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London Futures
Agiletown: the relentless march of technology and London's response

Key points

- Nearly one in three jobs in London is at high risk of being made redundant by technology in the next 10 to 20 years.
- London organisations cite advances in technology as the primary reason for job losses.
- Lower paid jobs are most at risk, with jobs paying £30,000 or less eight times more susceptible to replacement by technology than those that pay £100,000 or more.
- Nearly two-thirds of London businesses see a significant or very significant impact from technology in the next decade, but 73 per cent plan to increase their overall headcount in the city.
- London organisations are creating jobs that require digital know-how, creativity, management skills and entrepreneurship.

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UKFutures

Contents

Through the **UK Futures** programme, Deloitte is leading the debate and delivering leading insight and expertise to help British businesses truly harness the opportunities available to them as they pursue a new era of wealth creation.

Foreword

The future of London is critical to Deloitte, our clients and our people. We opened our first office in the world in the city in 1845. Today it is still our largest client-serving location, accounting for seven per cent of our worldwide revenues. That is why we have undertaken two complementary studies that look at the major impact technological advances are having on London. We hope that the findings presented in this report provide a useful contribution to the debate on the future of our city. We also take a look at what the future might hold for London in a number of key areas: education and skills; work and place; transport and infrastructure; and retail.

Major advances in technology create a number of challenges for London, but also present a range of opportunities. Unless the changes that are coming in the next two decades are fully understood and anticipated by businesses, policy makers and educators, there will be a risk of avoidable unemployment and under-employment of Londoners. A widening gap between 'haves' and 'have nots' is also a risk as lower skill jobs continue to disappear. London continues to be the world's leading magnet for talented people, but the skill sets that are needed are changing. Deloitte has called for the appointment of a city-level Chief Talent Officer to coordinate a strategic response. We believe that our recent research, described in this report, confirms this need.

Looking forward, **agility** seems to be the key: an agile workforce with the skills to adapt to fast-changing job requirements; flexible use of working space to accommodate rapidly-evolving work practices; and a city infrastructure that uses technology to support increasing numbers of people at home, work or play.

London has a very long history of harnessing technology to its advantage and there is every reason to believe it will do the same again. The technology might be different, but the city's success will as ever require a flexible response within a clear framework for change.

This report focuses on the capital, but in the coming months we shall also be giving our view of the implications of automation and computerisation for a number of the UK's other great cities.

Angus Knowles-Cutler
London Senior Partner

Introduction

Top: Carl Benedikt Frey
Bottom: Michael A Osborne

Throughout history, advances in technology have transformed commercial activity and the jobs that people do, never more so than today with the accelerating pace of change in digitisation and robotics. The continuing impact of technology on jobs needs a response from policy makers, businesses and educators.

Although the replacement of people by machines is well understood, the scale and scope of changes yet to come may not be. We have studied the risks to jobs in the UK from automation and have attempted to measure the scale of the problem. We have welcomed the opportunity to work with Deloitte on this important research.

We have found that within the UK, a lower proportion of jobs are at risk in London than in the rest of the UK, but even here the risks are significant and substantial changes are inevitable. Of particular concern is our assessment that London jobs paying less than £30,000 a year are over eight times more likely to disappear than jobs paying over £100,000. The speed of transformation is not so easy to predict, but we believe that the employment landscape will be very different in ten to twenty years from what it is today.

Carl Benedikt Frey
James Martin Fellow,
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at the University of Oxford

Dr. Michael A Osborne
Associate Professor of Machine Learning in the Department of Engineering Science, University of Oxford

Executive summary

Since the industrial revolution, advances in technology have seen machines taking the place of humans. The emergence of digital technology has accelerated this process: exponential growth in computing power, combined with a dramatic reduction in cost, has seen technology substituting for labour in ways previously unimaginable. This Deloitte study, using cutting-edge academic techniques and drawing on insights from leading businesses, examines the challenges facing London and the UK over the next two decades. This analysis will help to ensure we continue to build a strong and sustainable economy in the future.

The jobs challenge

To understand the potential impact of computers and robots on jobs in the UK, Deloitte has worked with Carl Benedikt Frey and Michael A. Osborne of the Oxford Martin School at Oxford University, to estimate the types and numbers of jobs at risk from automation. This analysis and the methodology follow a similar 2013 study of US labour markets[1]. We conclude that 35 per cent of today's jobs in the UK and 30 per cent in London are at high risk of disappearing over the next two decades as a result of technology.

Which jobs are at risk?

There are significant implications for the number and types of jobs at risk. Jobs most at risk from technology are in office and administrative support; sales and services; transportation; construction and extraction; and manufacturing. However, for 40 per cent of UK jobs (and 51 per cent of London jobs), the risk of automation is low or non existent. The jobs least at risk are in skilled management; financial services; computers, engineering and science; education; legal services; community services; the arts and media; and healthcare.

Frey and Osborne estimate that for the UK as a whole, jobs paying less than £30,000 a year are nearly five times more likely to be lost to automation than jobs paying over £100,000. For London, the ratio is more than eight times.

The reason that the number of jobs at risk in London is relatively low because a large proportion of the work force is already in high-skill roles that technology cannot easily replace. Also, the economics of employing staff in London mean that the trend is already further advanced in the city.

What do London businesses think?

To complement this analysis, Deloitte has also conducted a survey of 100 London-based employers across the private and public sectors. A majority of businesses (73 per cent) plan to increase their London headcount in the next five years. This is consistent with previous Deloitte analysis which forecast that net London employment will increase by at least 300,000 in the same period. However, we can expect growth rates to vary between business sectors. Public sector respondents paint quite a different picture, so over time the proportion of government and public sector jobs in London may decline.

It seems clear that a significant shift is occurring in the labour market. Jobs that do not need to be done in London, or can be fully replaced by technology, will continue to leave the city. However, the positive outlook for London jobs reflects an increasing premium in the global market on jobs requiring creativity, complex problem-solving and with a high technical content. London has earned its place as a global city through constantly evolving in the face of technological change. It will need to continue adapting.

The need for an agile response

To meet the demands of technology and a growing population, London will need to attract the right people, and be able to educate them, house them and provide the infrastructure to support a global city.

Much planning for London is in place or under way, but high on the city's agenda should be the possibility that the pace of technological advance is accelerating and the challenges will have to be met sooner than expected.

The onward march of computers and robots

Digital brain power

Computer technologies are transforming the work place, displacing labour from some jobs but also creating new types of work that call for different skills. In the past, computerisation has been limited mainly to repetitive tasks that can easily be specified in software and performed by machine. The future will be different. The capabilities of computers are expanding beyond routine work: as a result, tasks that were once considered too complex for coding will be converted into well-defined problems capable of digital solutions.

Improvements in the ability of sensors to capture data are an example of this process of change: better sensors make possible further developments in robotics. The ability to collect and analyse big data allows machine learning (ML) algorithms to perform some cognitive tasks more efficiently and effectively than labour, making possible – and desirable – the automation of some knowledge work.

Some of the changes are regularly reported. Advances in user interfaces enable computers to respond more efficiently to requests from customers, reducing the need for human intervention in some areas of customer service. Improved sensors and the creation of three-dimensional road maps are opening up possibilities for automated vehicle navigation.

The capabilities of computers are expanding beyond routine work: as a result, tasks that were once considered too complex for coding will be converted into well-defined problems capable of digital solutions.

Machines have their limits

Although computerisation means that some jobs will disappear, there are limits to the foreseeable scope of computerisation:

- Some tasks require a high level of perception and manipulation, where people can see and respond to circumstances in ways that robots and computers cannot
- Jobs requiring creativity and social skills are not susceptible to automation

As computers take over some elements of work, people will need the agility to adapt, innovate and exploit new opportunities that emerge.

How many jobs are at risk?

Against this background of change in the work place, important questions are:

- To what extent are today's jobs at risk of computerisation?
- How must people and the work place respond to the disruption caused by progress?

