Greenwich Smart City Strategy
The challenge for our cities has never been greater: increasing demands on services and infrastructure, reducing budgets, increased expectations, concerns about the environment and global competition. From all these perspectives we need our cities to work better – for our residents, businesses and visitors. Advances in technology and data analysis provide us with the tools to understand better the functioning of our cities, and to plan and deliver services more effectively. But the challenge is more than just how we improve our services. Technology development impacts upon the economy, the design of the built environment, and even the relationship between residents and the Council. But let us be clear: communities are at the core of cities and need to be at the core of a smart city strategy. This strategy is, first and foremost, about our people, with technology the enabler of change.

The purpose of publishing this Smart City Strategy is to begin this process of change - a change that puts Greenwich at the forefront of public service transformation and true leaders in the business of providing solutions to urban challenges. I use the word “business” advisedly: urban innovation is becoming a massive global market, estimated to be worth over $400 billion by 2020. By taking a leading role, not only will we improve the quality of life in Greenwich, but also provide a source of high value jobs.

Smart City innovation is not ‘business as usual’. It is looking at how we can use technology to innovate, to find new solutions and to create a better future for our cities and its communities. Ours is an ambitious and far reaching strategy that acknowledges the need for the Council to adapt, and respond to, the challenge and opportunity technology presents. It signals our ambition to continue Greenwich’s long established association with innovation and discovery. To become, once again, London’s hub of innovation, its test bed for new ideas – London’s smart Borough.

I should also note in conclusion that successful change requires clear vision and leadership. I would like to reassure you that, together with my leadership team, I will give this the highest priority to make it a success.

Thank you for your interest and support.

Cllr Denise Hyland
Leader of the Royal Borough of Greenwich
London, UK.
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Executive Summary

Background

Cities around the world are confronted with a range of challenges. These include demographic change and the rising cost of healthcare, traffic congestion and high levels of emissions, the need to improve employment prospects and the quality of work in the face of technical change and, following the financial crisis, to deliver services with significantly reduced budgets and higher citizen expectations. Greenwich is no different. For example:

- it is estimated that between 2010 and 2028, the Borough’s population will rise by 34%, with the number of people over 65 rising 57%, from 26,000 to 41,000;
- cars account for 45% of journeys made in the Borough and congestion on the approach roads to the Blackwall Tunnel leads to high levels of greenhouse gas emissions in the locale;
- the local economy is heavily reliant on relatively low skills and low paid service jobs which possibly reflects the fact that the qualifications of 38% of Greenwich residents are no higher than NVQ 2 - the equivalent of GCSEs – a group which is particularly vulnerable to the automation of simple, repetitive, service tasks; and
- the Council, like others, has been forced to make considerable savings and is being required to find further savings over the next three years which, together, will amount to a significant reduction in Council expenditure per head.

An increasing number of cities are turning to “smarter” approaches in planning their future, in creating a modern infrastructure and in delivering services. Greenwich has played an important role in shaping thinking in how innovation can be harnessed to improve cities, particularly in the development of national and international standards. The Council is committed to adopting such “smart city” approaches to cope with the many challenges ahead and to create new opportunities for business and local communities. This strategy sets out how the Council proposes to do that and underpins and complements the Council’s existing strategies and vision.

What are the Foundations of a “Smart City”?

For some, it is simply investing in ultra-fast broadband and other digital technologies, or installing a management control centre and a range of technology solutions to specific challenges. In truth, there is no digital “silver bullet”: the complex nature of the urban environment and how it evolves over time in response to technological, economic and social change requires a systemic approach, which draws on the full range of policy instruments, but it is certainly underpinned by the use of technology and the ability to collect, transmit, manage and interpret data, and make it available, to enable both service providers and users to make better decisions. Smarter use of new technology also enables cities to be designed and planned more effectively, to manage demand for services and encourage citizens to use lower cost modes of delivery i.e. to promote “channel shift”. Thus, in our view, a “smart city” is one that:

- provides clear leadership and drive, while engaging with citizens and businesses in a transparent and democratic manner;
- develops a vision and strategy for the city which is informed by leading international experience and, where possible, builds on its past, its strong sense of community, a respect for its natural environment, and optimizes the use of space/the built environment and resources in the face of demographic, industrial and technology change;
- provides a modern, digital infrastructure and connectivity that is globally competitive;
- develops a culture of sharing information which supplies users and service providers with the real time information that they need to take informed decisions, which also has a predictive capability, to ensure optimum use of current capacity to anticipate problems, and the means to plan more effectively for the future;

- offers a business environment, which allows a wide range of businesses to flourish and encourages new high value firms to locate in the city;

- provides an education and skills infrastructure that offers all citizens the opportunity to participate in the digital economy and to secure well paid employment, regardless of sector;

- has the mechanisms, resources and culture in place to support agility and innovation within its own public services, that is at the forefront of good practice i.e. it is a “learning organization”, able to manage risk and develop new approaches in a timely and cost-effective manner, in order to deliver high quality services that engage with and meet the needs of the citizen, rather than organizational convenience and traditions.

Objectives and Principles
The aim is to display the above attributes and characteristics so that Greenwich becomes recognized as London’s “smart” and innovative Borough, able to deliver resource-efficient, low-carbon, healthy and liveable neighbourhoods within the Borough, where citizens enjoy improved social and economic opportunities, while feeling part of the community and part of the decision making processes affecting the environments and communities they live in, and where services are delivered efficiently and reflect the needs and aspirations of citizens. Above all, it is that Greenwich is a most desirable and vibrant place to live, work or visit.

The approach is based on the key principles of:
- inclusivity: this is a strategy aimed to benefit all citizens, communities and neighbourhoods;
- citizen centric: we aim to transform citizen engagement in the Borough to ensure our policies put citizens at the forefront of our policy development and meet their needs;
- transparency: citizens will be informed of change and its outcomes, and information will be made accessible for the benefit of our citizens;
- standards and good practice: Greenwich will follow the principles of a “learning organization”, open to new ideas and an exemplar in the use of standards and good management practice - evidence based, outcomes driven and willing to share.

A Strategy of Transformation
The strategy sets out an ambitious programme of transformation in four main areas:

(i) Transforming Neighbourhoods and Communities: The Council recognizes the diversity within the Borough and the importance of a co-ordinated approach to ensure that proposals meet the needs of citizens within their individual communities. The Council shall focus on:
- removing the digital divide and ensuring all citizens can take advantage of the internet by promoting digital skills;
- developing a strategy to roll out ultra-fast digital broadband to all neighbourhoods, so that all have access to world class connectivity and to high quality public services, delivered via digital technology;
- piloting new concepts/approaches, such as “smart” parking, the “Digital High Street”, smart waste collection, and telecare, across the Borough’s neighbourhoods;
- strengthening our relationships with organisations, such as the Peabody Trust in Thamesmead, working to improve the quality of life in communities.

(ii) Transforming Infrastructure: Transport connectivity is to be considerably enhanced by the extension of Crossrail to Woolwich and Abbey Wood, in 2017, which will transform travel times and capacity into the City, West End and Heathrow. The quality of the Borough’s physical infrastructure will also be enhanced by the development that is necessary to accommodate the increase in its population. However, a recent House of Lords report, “Make or Break: The UK’s Digital Future”, highlighted the importance of a modern digital infrastructure to business competitiveness and noted that, in terms of average broadband download speeds, London came 26th out of 33 European capitals. If the Council is to promote the digital delivery of public services, and establish Greenwich as an area where new digital businesses can prosper, then it needs to ensure that both public and private sector organisations have access to globally competitive connectivity – fixed and mobile. Furthermore, if Masterplans and new developments are to be energy efficient and sustainable, and if the Council is to promote intelligent mobility, then it needs to embrace the widespread use of sensors and actuators in the built environment – the so called Internet of Things and Building Information Modelling – which are important building blocks in the concept of a smart neighbourhood. The Council will therefore:
- seek to develop a strategy to deliver ultra-fast broadband to all parts of the Borough;
- work with Department for Business, Innovation and Skills, to develop the Council’s application of Building Information Modelling in Borough developments, to improve understanding of the built environment and how it operates.

(iii) Transforming Public Services: Public services have traditionally been delivered by separate teams, with their own separate information systems, which has militated against a co-ordinated and citizen-centric approach, and new innovative methods, making appropriate use of digital technologies, have been slow to materialise. Using a British Standards based approach, the Council will therefore:
- review the structure and organization of services, including the information collected, with a view to exploring the scope to share information in a secure and trusted software environment, providing the foundation for a new approach;
- seek to pilot new innovative approaches, including those encouraging channel shift and demand management, to understand the costs and benefits of innovation, the risks associated and the means to mitigate them, in order to develop the case for wider adoption;
- establish a team dedicated to transformation, Digital Greenwich, reporting directly to the CEO, to work with service delivery teams to identify opportunities for innovation, to initiate new pilots, to identify good practice at home and abroad, and help to drive the transformation agenda.

(iv) Transforming the Greenwich Economy: The Borough has a particularly strong visitor economy thanks to its royal, scientific, maritime and military traditions and, more recently, the establishment of O2, the world’s most active entertainments arena, with London’s only cruise liner terminal to be opened nearby in 2017. However, as noted earlier, the local economy tends to be structured around low productivity service sectors, which will become increasingly vulnerable to computerisation. In addition to making established businesses more resilient to technological change, we also need to encourage the growth of high value digital SMEs. Along with the activities described above, of developing a strategy to transform the connectivity of the Borough, the Council will:

- raise business awareness of the e-Business Programme to make more Greenwich businesses digitally skilled and look for other funding opportunities to develop complementary programmes;

- promote the Greenwich Digital Innovation Centre and the Digital Skills Centre in Ravensbourne which provide space, knowledge transfer and skills/business support programmes to Greenwich entrepreneurs;

- work with partners to develop the concept of a cloud based data integration and Urban Innovation Platform and, together with the commissioning of pilot projects in support of the Council’s objectives for service transformation, encourage innovative SMEs to locate in Greenwich to be closer to this hub of innovation;

- play an active role in helping Greenwich businesses internationalise through EU programmes and London’s own Export Programme;

- work with the Greenwich Education Business Partnership, and training providers, to promote stronger links between schools and digital businesses to encourage the greater uptake of ICT Apprenticeships and promote work experience opportunities in the sector;

- collaborate with the University of Greenwich and Ravensbourne to create opportunities for graduates and local residents to develop new business start-ups and support incubation programmes.

