdf. [Accessed 18th February 2015].
 - (2014d) *UK Commission's Statement of Intend for NOS*. UKCES, Wath-upon-Deerne. Available: <https://www.gov.uk/government/publications/standards-and-frameworks-an-overview>. [Accessed 18th February 2015].
- UK Visas & Immigration (2014). *Codes of Practice for Skilled Workers – Standard Occupational Classification (SOC) codes*. London. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/303033/CoP_-_Apr_14_V0_6.pdf. [Accessed 12th January 2015].
- Universities UK (2010) *Creating Prosperity: the role of higher education in driving the UK's creative economy*. Universities UK, London. Available: <http://www.universitiesuk.ac.uk/highereducation/Documents/2010/CreatingProsperityTheRoleOfHigherEducation.pdf> . [Accessed 1st February 2015]
- Welsh Government (2014) *Priority Sector Statistics* <http://gov.wales/statistics-and-research/priority-sector-statistics/?lang=en>
- (2015) *Creative Industries Sector* <http://gov.wales/topics/businessandconomy/sector/creative-industries-sector/?lang=en>

Evidence Reports present detailed findings of the research produced by the UK Commission for Employment and Skills. The reports contribute to the accumulation of knowledge and intelligence on skills and employment issues through the review of existing evidence or through primary research.

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