The risks and the challenges of computerisation have global implications. This report focuses on how they affect London, and makes comparisons with other parts of the UK. It also considers what London must do to retain its unique position as a leading international centre for trade and commerce in a digital age.

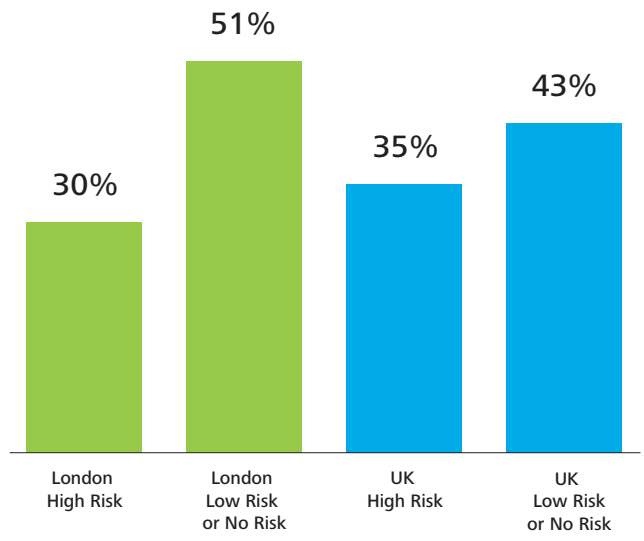
To obtain an answer to the first of the above questions, Deloitte asked Oxford Martin School academics Carl Benedikt Frey and Michael A. Osborne to carry out some research into the jobs that are at risk from computerisation, and how this will affect London.

Frey and Osborne: predicting the changes in work and jobs

In a recent study entitled "The Future of Employment: How susceptible are Jobs to Computerisation"[2], Frey and Osborne applied a research methodology to assess the proportion of current jobs in the United States that are at high risk from automation.

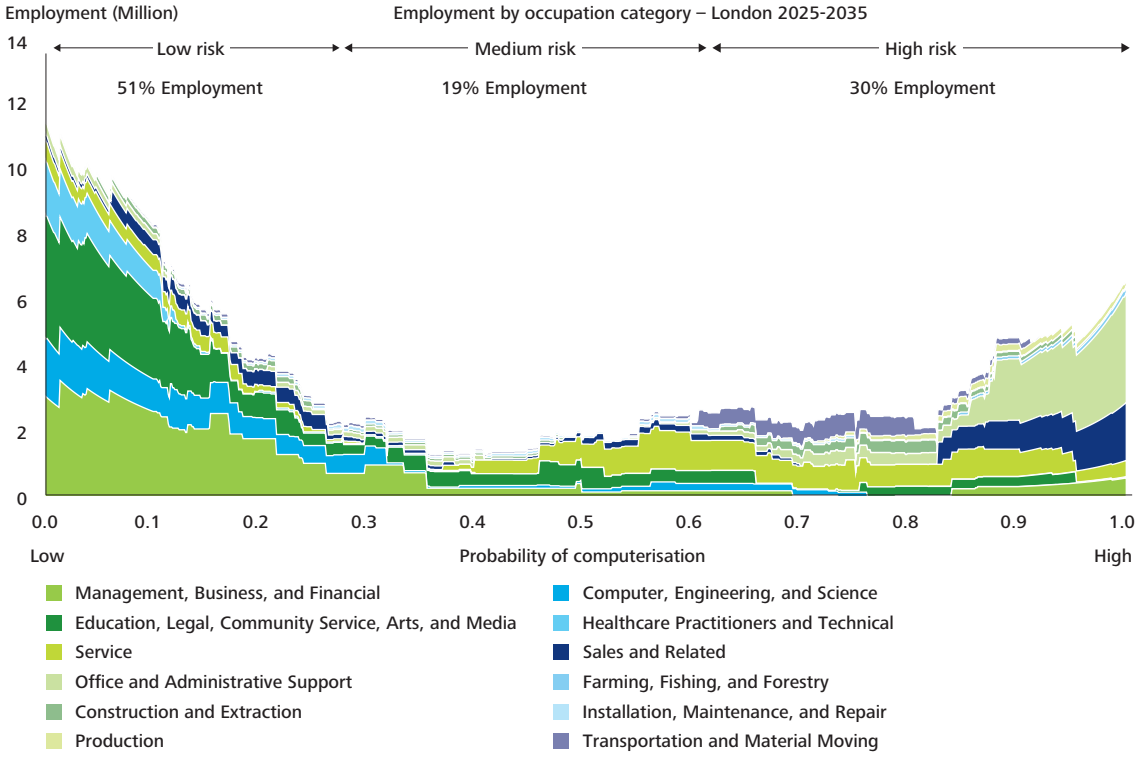
Deloitte asked them to carry out similar research in the UK. They estimate that on average, 35 per cent of current jobs in the UK are at high risk over the next ten to twenty years. The figure for London is 30 per cent. (See Figure 1.)

Figure 1. Jobs at high risk and low risk from automation, London and Uk comparison (%)



Source: Frey and Osborne, Deloitte, 2014

Figure 2. Current jobs at risk from computerisation: London*



*The area under all curves is equal to total UK employment

Source: Frey and Osborne, Deloitte, 2014

The proportion of jobs with low risk or no risk from automation in London is 51 per cent. The low share of jobs at risk reflects London's specialization in social and creative work. Because proximity facilitates social interactions and idea transmission, creative and social skills are more productive in cities. Further, a larger pool of skilled workers makes a city more resilient to technological change: skilled workers are more able to implement new ideas and adopt new technologies.

Frey and Osborne also provide an analysis of the business sectors and how the risk to jobs varies within each sector. Their conclusions for London are shown in Figure 2.

The research takes a ten to twenty year view and the estimates are probabilities rather than certainties. The speed and extent of computerisation will depend on the strength of social and political resistance to change, which is difficult to predict. Deloitte expects however that substantial changes to jobs in London are likely to occur within the next ten years or so.

How are the risks identified?

Frey and Osborne adapted their research in the United States to the situation in the UK. They identified three 'bottlenecks' to automation that reduce the risks to jobs: the skills of perception and manipulation; creativity; and social intelligence. For each of 369 classifications of jobs, they systematically identified features corresponding to the degree of each of these skills and from this they estimated a probability of automation. (Their methodology is described in more detail at the end of this report.)

Which jobs are most at risk?

The research indicates that the jobs least at risk from computerisation are in areas such as senior management and financial services; computers, engineering and science; education; legal services; community services; the arts and media; and health care.

The jobs most at risk are in office and administrative support work; sales and services; transportation; construction and extraction; and production (manufacturing). These are not the lowest paid (see Figure 3).

Even so, Frey and Osborne have estimated that London jobs where the annual rate of pay is less than £30,000 are more than eight times more likely to be replaced by automation than jobs paying more than £100,000. In fact, 63% of these jobs are in the high risk category compared with 30% for all London jobs. In the UK, the ratio is less than five times. This is surely a matter of some concern.

An area where jobs are at high risk from computerisation is in manufacturing, where jobs are vulnerable to advances in robotics technology. The relatively low number of manufacturing jobs in London helps to explain why the city's exposure to job losses is relatively low. London is ahead of the curve in adapting to the changing demands of the commercial market place, and has already made progress towards acquiring a more creative and agile work force. It already employs a relatively high proportion of skilled workers in cognitive, advisory and creative jobs compared with other leading cities in the US and Europe.

Skilled cities have benefited from the computer revolution, in terms of growth in both population and wages. There has also been a migration from London of jobs that may be at medium-to-high risk from computerisation, so that London's work force already contains a relatively high proportion of people with the talent and ability to adapt to the needs of employers in an evolving labour market.