Conclusion

The Council believes that the above programme of activities is coherent, ambitious and yet achievable. It will, in the spirit of transparency, report on progress annually.
Section 1

Introduction
1. Introduction

This chapter provides a context for the Council’s smart city strategy by setting out some of the key challenges the Council will face in the years ahead. It goes on to describe how it proposes to adopt a smart city approach to addressing these challenges, the important characteristics of such an approach, and how this report is structured.

Background

1.01. Greenwich, situated in SE London, with a current population of around 275,000, is one of London’s 33 Boroughs. It has a long history associated with defence, as a result of its early growth around Woolwich Dockyard, founded by Henry VIII in 1512, and the subsequent development of the Royal Arsenal which, at its peak in WWI, employed around 80,000 people; with science, since the establishment of the Royal Observatory in 1675, in the reign of Charles II, which eventually led to it becoming the “home of world time” when its position on the Prime Meridian was agreed in 1884; with innovation, industry and trade, with the growth of Britain’s submarine cable industry in the 19th Century and the establishment of the country’s largest coal gas plant on the Greenwich Peninsula in 1886, subsequently converted into the world’s largest oil gasification plant in the 1960s; and with architecture, thanks to Sir Christopher Wren’s grand vision and design for the Royal Naval Hospital, constructed in the early 18th Century, on the site of a former Royal palace and birthplace of Henry VIII, Mary Tudor and Elizabeth I. Today, it is perhaps best known as a visitor destination, with its maritime heritage designated a World Heritage Site, the O2 Arena, constructed for the Millennium celebrations, the most popular entertainment venue in the world and, by 2017, it will be host to London’s only cruise liner terminal.

Future Challenges

1.02 Like all local authorities, Greenwich Council is required by legislation to perform a wide range of statutory duties and it also undertakes a large number of discretionary activities to maintain and enhance the quality of life in the Borough. In fulfilling these duties the Council faces many challenges in the years ahead, which will drive change, in particular:

• A rapidly rising population, with a changing age demographic: the Borough, along with its neighbours in East London, is one of London’s growth Boroughs to accommodate the increase in London’s population over the next ten to fifteen years. The anticipated 30% growth in population (see Table 2) will be accommodated through the development of brownfield sites for housing, housing renewal and increased densities; this will impose further pressure on an already strained infrastructure. Furthermore, as people live longer, Greenwich’s population, over the age of 80, is expected to increase by 70% between 2010 and 2028 and this will impose new challenges and rising costs to meet their needs.

• Rising expectations regarding service delivery in a world of reduced public expenditure: as digitalization transforms service delivery in the private sector, citizens will reasonably expect similar improvements in public services. However, as the Government seeks to reduce public expenditure, so Government grants in support of local activities will continue to reduce.

For Greenwich, these reductions are expected to be in excess of £70 million over the next five years. All Councils will need to review their priorities and develop a new relationship with their citizens.

1 http://www.local.gov.uk/documents/10180/5854661/L14-340+Future+funding+-+initial+draft.pdf/1854420d-1ce0-49c5-8515-062dcccc2c70
• **Employment and Technological change:** Greenwich has a wide range of incomes and wealth where relatively wealthy Wards co-exist with some of the poorest in London. Further developments in digital technology hold the prospect of increased disruption to traditional business sectors and the loss of low skill, simple service tasks. Recent studies have estimated that over 30% of jobs are at risk and that low paid, low skilled jobs are by far the most vulnerable. To ensure employment for its residents and to provide a source of revenue for its expenditure, in the form of non-domestic rates, the Council will need to maintain its effort to secure business regeneration and growth. As noted above, this same technological change also affords the opportunity to transform the way services are delivered and in the way citizens can engage with the Council and their own communities.

• **Improving environmental quality and further reductions in emissions:** while the Borough has performed as well as other Outer London Boroughs in reducing emissions and creating a sustainable environment, further effort is required. Nationally, in April 2015, the Supreme Court ordered the Government to publish, by the end of the year, its plans to reduce air pollution, which has been in breach of EU standards – the EU air quality directive – since 2010.

### Table 1. The Changing Greenwich Demographic

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2010</th>
<th>2014</th>
<th>2018</th>
<th>2024</th>
<th>2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-3</td>
<td>17,204</td>
<td>18,236</td>
<td>19,113</td>
<td>19,592</td>
<td>19,351</td>
</tr>
<tr>
<td>Age 4-15</td>
<td>38,353</td>
<td>41,620</td>
<td>46,950</td>
<td>52,408</td>
<td>52,943</td>
</tr>
<tr>
<td>Age 16-64</td>
<td>173,691</td>
<td>186,558</td>
<td>201,893</td>
<td>221,471</td>
<td>228,526</td>
</tr>
<tr>
<td>Age 65-84</td>
<td>22,490</td>
<td>24,668</td>
<td>26,608</td>
<td>30,894</td>
<td>34,808</td>
</tr>
<tr>
<td>Age +85</td>
<td>3,742</td>
<td>4,019</td>
<td>4,453</td>
<td>5,581</td>
<td>6,327</td>
</tr>
</tbody>
</table>

1.04 In 2013, the Council published its Core Strategy, which articulated a vision for the Borough and set out its plans for addressing the significant challenges that the Borough faces over the next fifteen years. The focus of the Core Strategy is the spatial development of the Borough and, in particular, to accommodate a substantial growth in housing to meet the Mayor of London’s targets; the need to develop a built environment of mixed use, where employment opportunities can be found within the Borough, where accommodation meets the changing demographic and is affordable and resilient to the risk of flooding, and where citizens can readily use alternative modes of transport to the car.

1.05 At the same time, there has been a surge in interest in how developments in digital technology, which is transforming operations in the private sector, might play a similar role in the delivery of public services. The concept of smart cities has emerged as a policy priority for Government and the European Union; a Foresight Programme led by the Government’s Chief Scientific

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2. [http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/uk-futures/london-futures-agiletown.pdf](http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/uk-futures/london-futures-agiletown.pdf)
Adviser has been established to report on the future of cities; the British Standards Institution (BSI) and the International Standards Organisation (ISO) have adopted a strategic approach to formalizing good practice in the form of standards; a number of city networks have been established to share experience; and a number of reports have been published by think tank and consultancies on the scale of the challenge and the opportunities for cities and the business sector. More broadly, an analysis of the drivers of innovation and growth in the USA and EU has underlined the important role which digitalization is playing in generating economic growth.

The Council’s Vision, set out in the Core Strategy, highlighted the importance of digital and creative industries and advanced manufacturing as growth sectors. The Council has already invested in creating an emerging Digital Hub on the Greenwich Peninsula, and helped a wide range of Greenwich businesses to cope with digitalization through its e-Business Programme. There are now almost 1,000 ICT businesses in the Borough and over 600 businesses will benefit from the Council’s e-Business programme.

However, as Table 3 below illustrates, the composition of businesses within the Borough remains significantly skewed towards low value added service sectors. Many sectors prevalent in the Greenwich economy are vulnerable to developments in the digital economy. According to the research commissioned by Deloitte’s (op cit), some sectors, such as those related to the visitor economy, the arts, education, and health/social care, are unlikely to be replaced by computerization but others, such as sales, logistics and service administration will become increasingly vulnerable to technology change.

Table 2. The Size and Productivity of Business Sectors in Greenwich

Furthermore, as Table 3 below illustrates, an analysis of the data relating to Job Seekers Allowance shows that, while unemployment and long term unemployment is falling within the Borough, those occupations defined in the Deloitte’s study undertaken by Frey and Osborne as...
most vulnerable to technology change, are precisely those where people are finding it hardest to find work.

**Table 3. Long Term Unemployment by Occupation**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total no. of long term ISAs</th>
<th>Administrative and Services Occupation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1,200</td>
<td>90%</td>
</tr>
<tr>
<td>2010</td>
<td>1,197</td>
<td>45%</td>
</tr>
<tr>
<td>2015</td>
<td>1,153</td>
<td>15%</td>
</tr>
<tr>
<td>2020</td>
<td>1,065</td>
<td>12%</td>
</tr>
<tr>
<td>2025</td>
<td>958</td>
<td>12%</td>
</tr>
</tbody>
</table>

1.09 But a critical question is whether the UK, and Greenwich in particular, is well placed to seize the opportunities arising from digital technology. A recent House of Lords report on the UK’s Digital Future\(^3\) signalled that, despite London’s growth in digital businesses its digital infrastructure was one of the worst among capitals in Europe, and pointed to the shortfall in digital skills which was acting as a brake on business growth.

1.10 It is timely, therefore, to complement the Core Strategy and other relevant strategies with a Smart City Strategy, aimed at making Greenwich a “smarter” borough, indeed London’s “Smart Borough”. In so doing, this strategy seeks to address the challenges confronting our communities and to set out an approach, which will help the Borough to meet the challenge of the increase in population in a sustainable way, to provide resilience to unexpected events, to transform public services within the Borough and to create a business environment that not only improves the resilience of established firms in offering a wide range of employment opportunities, but also fosters the development of a cluster of emerging digital businesses that will create higher value jobs and put the Borough at the forefront of the digital economy.

1.11 However, it should be emphasized at the outset that digital technologies are not a “silver bullet” and “smartness” is not an end in itself. Neighbourhoods are complex ecosystems which are subject to external shocks and evolve over time, and, to maintain their harmonious development, there is a need to draw on a range of policy interventions. As is recognized in the Core Strategy, communities reside in a given location and, to accommodate the significant rise in population, its diversity and changing demographic, and to address mobility in a more densely populated environment, it is essential to optimize the use of that space and its physical infrastructure, and create a desirable environment for citizens and businesses alike. Here digital technologies can help, not only in the design of the new built environment, but also in monitoring how the infrastructure – old and new - is being used. For example, technology can monitor the flow of traffic and the energy efficiency of buildings, and in engaging with citizens on how it might be improved.