Figure 3: Probability of computerisation and median earnings

Source: Frey and Osborne, Deloitte 2014

Frey and Osborne have estimated that London jobs where the annual rate of pay is less than £30,000 are more than eight times more likely to be replaced by automation than jobs paying more than £100,000. In the UK, the ratio is less than five times. This is surely a matter of some concern.

Figure 4. Jobs lost from London, 2001 – 2013

	London		Rest of the UK	
ONS job description	**Numbers lost**		**Numbers lost**	
	000s	**%**	**000s**	**%**
Library assistants and clerks	4.7	65	22.0	48
Sales-related occupations	9.1	65	42.2	40
Filing, record assistants and clerks	14.1	58	49.1	30
Travel agents	7.3	56	20.9	44
Counter clerks	15.9	48	91.7	46
PAs and other secretaries	32.9	44	162.6	47
Collectors, sales persons, credit agents	0.8	43	2.1	8
Pensions and insurance clerks	2.9	38	5.3	7
Credit controllers	1.9	33	19.2	37
Accounts wages clerks, bookkeepers	**30.1**	**32**	**109.4**	**23**
Total and weighted average reductions	**119.7**	**43**	**524.5**	**34**

Source: ONS Annual Population Survey, 2014

Figure 5. Fastest-growing job titles – global view

LinkedIn job title	New jobs globally, 2008-13	Growth multiple
IOS developer	12,545	× 142
Android developer	10,501	× 199
Zumba instructor	6,315	× 396
Social media intern	4,325	× 174
Data scientist	4,184	× 30
User interface/user experience designer	3,350	× 22
Big data architect	3,440	× 0
Beach body coach	3,360	× 0
Cloud services specialist	3,119	× 17
Digital marketing specialist	2,720	× 17

Source: LinkedIn Talent Blog, Top 10 Job Titles That Didn't Exist 5 Years ago, Sohan Murthy, Jan 6 2014

Skilled workers are more resilient and agile, and are more able to embrace new industries and new occupations.

New jobs will come as others go

Figure 4 shows the types of jobs that have been lost since the beginning of the millennium. For the ten occupations shown in the table, the total number of jobs in London has fallen by 43 per cent since 2001, either replaced by automation or moved out from the city. This compares with job losses of 34 per cent for the same occupations in the rest of the UK: not as large a percentage, but still a substantial number. The losses during this period have been mainly among jobs where productivity has been greatly improved by technology, such as secretary, counter clerk, travel agent, debt collector and librarian. The higher level of job losses in these categories in London compared with the rest of the UK is probably due to the cost of employment in the city accelerating the uptake of technology.

So change is well under way and, arguably, London has a track record over many centuries of adapting successfully to the challenge.

As existing jobs disappear, new roles are emerging continually and growing in number at a fast rate. This report will look at expectations of job increases in London over the next five to ten years.

It is difficult to predict just what new occupations will appear over this time but Figure 5, which shows the rate of growth globally in some jobs that barely existed five years or so ago, may provide an insight. The figures are from an examination by LinkedIn into the profiles of their 259 million worldwide members, to determine the fastest-growing job titles. While some of these jobs are of the moment, some are clearly here to stay. The study is global and not London-specific. However it gives an indication of the pace of change, and no doubt a good number of these jobs are to be found in London.

What does the Frey and Osborne research tell us?

A number of conclusions may be drawn from the research of Frey and Osborne.

- Although many jobs in London are at risk from computerisation, a relatively large proportion is not.
- This is because many jobs in London require highly-skilled (and highly-paid) individuals. London has been successful in adapting to the demands of employers for talented staff.
- A challenge for the future is to maintain this agility in the work place. A crucial requirement is to develop or attract – and retain – a work force with appropriate skills and abilities.
- Cities that maintain their ability to shift workers into new employment opportunities resulting from technological change will prove the most resilient.

Although not a part of the research by Frey and Osborne, London must also meet a growing demand for labour over the next few years. The need is for a larger as well as a more highly-skilled and tech-savvy work force.

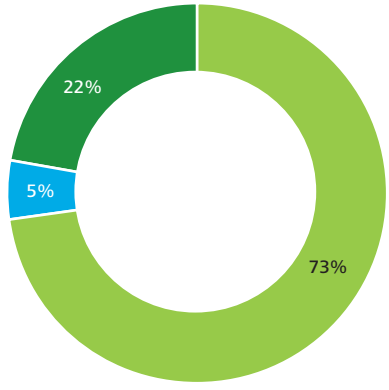
In parallel with the research of Frey and Osborne, Deloitte conducted a survey of 100 London-based employers in September 2014. The aim was to assess whether the views of their senior managers are consistent both with the research findings and also with Deloitte's predictions of the challenges that London must address for the future.

Of the 100 employers, 73 were private sector businesses and 27 were from the government and public sector. Against a background of cuts in government spending some differences in future intentions were to be expected.

London has been successful in adapting to the demands of employers for talented staff.

London's growing work force

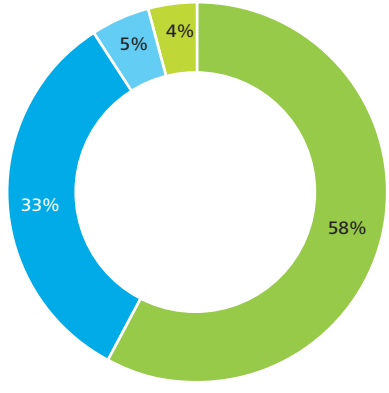
Figure 6. Plans to increase or reduce headcount in London in the next five years (businesses)



Yes, plan to increase London headcount
Yes, plan to reduce London headcount
No plans for change

Source: Deloitte analysis, 2014

Figure 7. Plans for employee headcount in London in the next five years (only relates to businesses that plan change)



Increase by more than 10%
Increase by up to 10%
Reduce by more than 10%
Can't estimate

Source: Deloitte analysis, 2014

Deloitte forecasts that London will overall increase employment by 300,000 by 2020. Our survey of London businesses supports this prediction. When asked about their plans for increasing or reducing headcount in London over the next five years 73 per cent of respondents from the private sector indicated an intention to increase their employee numbers and only five per cent expected to reduce them. (See Figure 6.)

Allowing for the certainty of new businesses being established as well as existing businesses increasing their headcount, these views seem consistent with Deloitte's predictions of an increase in job numbers in London by 2020.

Broken down by industry sector, 81 per cent of businesses in technology, media and telecommunications (TMT) expect to grow their headcount, 78 per cent in financial and business services and 62 per cent in retail.

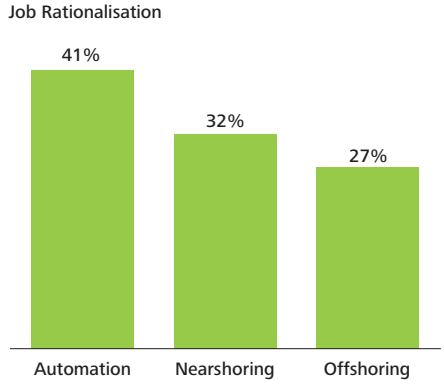
Among the respondents from the government and public sector, however, expectations were different: 37 per cent expect to reduce in employee numbers in the next five years and only 22 per cent to increase them. This implies that London is likely to be the home to more private sector employment and fewer public sector jobs over the next five years or so.

Where businesses are planning a reduction in jobs in London over the next five years, the reasons given were partly because jobs will be moved out of the city, either to locations elsewhere in the UK or to other countries, but also because automation will eliminate jobs. (See Figure 8.)

The large proportion of London jobs in the low-risk category in Frey and Osborne's research reflects the city's specialisation in social and creative skills. The high population density of London relative to many other cities and regions facilitates social interaction and the exchange of ideas in which creativity and social skills can flourish. London is already a centre for more high-skilled jobs than other leading cities around the world.