\(^3\) [http://www.publications.parliament.uk/pa/ld201415/ldselect/lddigital/111/111.pdf](http://www.publications.parliament.uk/pa/ld201415/ldselect/lddigital/111/111.pdf)
Foundations/Characteristics of a Smart City

1.12 Thus, a truly smart city, as reflected in this strategy, is one that recognizes the evolving nature of urban communities and the systemic nature of change, and seeks to develop a holistic response which ensures that future development is innovative, sustainable and resilient to external shocks by:

- providing clear leadership and drive, while engaging with citizens and businesses in a transparent and democratic manner;
- developing a vision and strategy for the city which is informed by leading international experience and, where possible, builds on its past, its strong sense of community, a respect for its natural environment, and optimizes the use of space/the built environment and resources in the face of demographic, industrial and technology change;
- providing a modern, digitally enabled infrastructure and connectivity that is globally competitive;
- developing a culture of sharing information which supplies users and service providers with the real time information that they need to take informed decisions, which also has a predictive capability, to ensure optimum use of current capacity and the means to plan more effectively for the future;
- offering a business environment, which allows a wide range of businesses to flourish and encourages new high value firms to locate in the city;
- providing an education and skills infrastructure that offers all citizens the opportunity to participate in the digital economy and to secure well paid employment, regardless of sector;
- has the mechanisms, resources and culture in place to support agility and innovation within its own public services, that is at the forefront of good practice i.e. a “learning organization”, able to manage risk and develop new approaches in a timely and cost-effective manner; in order to deliver high quality services that engage with and meet the needs of the citizen, rather than organizational convenience and traditions;
- in short, making the city a most desirable and vibrant place to live, work or visit.

Our Objectives and Principles

1.13 Our aim is to display the above attributes and characteristics so that Greenwich becomes recognized as London’s “smart” and innovative Borough and able to deliver resource-efficient, low-carbon, healthy and liveable neighbourhoods within the Borough, where citizens enjoy improved social and economic opportunities, while feeling integrated and part of the decision making processes affecting the environments and communities they live in, and where services are delivered efficiently and reflect the needs and desires of citizens. Above all, it is that Greenwich is a most desirable and vibrant place to live, work or visit.

1.14 Our approach is based on the key principles of:

- inclusivity: this is a strategy aimed to benefit all citizens, communities and neighbourhoods;
- citizen centric: we aim to transform citizen engagement in the Borough to ensure our policies put citizens at the forefront of our policy development and meet their needs;
- transparency: citizens will be informed of change and its outcomes, and information will be made accessible for the benefit of our citizens;
- standards and good practice: Greenwich will follow the principles of a “learning organization”, open to new ideas and an exemplar in the use of standards and good management practice - evidence based and outcomes driven.
1.15 To achieve this, the Council’s digital strategy focuses on four key elements, which form the main chapters of this report. These are:
- Smart Neighbourhoods and Communities
- Infrastructure for Change
- An Innovative and Smart Council;
- Economic Growth and Higher Value Jobs.

1.16 But, as implied above, we need not only to achieve excellent outcomes in each of the elements, but also ensure they have a coherence and synergy, such that the whole is greater than the sum of the parts. To ensure this, the Council has established a small team, Digital Greenwich, reporting directly to the CEO to help establish a modern digital infrastructure; promote a more dynamic local economy; work with local stakeholders to transform local communities; exercise a horizon scanning function to identify new opportunities to innovate, and facilitate a more integrated approach to service delivery, working closely with the Council’s policy and service delivery teams and potential sources of innovation, to place Greenwich at the forefront of public service innovation and good practice. This is a journey – for both the Council and the Borough – which will be measured and transparent, the key milestones of which are set out in the concluding chapter, “The Way Forward”.
Section 2
Smart Neighbourhoods and Communities
2. Smart Neighbourhoods and Communities

This chapter describes the very different and evolving nature of Greenwich's communities, neighbourhoods and high streets, and how these will change further as the population grows, as the Borough's industrial structure moves to higher value added sectors, and as technology and real time information alters citizen behaviour and, potentially, the use of urban spaces. It concludes by noting the importance for the Council of developing a better understanding of how technology will impact upon the Borough's urban form and the need to work with developers and partners, that are active in Greenwich, to ensure that all take account of digital technologies to make for a sustainable and more resilient Borough.

Background

2.01 Greenwich is not a single generic entity but a series of linked neighbourhoods and communities with their own distinctive characteristics. As a selection of statistics drawn from the London Data Store's Ward Profiles shows, Greenwich's communities, or Wards, have very different profiles (see chart). It is a central tenet of the Council's policy that this smart city strategy should be focused on the needs of all citizens and the communities they live in, and address their different needs and reflect the special characteristics of each neighbourhood and district. While the strategy is for the Borough, it is within local neighbourhoods that the benefits and opportunities arising from the strategy will be proven. The approach, therefore, needs to reflect the local circumstances and aspirations of local communities and their neighbourhoods.

2.02 But raw statistics alone barely convey the complexity of local communities and how they evolve over time, in particular the interplay between the physical environment, economic development in response to technology and market drivers, and the social forces at play, as people with different skills and attributes move into and out of the area. Greenwich, and its individual Wards, has experienced massive change in its industrial structure over time. For example, the expansion of the Royal Arsenal (to around 80,000 employees in WWI) and other industries, such as telephones and telephone cable, in the early part of the 20th Century was followed by sharp contraction, to the point of closure in the 1960s, that had a devastating impact on Woolwich and Charlton.

2.03 The ebb and flow of industry in the Borough has had a profound impact on land use, demand for housing and the urban infrastructure. Today, the knowledge-based economy employs more people in the Royal Borough than manufacturing. The importance and presence of the knowledge-based economy across the Capital is already considerable and will only grow in the coming decades. The transition in Greenwich towards a knowledge-based economy will bring not only changes on the economic structure of the Borough, but also on its urban form – the more knowledge intensive the economy becomes, the higher the concentration and intensity of uses needs to be. An understanding of the nature, dynamics and requirements of this new economy, as well as the relationships between the different actors, is critical if cities are to adapt, accommodate and capitalize on this trend. Digital technologies provide the tools to help understand and manage the impact the transition to a digital economy is having on the Borough and, more importantly, to inform the design of the Borough's built environment to make it resilient to change.

2.04 Successful cities are remarkably resilient. They adapt to external factors, accommodating changes, with districts taking on new roles, and buildings new uses. Indeed, a key element
Ward Profiles

<table>
<thead>
<tr>
<th></th>
<th>Abbey Wood</th>
<th>Blackheath and Westcombe</th>
<th>Charlton</th>
<th>Coldharbour and New Eltham</th>
<th>Eltham North</th>
<th>Eltham South</th>
<th>Eltham West</th>
<th>Glyndon</th>
<th>Greenwich West</th>
</tr>
</thead>
<tbody>
<tr>
<td>% aged 65+</td>
<td>10.2</td>
<td>15.1</td>
<td>11.2</td>
<td>18.1</td>
<td>18.5</td>
<td>15.7</td>
<td>11.6</td>
<td>7.6</td>
<td>7.9</td>
</tr>
<tr>
<td>pop density per sq km</td>
<td>5,722</td>
<td>6,048</td>
<td>7,050</td>
<td>5,180</td>
<td>4,789</td>
<td>2,717</td>
<td>4,667</td>
<td>10,441</td>
<td>6,054</td>
</tr>
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<td>Male life expectancy</td>
<td>76.0</td>
<td>80.7</td>
<td>76.3</td>
<td>78.4</td>
<td>81.1</td>
<td>79.8</td>
<td>76.6</td>
<td>75.3</td>
<td>79.4</td>
</tr>
<tr>
<td>% obesity in Yr 6</td>
<td>29.5</td>
<td>23.3</td>
<td>27.3</td>
<td>22.7</td>
<td>14.4</td>
<td>25.4</td>
<td>20.6</td>
<td>24.3</td>
<td>25.9</td>
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<tr>
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<td>75.5</td>
<td>67.7</td>
<td>70.7</td>
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<td>64.9</td>
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<tr>
<td>% H/holds socially rented</td>
<td>38.9</td>
<td>22.4</td>
<td>41.1</td>
<td>23.5</td>
<td>17.0</td>
<td>22.4</td>
<td>44.1</td>
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<td>% JSA Claimants</td>
<td>5.9</td>
<td>2.5</td>
<td>5.3</td>
<td>3.6</td>
<td>2.7</td>
<td>3.9</td>
<td>4.7</td>
<td>6.3</td>
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</tr>
<tr>
<td>% with no Qualifications</td>
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<td>12.1</td>
<td>20.8</td>
<td>25.4</td>
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<td>21.5</td>
<td>30.8</td>
<td>21.4</td>
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<tr>
<td>% with Level 4 and above</td>
<td>24.2</td>
<td>57.5</td>
<td>37.2</td>
<td>23.4</td>
<td>31.8</td>
<td>25.1</td>
<td>21.2</td>
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<td>30,964</td>
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<td>45,608</td>
<td>35,041</td>
<td>27,422</td>
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<tr>
<th></th>
<th>Kidbrooke with Hornfair</th>
<th>Middle Park and Sutcliffe</th>
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<th>Plumstead</th>
<th>Shooters Hill</th>
<th>Thamesmead Moorings</th>
<th>Woolwich Common</th>
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<td>% aged 65+</td>
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<td>4,156</td>
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<td>3,487</td>
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<td>80.3</td>
<td>76.4</td>
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<td>24.1</td>
<td>19.4</td>
<td>27.3</td>
<td>23.0</td>
<td>28.4</td>
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<tr>
<td>Emp. Rate (16-64)</td>
<td>67.3</td>
<td>65.6</td>
<td>74.2</td>
<td>63.9</td>
<td>69.5</td>
<td>62.9</td>
<td>60.5</td>
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<tr>
<td>% H/holds socially rented</td>
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<td>37.3</td>
<td>30.6</td>
<td>27.3</td>
<td>19.5</td>
<td>38.0</td>
<td>50.0</td>
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<tr>
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<td>5.9</td>
<td>2.8</td>
<td>7.2</td>
<td>3.4</td>
<td>6.0</td>
<td>8.8</td>
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</tr>
<tr>
<td>% with Level 4 and above</td>
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<td>31.3</td>
<td>32.4</td>
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<tr>
<td>Est. Median H/hold income</td>
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<td>25,672</td>
<td>36,161</td>
<td>27,478</td>
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<td>26,231</td>
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</table>
in a successful city is its flexibility, allowing the city, its neighbourhoods and buildings to evolve and adapt to future changes. Changes in the built environment in London are self-evident – from the intensification and concentration of uses at Clerkenwell and Shoreditch – where financial, creative and media industries cluster and coexist with housing and retail, to the changing nature of our high streets. Digital technologies are themselves driving some, possibly facilitating all, of these changes and digital technologies themselves provide the tools to help understand and manage the impact the transition of our cities, ad to inform the design of the built environment and its composition. These tools are data driven: better data allows us to model the impact of new developments, as well as demographic, social, economic and environmental factors, on our neighbourhoods. This in turn allows us to make better decisions to support the objective of creating vibrant, sustainable and balanced neighbourhoods.

2.05 Thus, technology creates opportunities to do things in new ways and meet long standing challenges. But these changes need to be anticipated and planned for. For example, in the future, automated and electric vehicles, accompanied by an intelligent modal shift, will allow for more efficient use of infrastructure, safer and cleaner neighbourhoods. The decisions we are taking today need to anticipate the impact this will have on the built environment if the benefits are to be fully achieved. The use of technology will help us understand and model the changes that are required.

2.06 In thinking systemically about the impact of new digital technologies on communities, and the 34% increase in population that is projected from 2010-2028, new technologies and tools will allow the Council to consider more fundamentally how neighbourhoods should be designed and developed to accommodate changes and opportunities that technology will create. This creates an opportunity to shape how neighbourhoods evolve, and address concerns such as road safety, mobility, use of natural resources, and air quality. Moreover, technology can influence the interaction between different land uses, the infrastructure and people, and also help us to shape rather than respond to events. This requires a good understanding of the dynamics within neighbourhoods and how digital technologies will impact upon existing systems, and the urban form and function of our neighbourhoods.

2.07 In designing urban spaces for the future, the Borough can benefit from understanding how digital technologies may impact upon the use of that space, and potentially improve the current existing city systems and supporting infrastructure. For example, new technologies have changed organisations’ working dynamics, culture and protocols – allowing an increasing number of members of staff to work from home or enabling teams from different organisations to meet online, across different Boroughs within a city, or even across different time zones. By transforming the digital infrastructure in Greenwich, we raise the prospect of an increasing number of digital micro businesses offering a wide range of apps/products, which will enable utilities, citizens and other businesses to take informed decisions on how to make an optimal use of time and resources e.g. making more intelligent use of transport - whether and when to travel and what mode of transport. Thus, the Council will seek to understand the impact a more informed and responsive society might have on, for example:

(i) the demand not only for local services and digital infrastructure, but also leisure and recreational space;

(ii) the Borough’s mobility and accessibility patterns – which may help deliver the Borough’s modal shift towards more sustainable mobility systems – walking, cycling and electric vehicle sharing schemes;
Thamesmead

The regeneration of Thamesmead represents a rare opportunity to embed smart city principles into a New Town for the 21st century. The transformation will be led by Peabody, one of London’s largest housing associations, which owns much of the land, housing stock, and commercial and community space in the town.

Working closely with the Royal Borough of Greenwich, Peabody is exploring a ‘smart city’ approach to the regeneration in its bid to position Thamesmead as one of the top three growth areas in London.

Originally conceived as a new town to address the housing crisis after the Second World War, Thamesmead has experienced mixed fortunes since the first families moved there in 1968. Covering an area the size of central London, with 45,000 residents and a young population, it has the potential to become one of London’s most dynamic living environments, with great facilities and a thriving, mixed community.

Peabody has developed a 30-year strategic framework for Thamesmead, which considers housing, communities, jobs, culture, business, landscape, place management, tenure, inward investment, land use and transport. However, it is important to keep a balance between the long-term vision and the reality of the current lived experience in Thamesmead. So, as well as building new homes, Peabody will invest in existing homes, infrastructure and services to improve quality of life for existing residents. This includes protecting and strengthening Thamesmead’s unique character and assets, such as its waterways, green space and nature reserve.

Crossrail arrives at Abbey Wood in 2018 and, in the years ahead, Thamesmead will offer exciting new opportunities as an attractive and accessible part of London – a great place to live, work and visit.
(iii) the Borough’s land use patterns – which may be informed by a reduced demand for vehicle space, and ultimately on the Borough’s spatial structure, density and mixed use patterns. Moreover, change in one area will have impacts on others, giving even greater emphasis to the need for a holistic approach and thereby strengthen our understanding of the interconnected nature of decisions.

2.08 This evolution of our neighbourhoods, and their response to economic, social and technology change, is perhaps best illustrated on our high streets. The rise of the digital economy has brought about further change as, increasingly, customers are searching online for the best bargains and arranging for delivery or collection at a time of their convenience (which in turn is impacting on transport). And it is not only the sale of goods that is being transformed by digital technology: foreign travel and tourism, the use of taxi services, music and entertainment, news media and, increasingly, how we search for property and employment are just some of the sectors whose presence on the high street has been radically altered, if not removed altogether.

2.09 But high streets remain a focal point for all communities – and footfall and spending an indicator of their vibrancy. As some types of business move out so others move in to take their place, although the recent financial crisis had a significant impact on take up/occupancy. It is this combination of technological disruption and the flattening of real growth in incomes that has given rise to a growing focus on the high street as a social asset. A recent report published by the Digital High Street Advisory Board14, has emphasized the importance, in an increasingly dynamic digital world, of small retailers embracing digital technologies, not least to raise their profile and engage customers with compelling offers. Importantly, two key recommendations in the report reinforce the thrust of our own smart city strategy, namely that the Council should seek to transform the digital infrastructure of neighbourhoods, and raise the level of digital skills among citizens, SMEs and the voluntary services and charities within the community. These points are addressed in later chapters.

2.10 This is particularly important with the development of the “hyper-local” concept, i.e. the ability, thanks to digital technology, to focus information on a well-defined area to meet the needs of that community, and of visitors to the area15. Much of the activity to date has focused on news media and the ability of retailers, using location based technologies, to target residents or visitors in an area with special offers, or simply to inform people with similar profiles that they are in close proximity.

2.11 This is of particular importance to West Greenwich, Eltham, the Peninsula and, in the future, Woolwich, where visitor experience is important to the local economy. However, the concept extends well beyond the world of retail, and has the power to engage citizens on a wide range of social issues impacting upon their lives. For example, for many years, a local news site, King’s Cross Environment16, has offered an independent platform for the local community to air concerns, particularly about transport issues, and to advertise or comment on local activities. On a national scale, mySociety established FixMyStreet17 in 2007, now used by Greenwich Council, which provides a platform for members of the public to identify (with mobile phone cameras) and report specific incidences of pot holes, broken pavements, graffiti, fly-tipping, and the need for waste collection, which could be located on a map and reported to the relevant local authority.

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15 https://www.nesta.org.uk/sites/default/files/here_and_now_uk_hyperlocal_media_today.pdf
16 http://kingscrossenvironment.com
17 https://www.fixmystreet.com
2.12  The question for local authorities over the next few years is how can digital technologies and, in particular, the concept of “hyper local” be used to engage with citizens and help to improve the quality of life in neighbourhoods and communities. The Council recognizes that organisations working at the heart of our communities are well placed to help us develop a more citizen centric approach. The strategy will provide a framework to enable us to seek out those answers from a community perspective.

The Greenwich Vision and Approach

2.13  This is a significant agenda within the broader goal of delivering resource-efficient, low-carbon, healthy and liveable neighbourhoods within the Borough, where citizens enjoy improved social and economic opportunities, while feeling part of a wider community and part of the decision making processes affecting the environments and communities they live in, and where services are delivered efficiently and reflect the needs and desires of citizens. The Council recognizes that the design of its neighbourhoods, and their facilities, are fundamental to the way those communities operate. This is not a centralist, top-down model of what is good for people (or their neighbourhoods) but creating the conditions for communities themselves to shape their environment and neighbourhoods. Thus, while recognising the role of technology – not least Building Information Modeling, discussed in later chapters - as a key enabler, communities and urban spaces will face the greatest impact: it is well designed urban spaces that will accommodate and shape this change, and communities will both, drive it and benefit from it. Hence, both need to be front and centre of our strategy.

2.14  To that end, there is a need to develop expertise in how a digitally-led approach can add value to existing cityscapes and assist in the delivery of better designed, “smarter” built environments as well as more informed communities, to achieve the goal, of a more sustainable and resilient Greenwich. The Council cannot do this alone and so, through a commitment to smart urban design as a precursor to economic and social transformation, the Council will endeavor to attract a highly qualified group of urban professionals – a cluster of excellence with diverse urban expertise – to work together to define, design and develop specific integration tools and frameworks, to develop that more profound understanding of cities and the context for their development, and thus be able to define the most appropriate strategies and interventions.

2.15  This knowledge is at the apex of smart city concepts and strategies. It is replicable and, therefore, eminently tradeable, particularly in a world where urbanization is projected to grow rapidly over the next thirty years, and where established urban centres are in need of renewal.

2.16  To achieve the Council’s goals, it will:

- facilitate wider discussion about the impact of technology on the built environment and how the ability to collect and integrate data to better understand and model the impact of changes on districts and neighbourhoods.

- work with local developers and stakeholders, to embed the principles set out in the strategy, specifically to embed world class connectivity and to anticipate, promote and shape the changes to our neighbourhoods and communities, being brought about by digital technologies. This will include promoting smart city principles and requirements in planning guidelines. Furthermore, it will consider how the
Community Infrastructure Levy might be used more effectively in this context. It will also ensure that new buildings are compliant with the EU Directive on broadband connectivity (2014/61/EU).

- work with others to develop pilot projects that identify and bring together key data, and allow for the analysis of data to improve understanding of the built environment and the impact of developments and demographic, social, economic and environmental change on neighbourhoods.