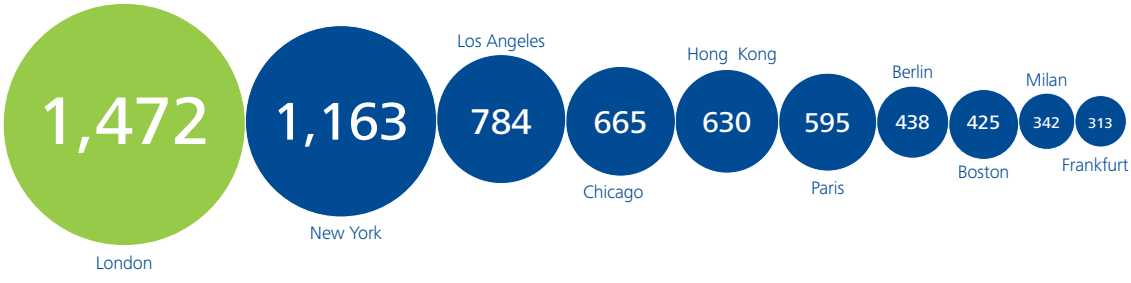
Deloitte research shows that, compared with other major cities worldwide, London has the highest number of people working in knowledge-based industries.

Figure 8. Factors leading to headcount reduction (responses have been weighted)



Source: Deloitte analysis, 2014

Figure 9. Number of high-skilled jobs in major cities worldwide, 2013*



*based on major cities where reliable and comparable data is available

Source: "Globaltown: Winning London's crucial battle for talent", Deloitte LLP, 2013

Figure 10. Leading cities by sector, based on headcount ranking

Financial services		Technology, media and telecommunications		Business and professional services		Consumer business		Education		Culture		Life sciences	
London	1	London	1	London	1	Los Angeles	1	London	1	London	1	Los Angeles	1
New York	2	Los Angeles	2	New York	2	London	2	New York	2	New York	2	New York	2
Hong Kong	3	New York	3	Chicago	3	Chicago	3	Hong Kong	3	Los Angeles	3	Toronto	3
Singapore	4	Singapore	4	Los Angeles	4	Singapore	4	Sydney	4	Paris	4	Boston	4
Boston	5	Hong Kong	5	Boston	5	New York	5	Boston	5	Singapore	5	Chicago	5

Source: Deloitte analysis, 2014

London is one of a few leading centres globally in many industries where a large proportion of jobs are high-skilled. Deloitte research in 2013 and 2014 into employment statistics in a range of industries and major global cities shows that, based on headcount of people employed, London came first or second in five sectors.

The leading position of London in such a range of sectors is striking, and suggests that it is a thriving and uniquely diverse global centre for business. Through its commercial diversity London is an agile city, able to adapt to shifting demand for jobs in different sectors. For example, despite the loss of many jobs in financial services since 2008, total employment in the city has increased, pointing to a re-balancing of jobs into other business sectors, notably technology, media and telecommunications.[3]

Other cities will compete for talent, and London must respond. London's lead in many of the major high-skill business sectors is a source of strength. There is likely to be substantial cross-fertilisation between the sectors. We have already seen this in areas such as app development and technology in financial services.

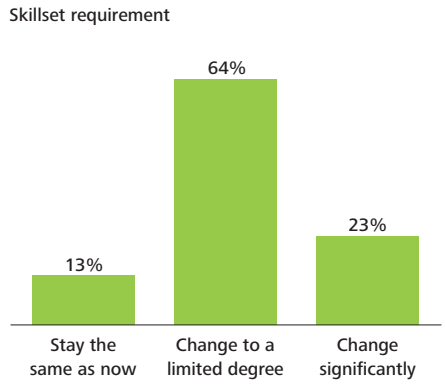
What skills will be needed?

The research by Frey and Osborne is based on an assumption that jobs least at risk from computerisation are those requiring preferably a combination of technical, creative and social skills. These are also the skills that employers will want from employees, in increasing numbers, over the next few years.

Not surprisingly, the results of the survey of London businesses support this view. On the issue of labour skills, 84 per cent of respondents in the private sector believe that the skill set of their London-based employees will have to change over the next ten years, either to a limited degree or significantly. When asked what skills they would increasingly require for their business in London, the top three selections were digital know-how, management and creativity. (See Figures 11 and 12.) The skills that employers expect to need less of in the future include those required for processing, support and clerical work, foreign languages and social perception.

When asked what types of functional role or occupation they expected to see increase in number in the next ten years, many survey respondents (not surprisingly perhaps) identified the job growth areas as IT, social media, web site development and e-commerce and some expect more jobs in a financial role. Others identified project managers, service providers, jobs in construction and education, and knowledge-based roles generally. One respondent saw a need for 'people who bring an agile problem-solving attitude towards their work.' These views are broadly consistent with the research findings of Frey and Osborne.

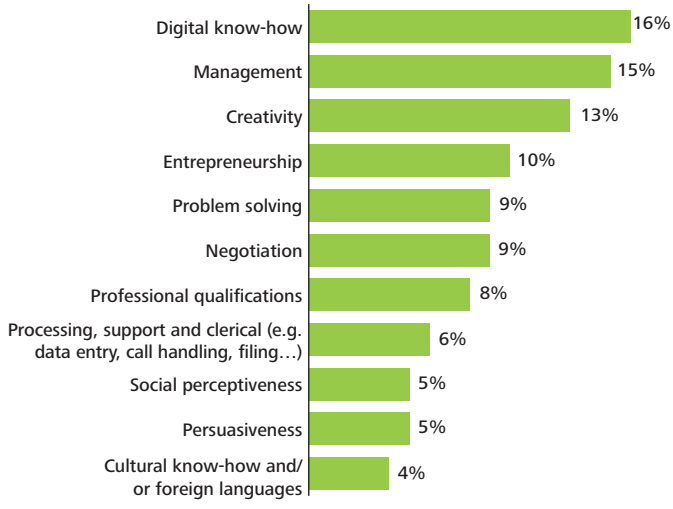
Figure 11. Skills set requirements in the next ten years, London businesses



Source: Deloitte analysis, 2014

The skills that employers expect to need less of in the future include those required for processing, support and clerical work, foreign languages and social perception.

Figure 12. The skills increasingly required, London businesses (responses have been weighted)



Source: Deloitte analysis, 2014

Adapting London for future needs

Going through a number of different careers, not just one, is likely to become the norm.

If London's work force is going to increase, with a growing proportion of high-skilled jobs, the city will have to adapt in a number of ways. Respondents to the business survey showed an awareness of the need for changes in education, the work place and the city's infrastructure. Among these were more learning of IT in schools and making the optimum use of building space to accommodate the work force. One respondent commented: "I think there will be a shift towards inter-organisational … collaboration."

Some of these areas for change are explored further in the rest of this report.

Education and skills

To meet the demand in London for more people with high-level skills, agility in the work force will be important. Individuals may need to consider a working life in which they move continually between jobs instead of settling into one career for many years. Going through a number of different careers, not just one, is likely to become the norm.

Portfolio careers, whereby workers switch jobs on a regular basis rather than build a career in one area, are likely to become increasingly common. Research already shows an increasing trend in the number of times that Generation Y change jobs in the first five to ten years of their working lives. This, coupled with the increase in highly-skilled and specialist roles, supports the ever-more popular concept of 'swarming', whereby a disparate group of professional experts work independently, but come together to complete a project for a period of time before dispersing and joining a new group (or 'swarm').

Individuals must be educated and trained to adapt to these changing demands of the work place.

The available graduate talent

London already has the highest percentage of graduates (or equivalent) in the work force of any major city in the world.[4]

Figure 13. Graduates in the workforce

Greater London	60%
Outer London	45%
London in total	53%

Paris	41%
Berlin	37%
New York	32%
Los Angeles	31%
Singapore	26%
Tokyo	20%

Source: ONS, Eurostat, US central data, various national statistics

London as a region has 40 universities and including Oxford and Cambridge, five of the top 20-ranked universities in the world.