- give a particular focus to high streets and to the infrastructure and digital skills required, to enable retailers to exploit digital technologies to best effect (see Chapters 4 and 5). In that context, the ideas presented in the Digital High Street Report on measuring the Borough's capability - through the High Street Digital Health Index - will be explored further.
3. Infrastructure for Change

This chapter describes how a fixed and mobile ultra-fast broadband network has become a source of competitive advantage in the struggle to create more dynamic business and social environments, and is also necessary for the innovative delivery of services. It sets out the Council’s commitment to develop a strategy to deliver such a network. The chapter goes on to describe the importance of the Internet of Things and Building Information Modelling in developing a better understanding of the built environment, how it is performing and how it is being used by society, and the council’s plans to adopt these technologies/approaches to create a smart infrastructure in the Borough.

Improving Connectivity within the Borough

3.01. Just as competitiveness in energy intensive sectors is driven by access to low cost energy providers, so competitiveness in the global digital economy is driven by the quality and price of connectivity, for users as well as those creating rich media and digital services. In order to develop a competitive digital economy in Greenwich, which will provide high value employment for its citizens, and to transform public service delivery, the Borough needs world class connectivity at prices that are internationally competitive.

3.02. Ofcom monitors UK performance against its leading European cities and publishes the results of its analysis in the form of the European Broadband Scorecard. The latest report was published in December 2014. The findings suggest that, overall, the UK’s digital infrastructure compares favourably with four comparator countries: France, Germany, Spain and Italy. The UK leads on comparisons of choice, take-up and usage, and is in first or second place for a range of indicators relating to price.

3.03. However, in its report on the UK’s digital future, “Make or Break: The UK’s Digital Future”, the House of Lords highlighted the international comparison of broadband speeds published by Ookla. According to Ookla’s analysis of broadband and mobile upload/download speeds, London’s performance is one of the poorest among European capitals (26th out of 33) and well below that of a range of other British and European cities.

3.04. It is clear that, within the main trading regions of the world, competition between cities is emerging in the form of the digital infrastructure that the city offers. The “1 Gigabit City” is a phenomenon that has been developing quickly, with Seoul, Hong Kong and Tokyo emerging as leaders in the Far East, Chattanooga, Kansas City and Lafayette (Silicon Bayou) in the USA, and Zurich, Bucharest and Stockholm in Europe. The impact of 1 Gigabit symmetric speeds on economic development has been striking. In 2014, the Lafayette Utility System (LUS) gigabit network attracted firms to the city and is estimated to have created 1,300 high quality jobs. In Chattanooga, a city with a population of less than 200,000, the network was developed by the energy utility, with a prime objective of reducing power outages, but it has created around 1,000 jobs and attracted $50 million of venture capital to fund new technology businesses. In a comparison between 1 Gigabit Stockholm and Copenhagen, the impact on business location has been striking. As the ability to handle large quantities of data swiftly has become increasingly important, more and more international enterprises have chosen to locate their Scandinavian headquarters in Stockholm: in 2009, Stockholm had 69% more establishments than

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18 http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/cmrm/EU_Scorecard_2014.pdf
19 http://explorer.netindex.com/maps
20 http://muninetworks.org/content/three-new-companies-move-silicon-bayou
Average Broadband Download Speeds (Annex 6 “Make or Break: The UK’s Digital Future, HL Paper 111)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Capital City</th>
<th>Country</th>
<th>January 2015 speeds (Mbps)</th>
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<tr>
<td>1</td>
<td>Bucharest</td>
<td>Romania</td>
<td>80.14</td>
</tr>
<tr>
<td>2</td>
<td>Paris</td>
<td>France</td>
<td>78.6</td>
</tr>
<tr>
<td>3</td>
<td>Vilnius</td>
<td>Lithuania</td>
<td>59.99</td>
</tr>
<tr>
<td>4</td>
<td>Stockholm</td>
<td>Sweden</td>
<td>59.46</td>
</tr>
<tr>
<td>5</td>
<td>Reykjavik</td>
<td>Iceland</td>
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<td>6</td>
<td>Bern</td>
<td>Switzerland</td>
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</tr>
<tr>
<td>7</td>
<td>Copenhagen</td>
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<td>Hungary</td>
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<td>Bosnia &amp; Herzegovina</td>
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<td>Croatia</td>
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<td>Rome</td>
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<tr>
<td>33</td>
<td>Nicosia</td>
<td>Cyprus</td>
<td>9.11</td>
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</tbody>
</table>

Copenhagen (compared to 10% in 2006). More broadly the investment has resulted in savings to the municipality and the opportunity to transform public services, the ability to roll out 4G mobile services swiftly, and a rise in the quality of jobs. Furthermore, like other 1 Gigabit cities, Stockholm will be well placed to roll out the next wave of mobile infrastructure, 5G.

3.05 The concept of the 1 Gigabit City, powered by fibre to the home, is also catching on in the UK. Small to medium sized towns and cities such as Peterborough, York, Aberdeen and Edinburgh have begun to attract private sector investment in widespread fibre deployment to homes and small businesses.

3.06 Greenwich is also a strong candidate for an urban 5G trial, building on a commitment to fibre, which will be needed to backhaul the wireless network traffic. By focusing on low latency network applications, Greenwich can build a faster smart city infrastructure, and demonstrate the business case of this emerging technology.

The Greenwich Vision

3.07 A fast, affordable digital infrastructure is central to the Council’s objectives – for the economy, for service transformation, for stronger neighbourhoods and communities. In Greenwich, where micro-businesses, with 1-10 employees, account for by far the largest share of employment and GVA, where 18 million visitors each year expect to be able to upload relevant information instantly and to be able to connect with family and friends, where a key objective is to transform public services for the benefit of all citizens, e.g. through pervasive public Wi-Fi services; and to be at the forefront of 5G roll out, in order to strengthen the digital cluster located here and to improve the quality of jobs and income, it is vital that connectivity is competitive and “future proof”.

3.08 Our aim is that the Greenwich of the future will offer its community, and visitors, connectivity on a par with other cities in Europe, at an affordable price.

The Council will therefore:

- conduct an Open Market Review to identify, from private sector service providers, the existing and planned infrastructure for the Borough;
- consult network equipment providers over their technology roadmaps;
- carry out an audit of its own assets and contracts related to ICT to obtain a full picture of how it might work with partners and identify any potential barriers to progress;
- consult private sector users, in order to form a view on future demand;
- consider the evidence, in consultation with the Regulator, DCMS and the EU Commission, and set out its strategy in the Spring of 2016.

3.09 The ability of devices to communicate is already transforming industrial operations and supply chains, the delivery of services, and life in the home; it will transform the delivery of public services as well. For example, at a simple level, embedded sensors will enable the remote testing of assets, such as street lighting, helping identify when lights are close to failing, rather than after they have failed. More sophisticated applications of digital technologies include a combination of sensor and communication technologies and this would enable a whole range of applications including:
- a far higher proportion of those in need to be cared for at home;
- the ability to balance supply and demand from a range of renewable sources to meet the peaks and troughs of demand in a world of variable supply;
- the ability to automate facilities management in public buildings, with improvements in energy efficiency and occupancy; and
- traffic to be modelled, monitored and managed more efficiently, including smart parking (where mobile apps identify space becoming available, followed by mobile payment).

3.10 The Government has recently issued two reports setting out its vision and strategy for Internet of Things (IoT) and BIM respectively:
- “The Internet of Things: making the most of the Second Digital Revolution” by the Chief Scientific Adviser (CSA), Sir Mark Walport22.

3.11 As intelligence is built into all aspects of the infrastructure so the number of connected devices is rising exponentially. Estimates of growth vary widely and are being revised upwards, because of the emerging nature of the market. In his report on the IoT, the Chief Scientific Advisor summarized the range of estimates to be between 20 billion to 100 billion connected devices by 2020 from the current figure of around 14 billion objects. One of the authoritative commentators, Machina Research24, whose estimates are at the lower end of the scale, forecasts that, by 2020, global connectivity will have reached 22 billion devices. Of these, over one third will be in intelligent buildings – heating, ventilation, air-conditioning and security – while utilities will account for 10% and the automotive industry around 8%. The challenge is not so much how to generate data, but how to capture and collate it in a way that can be exploited to the benefit of the community. In January 201325, Machina estimated that, by 2022, the Machine to Macine (M2M) market would amount to over $1 trillion with two thirds accounted for by the devices and their installation and one third accounted for by the “service wrap” flowing from this network of connected devices. These services will be enabled by secure, software platforms from which data analytics and other services will be generated – the data analytics alone being forecast to reach $16.1 billion by 2017, according to IDC estimates (op cit 2).

3.12 How digitalization will transform urban environments is set out in the Government’s Strategic Plan for Level 3 Building Information Modelling (BIM). BIM is described as a game-changer for the construction sector and defined as,

“a collaborative way of working, underpinned by the digital technologies which unlock more efficient methods of designing, delivering and maintaining physical built assets. BIM embeds key product and asset data in a 3D computer model that can be used for effective management of information throughout an asset’s lifecycle – from earliest concept through to operation.”

3.13 It was a key tool in the design, construction, and managed disassembly of the Olympic site, and instrumental in delivering the project on time and within budget. It is also central to the design and construction of the £16 billion Crossrail project26, the largest BIM enabled project in Europe, which is extending to the Borough by 2018.

26 http://www.crossrail.co.uk/benefits/design-innovation/
The Government has already identified 20% savings in capital expenditure from the use of BIM and is projecting 33% savings in whole life costs. Expertise in the deployment of BIM not only offers substantial opportunities for improving productivity in the UK construction contracting market – worth over £50 billion per annum – but also significant business opportunities in a global construction market that is projected to almost double from around $8 trillion pa to $15 trillion pa by 2025. To achieve its goals, the Government is attaching priority to:

- the creation of a set of new, international “Open Data Standards to enable easy sharing of data across the entire market and the creation of a cultural environment which is co-operative, seeks to learn and share;
- the establishment of a new contractual framework for projects, which have been procured with BIM, to ensure consistency, avoid confusion and encourage, open, collaborative working;
- training the public sector client in the use of BIM techniques such as, data requirements, operational methods and contractual processes;
- driving domestic and international growth and jobs in technology and construction.

The Greenwich Vision

As a local authority, Greenwich recognizes and share these priorities. Increasingly, the infrastructure of towns and cities is perceived to be constructed in layers, with the Information layer, gathering and interpreting the data being generated by the layers of construction assets and utilities infrastructure, the transport/logistics layer and citizens themselves. This is illustrated in Figure 1 below.

Figure 1. The Inter-Connected Layers of a Smart City

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Greenwich Smart City Strategy

BIM for the New Crossrail Station at Armourer’s Court – Woolwich

- Full BIM-based lifecycle management solution
- Constrained site, with added complexities of a Heritage site (the Royal Arsenal) and DLR terminal close by
- Nearly 400 new homes to be built directly above the new Crossrail station
- 2,500 homes will be built on the 350,000m² site surrounding the station
- Since 2008, 13 planning applications have been received within 1km of the Crossrail station site

The new Crossrail station aims to assist in the transformation of Woolwich, by reducing journey times and traffic congestion (through better public transport links), and supporting regeneration. From 2018, up to 12 services an hour will allow passengers to travel to Canary Wharf, the City and the West End without having to change trains.

Crossrail aims to be the first major public infrastructure project to utilise BIM to manage its full lifecycle, from design through construction to operations and maintenance. A key focus is creating and storing accurate data (physical, environmental, and commercial) for management of the entire operation.

Through BIM, significant time and cost savings can be achieved on constrained sites such as Woolwich by bringing together models of all the components of the project in a virtual environment, checking for and therefore avoiding any clashes on site. The proposal will allow many of the complex utilities in and around the station to be visualised in 3D. This ensures that anyone working in the vicinity of the proposed stations knows the exact locations of the complex web of pipes and cable under the streets that need to be avoided or protected, improving safety and minimising risk of service interruptions.

Key Benefits of BIM for Crossrail:

- Reduction of risks
- Improved safety
- Reduced errors from using a trusted “single source of truth” approach to data management
- Reduced information loss between project phases
- Improved project delivery
3.16 Our vision is that, with our significant construction programme, Greenwich should be at the forefront of developments in BIM, in effect to become a BIM Borough, where the community benefits from the power of this transformational technology, embedded in the infrastructure, as exemplified in para 3.08. We also believe there is the opportunity to build a cluster of expertise in the development of BIM/the IoT, and in its many applications, which will create high value jobs for our citizens.

3.17 The Council will therefore:

- work with developers and contractors to ensure that our Masterplans and major developments and refurbishments are BIM enabled and that appropriate data is open and shared to the benefit of all, in a secure and safe environment;
- liaise closely with the Digital Built Britain Task Force and the University of Greenwich to ensure that the Council and Greenwich residents in, or entering, the construction industry have access to relevant accredited learning programmes;
- explore the creation of a hub of advanced capability in new urban design, BIM management and data analytics by working closely with the Digital Built Britain Task Force and the University of Greenwich to ensure that businesses have access to the necessary research and knowledge, by piloting new applications, and by focusing in our Smart Cities Strategy on developing a business cluster which will collaborate with BIS/UKTI to promote UK knowledge and experience in overseas markets.
- collaborate with partners to develop a secure software platform to capture the data being generated and act as the interface between users and service providers (see data integration concept model in Figure 2 below).

*Figure 2. Data Integration Model*

*Source: Digital Greenwich*
Section 4
An Innovative and Smart Council
4. An Innovative and Smart Council

This chapter sets out the standards based approach the Council proposes to take to managing the transformation of services for which it is responsible, the key principles it will adopt and the roadmap it will develop for that purpose.

Background

4.01 It is clear from the Introduction that to improve the quality and efficiency of services in the Borough and to create a more dynamic economy, change is not an option, but an imperative. The Council has already made good progress in improving services, as well as delivering savings, with new ways of working helping to deliver efficiency savings of £100 million over the last four years.

4.02 The time is now right to build on these foundations and the lessons learned to date. If the Council is to improve the quality of its services in a world of constrained budgets, Greenwich, like other local authorities and cities, now needs to look beyond merely improving the efficiency of current ways of working. The Council needs to transform the way it works; transform the way it engages with citizens and other stakeholders; transform the way it partners with other organisations across the public, private and voluntary sectors in Greenwich and beyond; and transform the way it anticipates and responds to future challenges.

4.03 However, service transformation requires a structured and comprehensive approach over time; indeed, it is one which requires careful preparation and planning, and a framework for change which is based on sound principles and measureable in its outcomes. A framework has been recently developed by the British Standards Institution, in the form of PAS 181, which was developed under the guidance of a range of experts from a range of relevant stakeholder groups, a process in which Greenwich officials played a leading role.

4.04 The Council intends to use the British Standards Institution’s PAS 181, and other relevant standards, as the framework for developing a “smarter” Greenwich and this chapter summarises the main elements of the approach it shall be adopting.

4.05 Chapter 2 of the Core Strategy, published in 2013, sets out the Council’s vision for Greenwich in 2028 and the objectives it has set itself. These essentially define a vibrant and diverse local community, which is sustainable and resilient in social, economic and environmental terms; where current inequalities in health and income have been reduced; and where mobility, within and beyond the Borough, has been improved in the face of a one third increase in population and significant growth within the sub region.

4.06 This document, Greenwich’s Smart City Strategy, describes how the Borough will use smarter ways of working to ensure that:

- Greenwich has a digital infrastructure which compares in performance and price with other similar locations;
- The Council makes best use of data and the technology available in the delivery of its services;
- All citizens have ready access to the information and services they need, to run their daily lives, in the format that offers the most cost effective form of delivery;
- The Council engages with its citizens more effectively, adopting best practice in the use of digital and social media.

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Santander Smart City

Located on the north coast of Spain, Santander (pop. 174,000) is typical of many cities across Europe facing numerous challenges: congested transport infrastructure, pollution and air quality issues, increases in demand for energy, improving the management of services and the need to curb climate change.

In 2010 Santander was selected by the European Commission (EC) as a test-bed for smart city experimentation. The project team installed over 20,000 sensors around the city and the surrounding region – an area of around 5,300 square kilometres – to facilitate a range of new services, from air quality measurement, remote dimming of street lamps on empty streets to optimised watering of the city’s parks.

The sensors run on a network with wireless and fibre optic connections, owned and run by the municipality. Repeaters pick up signals they send and pass them to gateways where city-wide data is collated and sent to be analysed by the municipality or used by app developers to create new services.

NEC has provided the “Cloud Operations Control Centre (COCC)” for the Santander demonstration centre located in Pronillo, which features an advanced dashboard that enables city managers to quickly cross-reference and visualize any combination of city data sets as easy-to-understand graphs, maps and comparative statistics via multi-touch displays.

Interoperable standards make it possible to collect data from a diversity of sensors, in a consistent and secure way, resulting in an open, accessible and future-proofed multi-vendor M2M platform. These structured and unstructured M2M and social media data are then analysed using advanced algorithms.

Results

Traffic management: Santander expects to cut traffic emissions by up to 30% by reducing the time people spend looking for parking spaces with real-time space availability data – available on the city app and via digital displays around the city.

Air quality: The city cross-references traffic, carbon monoxide and temperature levels, combined with the wind direction and speed, and automatically issues alerts when air quality thresholds are exceeded via the website, app and local media. This is a huge benefit to the elderly and citizens with respiratory conditions who can opt to remain indoors.

Waste management: Santander is expecting to reduce CO2 emissions and significant costs with its just-in-time bin collections.

Light/temperature: Information on ambient light levels and traffic and footfall levels means the street lights can be automatically dimmed when not required.

Noise pollution, potholes and anti-social behaviour: The local university has created a map identifying areas with the greatest levels of noise pollution, while citizens can use a city app and their smartphone camera to report potholes, fly tipping or graffiti. New incidents are now typically solved in four to six days, compared to two or three weeks in the past.
Key Principles

4.07. The approach to change will be driven by a number of key principles:

- **“One Greenwich”:** transformational change cannot be delivered by the Borough working in isolation. The Council will work in partnership with all public sector, voluntary and community organisations active in Greenwich – such as the NHS, the Metropolitan Police Service, Transport for London, Job Centre Plus, registered social landlords, and colleges and universities – to develop an integrated approach to service transformation, in which all partners share and reuse their data and assets to deliver the best results for Greenwich citizens in the most efficient ways possible.

- **Universality and inclusivity:** public services, by definition, should be accessible to all. The Council plans a step change in the delivery and use of digital services and digital means of citizen engagement, which will be complemented by improving digital skills, awareness and access across the community to ensure that no one is left behind.

- **Citizen-centricity:** the needs and aspirations of citizens will drive all aspects of our approach to service transformation. This means working towards a one-stop service for citizen and business interactions with the Borough, which is available anytime, anywhere, over the channel of the citizen’s choice, and built around their needs not the internal structures of our organisations. The aim will be for the great majority of Greenwich citizens, the great majority of the time, to choose to use digital channels on a self-service basis.

- **A consultative and collaborative approach:** the Council sees service delivery as a collaborative process in which citizens are active co-creators of public services. It will empower people to create their own solutions both to their own needs and to the needs of others in Greenwich. It will also use new, digitally-enhanced forms of civic engagement to ensure direct, meaningful and real-time participation of citizens in the planning, policy, budgeting and management decisions of the Council. The Council is already partnering with organisations at the forefront of new approaches to citizen engagement and obtaining views from citizens in real time. The Council will look to extend these approaches to all areas of its activity.

- **Evidence-based and outcome driven:** the Council will set and report on clear performance indicators for the outcomes it is committed to achieve. As more information becomes available - from technology embedded in Greenwich’s infrastructure, and worn or carried by individuals, as well as Council initiatives – there is the opportunity to develop a real-time, event-level understanding of what is happening in the Borough. We will also explore the use of data gathering and analytics to exploit that opportunity, in order to improve and personalise public services in real time, to strip out waste by matching supply more precisely to demand, and by enhancing our ability to predict, anticipate and head-off problems before they emerge. The Council will encourage the community to make good use of this data, while ensuring at all times that the privacy of people’s personal data is secure.