The UK in general has made great progress in increasing the proportion of graduates (or equivalent) in the work force, up from 26 per cent in 2000 to 41 per cent now. This is important for London, which is a draw for individuals graduating in other parts of the country and taking up a first job. According to the OECD, the UK now has the highest proportion of graduates in work in the European Union.[5]

London is also able to attract more international students than any other city. In 2013 it attracted 99,360 foreign students, compared with 96,782 in Paris and 60,791 in New York. Many foreign students coming to London eventually take a job in the city and so add their skills to the work force.[6]

However London cannot and should not rely on other regions and countries to be the source of its skilled work force in the future. The capital needs to educate and train its own people, from school age onwards.

London has significantly improved the performance of its secondary school students. In 2005, 55.3 per cent of London schoolchildren received 5 or more A*- C grades, just below the national average of 56.3 per cent.[7] In 2012 this had risen to 84.1 per cent, compared with the national average of 81.8 per cent.[8]

Although this is positive progress for education in London, it is important to ask whether students are being given the most appropriate skills for their future working life.

Are students as tech-savvy as they need to be?

One area in which education is responding is in computer science where curriculum reform is reintroducing programming and design.

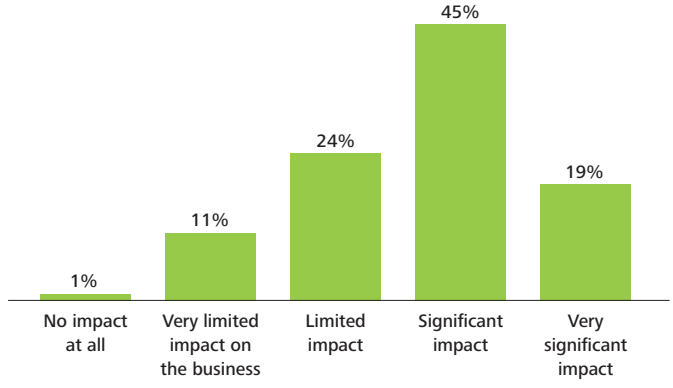
In the survey of London businesses there were mixed views about the likely impact of technology on business operations over the next ten years. A majority of respondents (64 per cent) were of the opinion that technology would have a significant or very significant impact on their business, but 36 per cent felt that the impact of technology would be limited.

Financial and business services are those that most expect changes in technology to affect their operations (91 per cent), followed by government and public services (67 per cent).

However there were mixed views about whether the effects of technological change were predictable or unpredictable and whether they would have a beneficial or negative effect. This may suggest that employers are not altogether certain about the way in which technology will affect business even within the next ten years. A conclusion may be that there could be an increasing demand for tech-savvy employees, although what they might be required to do in their jobs is not entirely certain.

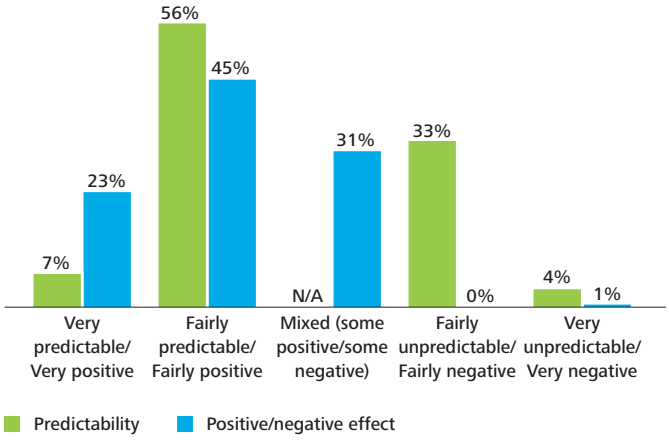
By business sector 84 per cent of transport, travel and hospitality companies expect changes in technology to have a positive impact, compared with 81 per cent of TMT companies, 70 per cent of government and public sector entities and 60 percent of financial and business services.

Figure 14. Impact of technology on London businesses in the next ten years



Source: Deloitte analysis, 2014

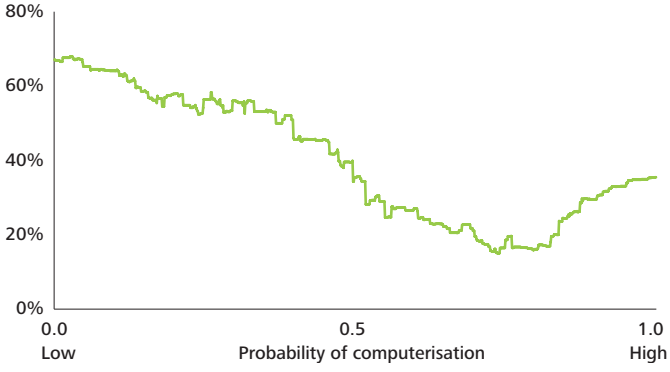
Figure 15. Impact of technology on London businesses in the next ten years: predictability and effect



Source: Deloitte analysis, 2014

Figure 16. Graduate jobs and risk from computerisation, London

Bachelor degeree or better (% of employed)



Source: Frey and Osborne, Deloitte 2014

Are universities teaching the right things?

Although London has a high level of graduates in its work force, there may be some misalignment between the degrees studied for and degree programmes that enable them to develop the skills they will need for their future working life.

The research by Frey and Osborne suggests that there is a large proportion of graduates among employees whose jobs are at greatest risk from computerisation.

Comparing the graduate jobs at risk with the industries where jobs are most at risk in Figure 1 suggest that many graduates are in jobs that do not make the best use of their potential talent and that may not be needed in years to come. Either their university education has not prepared them sufficiently well for high-skilled jobs or they are not making use of the skills they have acquired.

Still it is unclear whether the high proportion of graduates in jobs more exposed to the impact of digital is because of a lack of skill among graduates or an insufficiency of skilled graduate level jobs on offer.

The misalignment between degree programmes and the skills needed by London employers is evident in other ways. UK employers are more confident about accessing employees for careers in banking, finance, insurance and professional services than they are about finding suitably-educated employees in science, engineering and IT.[9]

STEM degrees are degrees in science, technology, engineering and mathematics and are in high demand. Although there are differences in the definition of STEM courses between countries, the characteristics of STEM are explained in a 2012 report by the Science and Technology Committee of the UK Parliament, as follows:

"The characteristics of a STEM graduate usually include: numeracy and the ability to generate, understand and analyse empirical data including critical analysis; an understanding of scientific and mathematical principles; the ability to apply a systematic and critical assessment of complex problems with an emphasis on solving them and applying the theoretical knowledge of the subject to practical problems; the ability to communicate scientific issues to stakeholders and others; ingenuity, logical reasoning and practical intelligence."[10]

The UK has a lower proportion of STEM degrees than many countries. In 2011, 34 per cent of UK degrees were classified as STEM degrees, compared to 59 per cent in Japan, 49 per cent in China and 38 per cent in Germany (although higher than the 31 per cent in the United States).[11]

Still, the UK government is supporting STEM take-up and the number of students studying STEM subjects at A Level and taking STEM degrees is rising. The misalignment between university degrees and the career skills needed by graduates will not be resolved by the universities alone. Input is needed from employers. Already some businesses are collaborating with certain universities and business schools to develop course syllabuses and content, and institutions such as the Deloitte University are also aimed at workforce education.

The task starts in the schools

Given that individuals are likely to have multiple careers, they must be taught transferable skills that can be taken from one employer to another. Schools and HE/FE institutions should continue to develop programmes that make their students more employable. For this, students may need programmes that stretch across disciplines of arts, maths and science, and the task starts in schools.

Inequality in education is an ongoing challenge. Individuals from low-income backgrounds face challenges achieving their academic potential and vocational training goals. To ensure we are accessing all of London's talent, employers and policy, employers and policy makers must focus their resources on responding with appropriate initiatives and programmes.

Why does education in London matter?