- **Greenwich Council as an outward looking, “learning organization” with the flexibility to develop new approaches:** the Council is committed to learning from others’ experience and, indeed, from its own, in order to improve performance; it also needs to promote a culture of challenge and experimentation to develop new approaches, and also develop new skill sets to be able to adopt new technology and explore any organisational implications. In developing
Stickyworld

Advances in digital technology provide new opportunities to involve residents and businesses in local decision making. Indeed, the world of citizen or customer engagement is changing fast. At the forefront of this development is Stickyworld, formed in 2010 by Michael Kohn, and located in Greenwich, thanks to the Borough’s commitment to its digital cluster, access to postgraduate skills from the University of Greenwich, and good connections to London and beyond.

Stickyworld facilitates online engagement in a way that is ideal for physical developments within an area district, which makes it perfect for presenting urban design and architects’ proposals. Instead of the traditional one-to-one engagement, it enables communities to create a dialogue among themselves, and with the developer or local authority, resulting in a richer and more meaningful response.

The Royal Borough of Greenwich chose Stickyworld’s approach to obtain feedback from citizens on a TfL funded major public realm improvement scheme at Eltham High Street. The lead consultant, East Architects, used the Stickyworld platform to create their own interactive websites to serve different stages of the project – introducing initial concepts and plans, allowing citizens and businesses to make notes on the area maps or pictures, or reply to others’ comments. These were analysed, revised plans drawn up, and the process repeated: visitors to the site could zoom in, to inspect the detail of the plans, and comment on line or in writing.

As Will Greasley, East Architects, said, “A significant benefit of the platform is the way it facilitates conversations, allowing questions and comments to be made in direct relation to online content. This is highly beneficial as it reduces the chance of miscommunication, and encourages focused engagement.”
national policy for smart cities, the Department for Business commissioned Arup\(^29\) to review developments in six global cities recognized as thought leaders. One element they had in common was the establishment of a small specialist team to support service transformation, to provide an independent view about the potential for new approaches and the ability to forge partnerships with others; they also had a small budget to pilot and facilitate change. Given the importance of the concept, the team reported directly to the Mayor or CEO.

### Developing a Roadmap for Change

4.08 Putting the above principles fully into practice in Greenwich cannot be done at once. This is a transformational journey which the Council and its stakeholders need to go on together over a period of years. The Council will work closely with stakeholders to develop the roadmap it will use to manage that journey. It will do so using the best practice framework recommended in the PAS 181 standard, which:
- Takes a phased and incremental approach
- Balances the need for Borough-wide change management, on the one hand, with the need to foster locally-driven, community-level innovation on the other
- Takes a ‘viral’ approach to implementation: that is, establishing the business processes, capacity, and structures that can drive transformation and create sustained improvements over time, even if all steps of the transformational journey cannot be planned in detail at the outset.

4.09 Our aim will be to publish this Service Transformation Roadmap in the first half of 2016. Key elements the Roadmap should address include:

1. **Confirming the view** of what a ‘smart future’ for Greenwich will look and feel like.
2. **Committing further to smart data**, i.e. ensuring that appropriate data on the performance and use of Greenwich’s physical, spatial and digital assets is available in real time and on an open and interoperable basis, in order to enable real-time integration and optimization of city resources.
3. **Building a partnership across data suppliers and users in Greenwich** (including the Council, its suppliers, the utilities, and other major service providers and asset owners in the Borough from across the public, private and third sectors) that is committed to progressive opening up of Borough data against agreed standards of interoperability and privacy protection.
4. **Empowering the Greenwich community to drive service transformation**. The Council will make available information to small businesses, social entrepreneurs and individual citizens, enabling them to design and deliver public services themselves, to use creatively anonymized public data with other data and to create new sorts of value (both ‘public value’ and commercial value).
5. **Delivering one-stop, citizen-centric services**. The Council and its partners will apply smart data and more citizen-centric ways of working to engage citizens, businesses and communities directly in the creation of services, ensuring that these are built around user needs not the Borough’s organizational structures. The Council will work towards providing citizens and businesses with public services accessible in one stop, over multiple channels.

6. **Digital services for all.** The Council wants the great majority of Council services to be accessible over digital channels - not because service users are forced to do so, but because they choose to do so in order to receive better services. This means not only radically improving the quality of digital services, but also ensuring that none of our citizens are left behind. Moving to universal digital delivery offers the potential for very significant operational savings in the Council and, for many residents and users, a better way of engaging with the Council. The Service Transformation Roadmap will set out the plan for doing so, through targeted investments and cross-sectoral partnerships aimed at tackling the access, skills and trust barriers which still deter some Greenwich residents from engaging fully with digital technology.

7. **Establishing governance and stakeholder engagement processes** to support and evaluate these changes, including through:

- **Establishing an Innovation Fund to pilot new approaches:** to help manage the risk of new innovative approaches, the Council will establish a fund to pilot new ideas against its own strategic priorities and obtain feedback from users. This will make it less reliant on external sources to develop ideas in areas of importance.

- **Developing a secure Borough-wide IT architecture,** as part of the strategy to develop ultra fast broadband across the Borough and a platform approach to service delivery.

- **Establishing a digital/smart borough transformation team,** reporting directly to the CEO. Digital Greenwich will be responsible for:
  - Leading the Council’s engagement with stakeholders to develop our Service Transformation Roadmap
  - Managing the Innovation Fund and identifying good practice and where technology and data can best be used to solve problems
  - Developing a detailed framework to measure and to report publically on a) the Borough’s performance in delivering our Service Transformation Roadmap, and b) the benefits that this delivers, mapped against key performance indicators.

4.10 In the light of the above, the Council will:

- **develop a roadmap for change [by Q2 2016] which:**
  - Creates a shared vision of what a ‘smart future’ for Greenwich will look and feel like
  - Invests further in smart data
  - Builds an open data partnership across all elements of Greenwich’s services
  - Empowers the Greenwich community to use that data to drive service transformation
  - Delivers one-stop, citizen-centric services
  - Ensures that no Greenwich citizen is left behind, with all able to benefit from digital services
  - Establishes governance and stakeholder engagement processes to support and evaluate these changes, including through: establishing an Innovation Fund to pilot new approaches; developing a secure Borough-wide IT architecture; and establishing Digital Greenwich as the digital/smart borough transformation team, reporting directly to the CEO

- **seek to engage with other cities,** with a strong commitment to smart city principles, to share experience and learn from the best.
The digital revolution is enabling cities to work in smarter, ways to address mounting twenty-first century challenges. More than ever, location is being used as a way of unifying and making sense of growing volumes of data within IT systems. Ordnance Survey’s role in providing an underpinning location framework is evolving rapidly to support smart cities.

**Transport:** We will integrate multiple data types to support end-to-end multimodal journeys and mobility-as-a-service.

This will mean, for example, integrating public transport routes, supporting vehicle sharing apps and providing the data infrastructure to enable autonomous vehicle navigation.

**Internet of Things (IoT):** The OS data framework is invaluable for providing location context and cross-referencing to enable IoT devices to efficiently connect to other data and services.

We will develop this role for the IoT by providing support for machine-to-machine data services built on location-awareness and persistent identifiers.

**Built environment:** We will develop our detailed mapping data to serve the needs for smarter infrastructure and property management, particularly Building Information Models (BIMs).

This will involve bringing together a range of OS and other data to support city models with 3D intelligence and indoor and underground applications.

**Predictive analytics** Demand is growing for hyper-local information in big data systems to predict environmental, social and economic factors.

We are aggregating third party information with OS data and creating interfaces that will directly support analytics-as-a-service.
Section 5

Creating a Dynamic Economy and High Value Employment.
5. Creating a Dynamic Economy and High Value Employment

This chapter focuses on the Greenwich economy and its resilience to further economic and technological change, and it sets out the steps the Council will take to improve economic growth, productivity and the quality of jobs within the Borough.

5.01. Recent reports prepared by GLA Economics\(^{30}\) confirm that London is steadily recovering from the financial crisis of 2008/9. Indeed, it has recovered more quickly than the rest of the UK economy with the result that the London economy now accounts for 22% of UK output and, in some key knowledge based sectors, even more, particularly financial services and insurance (50% of UK output), information and communication services (36%) and professional, scientific and technical services (34%).

5.02. However, as the chart below shows (taken from Figure 6, Current Issues Note 43, March 2015, GLA Economics\(^{31}\)) the growth in the London economy has not been evenly spread, with significant growth in the Inner East and West Districts and much slower growth in Outer London. Output per head in Outer London (East and North East), in which Greenwich is situated, was £14,731 in 2013 compared to Inner London East's £38,921 and the UK average of £23,755. Moreover, it has grown only 11% in real terms (i.e. accounting for changes in the Consumer Price Index) over the sixteen year period 1997-2013, while productivity in Inner London East, which includes Canary Wharf, has increased by almost 70% over the same period, and the UK average by 25%.

5.03. In analyzing the Greenwich economy, the starting point is the structure and composition of Greenwich business, drawing on Table 1 from the Introduction, which shows the relative importance of the different business sectors within the Borough and the average output per head of each. Some 40% of employment in the Borough lies in the public sector, including education, health and social care and public administration, and 90% of all jobs are in

\(^{30}\) https://londondatastore-upload.s3.amazonaws.com/dataset/london-economy-today/LETMar_15.pdf

\(^{31}\) http://www.london.gov.uk/sites/default/files/GVA%28I%29%26%20GVA%28P%29%20estimates%20for%20London%20current%20issues%20update%20.pdf
service sectors, with a strong presence in retail/wholesale activities, transportation/storage, accommodation and food services, administration and support services, information and communication services, and professional, scientific and technical services. There are three key areas of concern:

(i) The productivity of employment, and hence the wages, in these sectors of importance to Greenwich is often considerably lower than the London average, and even below the UK average.