It might be asked why London's education system has a particular responsibility for developing working life skills for its own people. It might be argued that employers can attract talent from other regions of the country, or from abroad, without needing to invest heavily in its home-grown talent.

The answer is perhaps straightforward. Many children growing up in London will expect to spend much or all of their working life in the city, and they should be equipped by their education to have the opportunity to succeed in whatever they choose to do in life.

Education itself is also a major industry in its own right, providing jobs for teachers, lecturers, researchers and others, and contributing substantially to the local economy. The higher education sector added £73 billion to the UK economy in 2013, accounting for 2.8 per cent of GDP and 757,000 jobs.[12]

So education in London matters hugely to the future well-being and prosperity of the city.

Employers have a role to play in supporting initiatives to encourage education and training among the under-privileged.

Training as well as education

Increasingly, individuals must possess a broad portfolio of transferable and flexible skills to drive a successful career. As individuals become ever more aware of this, they will be increasingly attracted to organisations that will support them in developing those skills. Providing 'best in class' comprehensive training programmes that focus on educating employees in skills outside their technical specialism may become a critical issue for attracting the best talent.

Education: conclusion

London needs to educate an agile work force, with transferable skills that will enable them to switch jobs, perhaps regularly and as circumstances require, throughout their working lives. The starting point for creating this work force is the education system.

Education is an enabler for the changing world. In order to service the demand from employers for people with creative, innovative and tech-savvy skills, London needs an education system that nurtures the talent of all our people. This requires constructive thinking about building the most appropriate teaching disciplines.

There is a time lag between investing in education and reaping the benefits. Student should be receiving educational and vocational training to fill future skills gaps, which are not necessarily the gaps that exist today, which may become dated over time and no longer relevant.

Decisions taken now about education in London will determine whether the city is able to provide the talent that employers will need in fifteen to twenty years' time and beyond.

There is also a challenge in re-training the current workforce for the challenges the city will face in the coming years. Employers must think in terms of continuous education to keep pace with the likely rate of technological change.

Figure 17. Education in London: the building blocks and the challenges

The building blocks in place	The challenges
London has the highest proportion of graduates in the work force of any major city in the world	To overcome the barriers to hiring a skilled work force in London. To align achievements in education with the skills required for a life in work
London has 40 universities	To develop the teaching curriculum in schools so as to develop students with software and digital skills and learning across the arts, maths and sciences
Including Oxford and Cambridge, London region has 4 of the world's top 6 universities[13]	To adapt university degree courses and HE programmes to produce graduates with high level skills that employers will demand, including creative and problem-solving skills
London universities attract more foreign students than any other city in the world	To develop suitable post-graduate programmes, including higher degree courses, with inter-disciplinary content. To provide lifelong opportunities for improving and adapting skills
Major improvements in London school performance have pushed the capital to the top of the UK GCSE league table	Commitment to improving education from the government, education institutions and employers
	There is a time lag between taking initiatives in education and obtaining the benefits. Decisions taken now may not bear fruit for many years

Source: Deloitte analysis, 2014

Work and place

The work place in London

The workplace is changing and we are already seeing marked changes in working practices, the use of property and the city's infrastructure. Some changes are well under way but others may take years before implementation, so London already needs to be planning for these.

Choosing a job in London

The expected growth in high-skilled jobs in London in the next five to ten years will have to be matched by a supply of suitably-qualified or talented individuals. Employers must be able to offer jobs that will attract and retain the people they need. The Deloitte survey found that the number one factor that organisations believe will attract recruits is the remuneration package they offer, followed closely by the work place environment and the fact that the prospective employees are already living in or near London. The attraction of pay may not be surprising, but the importance of the work place and working practices merits attention. (See Figure 18.)

The relevance of prospective employees being London-based may also be of some significance, given that the London region has the largest pool of high-skills talent in the world, four of the six best-rated universities (if Oxford and Cambridge are included) and the largest proportion of graduate workers of any major city.[14]

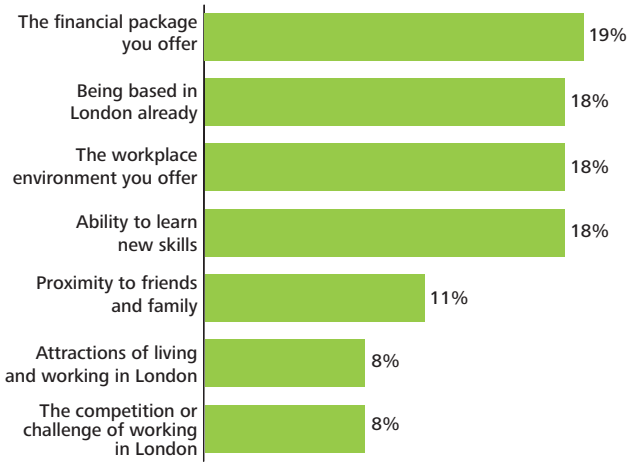
Anecdotally, London-based employers are facing increasing competition in recruiting technology professionals and an emerging preference of many to be based in the heart of London, rather than on the periphery. Talented people seem to enjoy the company of others like them: London is an advanced 'eco-system' for skilled and creative specialists. This attraction adds to the already complex employment challenge, which is that the cost of living near to, and commuting into, London is driving up employment costs for these in-demand talent pools.

Working practices

Changes in working practices are already happening. More employees have opportunities for flexible working hours; and there is more variation in where they work thanks to information and communications technology, and the sharing of files and software in the cloud. Individuals are able to contribute effectively to their employer's business whilst also achieving a better work-life balance.

People in skilled or creative jobs are increasingly acknowledged as needing different working environments within which to operate, ranging from team spaces to collaborate to quiet spaces to focus. Equal access to data, information and communication tools everywhere, have broken the traditional ties with fixed single work locations.

Figure 18. Reasons for choosing to work in London (responses have been weighted)



Source: Deloitte analysis, 2014

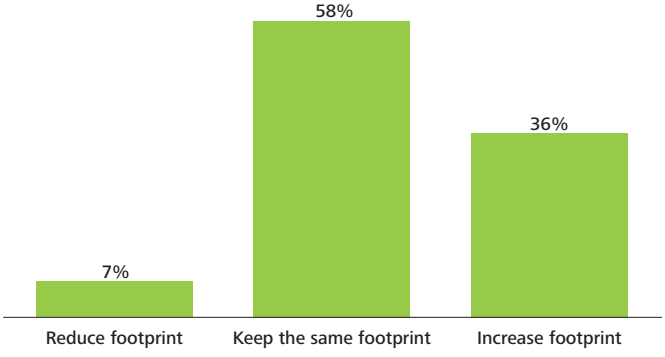
This evolving working environment, based around choice and 'the right space for the task', has implications for management. As agile working practices become the norm, management styles will have to change. The skills required to manage creative output-based tasks are very different from those needed for more traditional administrative operations.

Forward thinking employers are already beginning to make better and more imaginative use of their premises, to fit with the working practices of their employees.

These findings are consistent with the results of previous surveys. The Deloitte Talent in Banking Survey (2013)[15] found that "a creative and dynamic work environment is one of the most attractive attributes of a company for banking-oriented students", and Deloitte's Human Capital Trends Report (2013)[16] concluded that "when vying for top talent, workplace flexibility can be a deciding factor; one in three workers report that being able to flexibly integrate work and life is the most important factor in choosing a job."

Over one-third of private sector businesses plan to increase their property footprint in London in the next five years.

Figure 19. Plans for business property footprint in the next five years



Source: Deloitte analysis, 2014

These new flexible working practices, combined with the expanding possibilities created by big data and increasing automation, is putting pressure on technological infrastructure to keep up. Functioning with legacy systems until their retirement may hold back much needed innovation. Technology needs to advance in step with evolving employment models, fast-changing working practices and indeed the physical work environment, or one of these components risks becoming the weakest link in delivering the inevitable pace of change.

Property in London: will there be enough to meet demand?

A growing work force in London will affect the demand for property. Among the respondents to the Deloitte survey of London businesses, over one-third of private sector businesses plan to increase their property footprint in London in the next five years, and only seven per cent intend to reduce it. (See Figure 19.) The main reasons given for moving business premises were growth of the business and changes in headcount. (See Figure 20.)

Since 73 per cent of respondents aim to increase headcount in the next five years but only one-third expect to increase their accommodation, this suggests that many employers aim to do more with the same floor space. This will require agile and flexible working conditions: 40 per cent of the organisations in the survey plan to increase their flexible or collaborative space.

By sector, 48 per cent of financial and business services businesses say they will increase accommodation, as do 31 per cent of TMT, 30 per cent of manufacturing and, perhaps surprisingly, 28 per cent of the government occupiers surveyed.

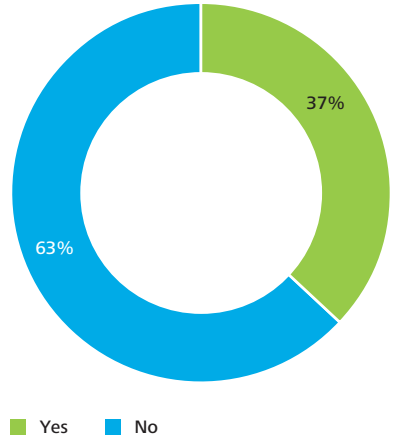
Allowing for new businesses setting up in London, however, it would seem reasonable to expect that demand for business premises in London will grow. To meet the demand for more space, property developers must either build out into new areas (brownfield sites in London) or upwards. Whichever the direction of expansion, the planning regime for London needs to make property development possible, to prevent supply from lagging behind growth in demand.

The demand will be not just for more business property space, but for space that provides a suitable work place environment.

The average length of business property leases in London is now about 12 years, down from 20 years in the 1990s. Shorter leases will allow employers to plan changes to their property portfolio more easily. More flexible and short-term accommodation will also be more popular, enabling the amount floor space to vary quickly up or down with business demand: Deloitte Real Estate has reported that serviced office space has doubled in the City of London since 2004.[17]

London's stock of commercial property will need to continue to evolve to meet the ever-changing demands of its occupiers. But this is a lengthy process, with a long lead time, and the ten-to-twenty year time horizon of this report's findings suggests that adapting London's property stock to the needs of a future London workforce needs to be on today's agenda.

Figure 20. Organisations considering moving premises within London in the next five years



Source: Deloitte analysis, 2014

The average length of business property leases in London is now about 12 years, down from 20 years in the 1990s.

Figure 21. Creating a smart city

Area of ICT application	
Transportation	Using real-time traffic prediction and other methods of reducing congestion and its by-products
Services	Using ICT to integrate the information systems of different service delivery organisations; for example in education, health care, public safety and waste management
Government	Makin government data more accessible to the public. Also use of smart cards, e-ID and e-licensing
Energy	Analysing customer energy usage to provide customised products and services, in order to improve energy efficiency and maintain sustainable power supplies
Water	Monitoring and managing of the water infrastructure to improve water efficiency and reduce wastage of water
Local economy	Using ICT to create 'smart' industrial zones where businesses can share information and administrative services

Source: Deloitte analysis, 2014

Figure 22. The work place in London: the building blocks and the challenges

The building blocks in place	The challenges
London is a centre where skilled people want to work	Providing a suitable working environment for more workers
Changes in the work place environment already happening	Supplying business property of a suitable kind to meet demand
Continuing building construction work in London	Initiating (and financing) infrastructure improvements. Need for significant increase in investment spending on infrastructure and also housing
Brownfield sites available for development	
Centres within London for particular industries (such as technology, media and communications)	Exploiting ICT to make infrastructure improvements possible
	To make policy and plans now for infrastructure in the future

Source: Deloitte analysis, 2014

Creating a smart city

The growing numbers of London residents will increase the pressure on the city's infrastructure and services. To cope with the future demand that will be placed on them, so as to ensure sustainable economic development for the capital and improve the quality of life of its residents, we would argue that London needs to become a 'smart city'.

A 'smart city' can be defined as a city that makes a conscious effort to have a holistic approach to using information and communications technologies (ICT) for real-time analysis, in order to transform its essential ways of operating in the areas of: energy generation, delivery and usage; the environment; government; mobility; and buildings (See Figures 21 and 22).

Many of these developments may be five or ten years from becoming technically feasible, but there is a long planning and development cycle and it takes years to implement changes. National and local government needs to develop policies for a 'smart city' infrastructure; and real estate businesses, engineers and construction firms need to carry out feasibility studies and produce development plans. The new infrastructure must then be put in place and made operational, a task for technology companies and service providers. Everything will need financing, by the public or private sectors.

So although technological change may still be several years away, policy making and feasibility studies should be under way now.

Infrastructure and housing

London's transport infrastructure

As the workforce in London grows in size, improvements are needed in the transport infrastructure, to get people to, from and between their places of work. Transport is also a key requirement for much business development, although the increasing flexibility of the work force and the use of work space could alleviate the burden on the transport network.

Transport for London (TfL): an agile employer

Transport for London (TfL), the provider of most of the transport services within London, is an example of a service provider and an employer that is responding positively to commercial challenges and demands of its customers, and adapting its business operations for the future.

It is investing heavily in an improved transport network. Crossrail will improve the east-west connectivity and improve the links from the City to Heathrow, and if Crossrail 2 gets the go-ahead this will improve services into London from commuter towns to the north and south. Improvements and extensions to the underground, such as the Northern Line extension to Battersea and the Metropolitan line to Watford Junction, are under way and others are planned.

TfL is also investing in new technology. Advanced signalling on the underground system will increase the capacity of the network to run more services and carry many more people, and intelligent road traffic management systems will help improve the use of the road network.

TfL is putting customers at the heart of its service, to meet the growing expectations of passengers. It is taking initiatives to make journeys easier and more straightforward, with services such as on-line information. Earlier this year it announced plans to start running trains through the night on Fridays and Saturdays on the core sections of five lines. These changes will call for different skills from employees, and possibly more flexible working conditions. Finally, TfL has also announced plans to invest in improvements to many of its underground stations, and to equip its staff with the latest mobile technology so they can get the information they need to help customers on the move.

London needs to improve its transport infrastructure and transport services. Many building blocks are in place, but substantial challenges remain.

Figure 23. Transport in London: the building blocks and the challenges

The building blocks in place	The challenges
A large network of underground trains and a bus network linked to an overground rail services and airports	Making the transport infrastructure more agile
Investments in new lines: • Crossrail improving east-west connectivity and increasing network capacity • Extensions to the Northern and Metropolitan Lines	Providing a service to meet the needs of customers, including London workers Reducing congestion: improving the flow of transport in London
Continuing investments in the network: stable funding that allows TfL to plan future work	Investing to optimise road traffic space and traffic flows: intelligent road traffic management
London Gateway sea container port, including Europe's largest logistics park Heathrow Terminal 2 re-development, to increase customer-handling capacity	Improving the connectivity between different transport services: the links between the network within London and the networks serving London from the commuter areas, other UK regions and the airports
	Making better commercial use of assets, particularly property assets

Source: Deloitte analysis, 2014

Housing

A word of warning has to be added about housing. As London seeks to attract more highly-skilled people, there is a serious risk that the lack of affordable accommodation may persuade many London workers to leave to work somewhere else, outside London, in a 'reverse brain drain'.

Research published by London First with Turner and Townsend in 2014 indicates that a housing crisis in London is becoming a threat to jobs and growth in the city.[18] It found that 56 per cent of London workers have difficulty paying their rent or mortgage and for 49 per cent, this could be a reason for moving out. Among 25-39 year-olds, the percentage figures were even higher. Employers share the same concerns: three-quarters of businesses in the survey warn that the lack of new homes and rising house costs in the capital are "a significant risk to the capital's economic growth". A significant proportion (38 per cent) expressed concerns that housing was already affecting recruitment and retention.

These views are consistent with a December 2013 Deloitte and London First report, which found that almost four out of five of 150 businesses in a survey said the cost of living in London and the south-east is a barrier to hiring a suitably skilled workforce. Despite this, 86 per cent said they were 'absolutely committed' to remaining in the capital and only one per cent said they were quite likely to leave by 2020.[19]

The research by London First is part of an effort to make the case to politicians and decision-makers about the need to increase house-building in London. The government has expressed its deep concern about the problem and the need to build affordable housing in London, and has been offering financial support to first time buyers. However problems with planning consents slow down the process of building new housing, and at the moment demand exceeds new supply.

The problem of housing is therefore an urgent challenge that London must address. One possibility is for employers to assist new graduate recruits for a period of time after they start working in London, perhaps by taking corporate lets of properties, or by financing the construction of accommodation. This would be made available for young professionals at affordable prices on short-term leases. As an employer, Deloitte is considering how to support its own graduate workforce; but a key challenge is finding suitable land for development. Planning rules treat undergraduate student accommodation as a special case for giving consent to property redevelopment, but these rules do not extend to 'professional students' such as young lawyers and accountants in training. A change in planning law in this respect could help to ease the problem for young professionals of where to find an affordable place to live in London.

56 per cent of London workers have difficulty paying their rent or mortgage and for 49 per cent this could be a reason for moving out.

Retail

Changing shopping habits

London is a large and important centre for retail business. It has iconic shopping streets and department stores, and a large customer population, by no means all of them local, and many of them affluent and willing to spend money.

Retailers have so far struggled to keep pace with the connected consumer. About 40 per cent of internet sales are 'click and collect' transactions, and although it represents only a small proportion of total retail sales, this method of consumer purchasing is increasing by about 30-40 per cent a year, at a time when total retail sales are rising by less than three per cent.[20] Click and collect relies upon ubiquity. It has to be as easy for consumers to collect as to click. Collection points need to be convenient. We have seen the growth of services such as Collect+ and Doddle and we are seeing retailers adapt by providing click and collect points as railway and underground stations. There must be collection points where the growing numbers of consumers can pick up their purchases: already we are seeing retailers adapt by providing these at some railway and underground stations.

Consumer habits have also been changing in the grocery sector, with a rapid expansion in the number of convenience stores. Increasingly, consumers are choosing to buy their groceries in smaller quantities and more frequently, and from a local store, rather than buying in bulk from a large supermarket. The retailers have responded by opening more small stores, but have not yet addressed the implications for their distribution networks. The current arrangements are for bulk shipments of goods to retailers' large regional distribution centres, from which they are delivered to stores in the network.

Deliveries in large trucks may be appropriate for large supermarkets, but not for small convenience stores in busy urban centres, where they can disrupt traffic flow. We might therefore expect retailers to adapt their systems in London, using smaller delivery vans and possibly a network of local distribution centres within the M25.

Figure 24. Retail in London: the building blocks and the challenges

The building blocks in place	The challenges
A large number of customers, many of them affluent, many used to digital/ mobile technology	Changing customer expectations about the shopping experience they want
Reputation as a major shopping centre, with iconic shopping streets and stores	Need to handle growth in on-line buying and click and collect
	Need to re-structure distribution for convenience store networks
	Bringing technology more into the in-store experience

Source: Deloitte analysis, 2014

Retailers are also experimenting with new ways of delivering an in-store experience for customers. Research suggests that most customers prefer to be left on their own to select the products they want, without talking to a sales assistant, and many would even like to pay for them with their own smartphone or tablet. To do this they need digital information about products, product availability and prices, which retailers would have to provide, together with new payment systems. Customers may appreciate advice from product experts, but not general-purpose floor sales staff. Technology changed the role of the shop assistant and is forcing retailers to rethink their staffing requirements.

Although retailers are responding to changes in the shopping preferences of customers. The majority of retailers appreciate the importance of delivering a seamless retail experience for their customers, whether in-store or online. They all are at different stages on the journey to achieve this. Our research shows that a large proportion of retailers expect their headcount in London to increase in the next five years: the growth may well be in the digital aspects of their operations, not in people on the shop floor.

Conclusion

To develop and maintain the talent pool that London needs, forward planning and successful policy implementation are essential. The consequences of policy failure would be of significant damage not just to London, but for the wider UK economy.

This report has identified issues that may be of interest to business leaders and policy makers as they develop strategies for the future. Deloitte has already presented an agenda for action, with suggestions about the measures that London should be taking to retain its pre-eminence as a global city, and to meet the challenges of the changing work place.

Deloitte agenda for action:

- appoint a Chief Talent Officer for London
- anticipate growing pressures on the city's infrastructure
- strengthen the links between employers and the education sector, to keep London at the forefront of higher education
- develop teaching in schools so that students are better-equipped to offer skills that employers want from their employees
- keep London an attractive place for talented people to work.

Chief Talent Officer (CTO) for London

The challenges facing London are complicated by the overlap of inter-related issues, ranging from education and training, to the work place and property, and transport and housing. But there is no one whose specific role is to co-ordinate change in the capital.

We believe that a CTO should be appointed by the Greater London Authority. The CTO would be a custodian for the city's strategy for talent, advising on initiatives, monitoring their progress and judging outcomes against predetermined targets. The role would cover a wide area of inter-related issues contributing to decisions affecting education, property, transport and infrastructure development. The objective of this role should be to ensure that London adapts to the changes it will have to undergo to retain its position as a global city.

London has the agility and ability to adapt. The key is to develop or attract, and then retain, a skilled work force on which its future success will depend.

Methodology

The Oxford study: Research by Frey and Osborne

Frey and Osborne identified three bottlenecks to automation of jobs: the skills of perception and manipulation; creativity; and social intelligence. For their US study they took detailed survey data from the 2010 version of the O*NET database, an online service developed by the US Department of Labor. They systematically identified features corresponding to the degree of each of the skills required to perform 702 occupations. (The O*NET defines the key skills required to perform an occupation as a standardised and measurable set of variables on a scale of 0 to 100.)

In order to measure the risk to each occupation from automation, 70 occupations were hand-labelled, assigning a value 1 if 'automatable' and 0 if not. For these subjective assignments, Osborne and Fey drew on a workshop held at the Oxford University Engineering Sciences Department, examining the 'automatability' of a wide range of job tasks. They used a Gaussian process classifier to predict the probability of automation for each occupation. This approach enabled them to identify irregularities in their hand-labelling process so that they could correct for potential subjective errors.

For their UK research they made an assumption that occupations in the UK demand the same set of skills as corresponding occupations in the US. To translate the 702 O*NET-SOC occupations into corresponding occupations in the UK, they used the International Standard Classification of Occupations (ISCO-08), as advised by the ONS, and then 'cross-walked' these to their corresponding 369 UK SOC 2010 codes. As there are fewer ISCO-08 codes than O*NET codes, some US occupations were merged for the purpose of the UK study. For each merged occupational group, the probabilities of automation were calculated as weighted averages of the probabilities of automation for each O*NET occupation within the group.

Deloitte survey of London-based organisations

Deloitte conducted a survey among senior representatives of 100 organisations between September 2014 and October 2014. The organisations that responded were made up in part of exclusively based London organisations and in part by organisations that have their premises and operations outside of London (60 per cent and 40 per cent respectively). The industries represented include financial services; government and public bodies; manufacturing and construction and technology, media and communications. The size of organisations was based around the number of people they employ in Greater London (10-100 employees (33 per cent), 101-200 employees (40 per cent) and more than 250 employees (27 per cent). All responses gathered were anonymous.

Respondents were individuals in senior roles within their organisation.

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