(ii) Up until now, low value service sectors have provided important employment opportunities for the relatively low skilled in Greenwich and other urban areas. However, the technology change that is sweeping through many service sectors raises the question of how resilient the Greenwich economy – indeed, the wider service economy - is to computerization. Research by Frey and Osborne suggests that almost one third of jobs in London are vulnerable to computerisation over the next 10-20 years and it is lower paid jobs, with simple replicable tasks, which are most at risk. 63% of these lower skilled jobs are in the high risk category compared with 30% overall, with service, sales, and administration and support posts being the most vulnerable. It cannot be assumed that Greenwich will be able to rely on these jobs in future. Table 4. below, setting out the skill levels of the Greenwich workforce, suggests there is no room for complacency: many jobs fall into the “at risk” category and, with continued downward pressure on public expenditure, public sector employment can no longer be considered as ‘safe’ as it once was. Furthermore, notwithstanding the improvement in employment prospects over the past year, Table 3 in the Introduction, providing an analysis of the occupations of those receiving Job Seekers Allowance for more than one year, points to the difficulty of those in low skilled service jobs finding employment

Table 4. Skills Profile of Greenwich Residents
(iii) The size composition of businesses in Greenwich has shifted from being dominated by large manufacturing or utility businesses to a micro-business economy where, in 2012 85% of the firms and 50% of output was generated by firms with less than 10 employees. While a microbusiness economy is not necessarily more vulnerable to the vicissitudes of the business cycle or technology change as one containing large firms, microbusinesses, particularly in the early years, have a much higher failure rate and face a tougher challenge of developing their markets and raising the finance to do so. However, it is those that succeed which are generating the employment and growth in the UK economy.

5.04. As the Frey and Osborne study also indicated, knowledge intensive services, such as management, technology/computing, creative activities, education, and jobs with a high degree of personal customer care are most resilient to computerization. Indeed, a study of LinkedIn profiles over the past five years, shows a significant increase in occupations with high levels of digital skills, such as in software development, social media, data science, user interfaces, digital marketing and cloud services.

The Greenwich Vision and Strategy

5.05. Our approach to secure sustainable long term employment for our citizens is, therefore, to promote those areas most resilient to computerisation and to support the improvement in the productivity and quality of jobs in the Borough, and access to these jobs beyond the Borough boundary, in particular by developing a cluster of high value digital businesses at the forefront of urban innovation, in the creative and design industries and in modern manufacturing, such as 3D printing. We shall also seek to strengthen the resilience of established Greenwich businesses by making them more aware of how to exploit digital technologies.

5.06. Our Strategy is based on a number of important elements:

(i) Developing a high specification digital infrastructure: this was covered in an earlier chapter and is clearly central to our ability to create a world class digital cluster, with its ever increasing demand for speed and bandwidth, and increasingly, businesses from all sectors and those wishing to work from home.

(ii) Prioritising our efforts around the key elements of the digital economy, where the opportunity for innovation by SMEs is greatest. In the modern digital economy, the new raw material is data, the new capital equipment for capturing and transforming it into valuable services is ICT and the new high level skills are how to model, validate, analyse, manage and apply it. Service solutions delivered in one sector can be rapidly transferred to another – very often delivered off the same cloud based platform - and SME resilience and growth is similarly linked to that ability to develop a diverse range of customers. Partly because of their importance to the urban innovation agenda, partly as a result of digital businesses already emerging within the Greenwich cluster, and partly with a view to future development, the following broad themes are areas where business clusters are likely to emerge:

   a) internet security;
   b) data analytics & visualization;
   c) robotics & autonomous systems;
   d) additive manufacturing, rapid prototyping & digital design;
   e) service design & citizen/customer engagement;
   f) applications which exploit the Internet of Things and integration of data;
Creating a business: In 2009 Dr Anders Johansson was becoming well known on the world’s academic stage as a leader in the analysis of crowd behaviours and dynamics. Fiona Strens was running a consultancy business focused on scouting out technology with disruptive potential in the security and safety sector. The two came together when Anders won the London Business School sponsored Global Security Challenge and, on a handshake, it was agreed to create a joint venture called CrowdVision to develop and commercialise live crowd analytics technology using video analytics techniques.

Where it all started: The first customers were in Mecca, where the company’s software product provides the safety authorities with early warning of danger and enables preventative crowd management. The safety record around the Jamarat plaza in Mecca has improved dramatically since the system was installed. Unfortunately, the CrowdVision deployments do not extend as far as the location of the tragic Mina crowd crushing accident in September 2015, so our work needs to continue.

Branching out: Between 2009 and 2014 the company gradually grew, taking on new staff and winning new customers – ranging from Police Forces for crowd safety in the 2012 Olympics to exclusive car show and music festival organisers looking to optimise their events. The founders pitched ‘dragons den style’ to several UK Angel Investor networks and secured enough funding over several years to sustain the business and create exciting new products.

Taking off: Since 2013 the focus has been on airports. A ‘Smart Airport’ solution was trialled close to home at London City Airport and then adopted large scale across the whole airport. It measures passenger numbers and activity and is used by operations staff, planners and executives to measure performance and inform real-time and planning decisions. The technology is now deployed in many airports, including some of the busiest and most prestigious international airports in Europe, the Middle East and the Americas. In March 2015 the company brought on board a large new investor providing the funds, skills and relationships to drive growth in the airport sector and beyond.

A place we call home: Since the summer of 2012 the business has chosen the Greenwich Digital Enterprise hub at Mitre Passage as its base. The value-for-money rates, good quality accommodation, community of like-minded innovators, and connected location make it perfect for a rapidly growing technology company. As we hire for growth we look for excellent people with a passion to build our business. Our reach is now international – we’ve just opened our New York office - and we benefit from the richness in backgrounds, culture, skills and languages that our highly diverse team brings. Several of those people were educated and live in the Greenwich borough, strengthening our links with the local community.
Importantly, these themes are central to the emerging “smart city”, service transformation agenda – whether it is intelligent transport/mobility systems, health and adult social care, resource and energy efficiency, reduced emissions, or city/social interaction. They will help to transform old, and create new, value chains in areas such as autonomous vehicles/autonomous logistics and construction. But these themes and these skills also underpin wider developments in the digital economy and, hence, offer the prospect of even stronger growth. However, business growth in new emerging markets presents a variety of challenges and we need to ensure our digital entrepreneurs have access to space, have the right leadership and management skills to build their businesses, and have access to finance to enable that growth.

(iii) **Improving the resilience of established businesses to digitalization.** The Greenwich E-business programme has been an important and valuable tool in raising awareness of the way digital technologies can improve business processes, reduce costs, raise profile/customer awareness and satisfaction, all of which improve business competitiveness and performance. We will strengthen the awareness of Greenwich businesses to the value and importance of this programme and seek additional funding to develop complementary activity;

(iv) **Capitalising on our Higher Education Institutions (HEIs).** The Borough is fortunate to have three excellent HEIs within its boundary, providing highly qualified young talent and developing intellectual property through their research programmes. There are a wide range of programmes for transferring knowledge between HEIs and business, and for supporting business capability, and we need to ensure that Greenwich SMEs are aware of these opportunities and to identify new areas for collaboration between universities and business – including universities from across London.

- The University of Greenwich has a number of research centres, based on the University’s strong traditions in architecture, computing and engineering, which offer significant capability in the area of urban innovation and, more broadly, related to the digital economy. The University has a strong interest in supporting faculty and students to commercialise their knowledge and already has a number of spin-outs, including several operating in the Council’s Digital Innovation Centre at North Greenwich cluster.

- Ravensbourne, with its world class capability in digital design, 3D printing and rapid prototyping, is seeking to develop further its research capability and has formed its own cluster of micro-businesses.

- The Trinity Laban Conservatoire of Music and Dance is at the forefront of innovation and creativity in the performing arts, an area of growing importance in the world of digital marketing and digital publication.

(v) **Training our young people to seize the opportunities of the digital age.** An analysis of apprenticeships being undertaken over the period 2005-2015 (see Table 5. below) highlights the low numbers embarking upon apprenticeships in ICT and the relatively high numbers in retail and business administration. This may be because the vast preponderance of ICT businesses in the Borough are micro-businesses, employing less than 10 people, who find it difficult to engage with the Apprenticeship system – a difficulty identified in the recent report by The Centre for London: “This is for Everyone: Connecting Young people and the Tech City Cluster”\(^34\). The Council will seek to improve the links between our digital firms and the

Real time whole system emergency care intelligence in your pocket

**Transforming Systems is born:** Transforming Systems was established in 2009 as a result of the delivery challenges observed in preparation for, and in response to, the H1N1 Swine flu pandemic. In a Joint venture with the University of Greenwich School of Computing & Mathematical Sciences and the NHS Medway Primary Care Trust, who provided seedcorn funding Transforming Systems took the emerging lessons and developed “SHREWD” - the single health resilience early warning database.

**What is Shrewd?** Shrewd addresses a number of common challenges, such as: lack of agreed indicators that are shared across a health economy; siloed planning and response to system resilience and critical data not being shared; poor communication systems across organisations, information rarely delivered in a timely fashion, reporting process was flawed, slow speed of operational response due to poor data; lack of an audit trail; and limited strategic system oversight for those needing to make an operational or strategic response. Shrewd is part of a process that helps to engage health economy partners in more effective sharing of mission critical information and helps coordinate an efficient and effective response to system escalation. It collects data, agreed with health economy partners, and presents it in an accessible way, in real time in response to growing system pressure.

**Key Features:** Shrewd facilitates a whole health economy agreement on what are the mission critical indicators for each organisation and helps identify system escalation triggers. It identifies where in the urgent or emergency care process pressure is, or is building, and within 3 clicks can identify the granular detail of what is contributing to that pressure. Most importantly, it builds in a live escalation response with a teleconferencing system, actions allocated to individuals with system alerts if an action is due and when it is overdue. The system can be personalised: in one click, any indicator on the personal dashboard can be set to push an alert to any mobile phone or device. It provides a powerful response to unplanned major incidents such as a terrorist attack or major road accident.

**Business Growth:** Since 2009 Transforming Systems has grown into a smart and flexible company, that can expand or contract its capacity through its developer and consultant network. It currently employs 10 staff with an Australian Office for overnight development and a just in time development facility in India. It is funded by 9 contracts with Clinical Commissioning groups and has a further 4 new contracts and 13 areas in contract negotiation or early stage development. It makes active use of its links with the University of Greenwich and has a range of new products already in development and testing all of which have been funded; these include a predictive analytics system, a real time beds system and a live primary care dashboard. As a result it is expected to double in size over the next 12 months.

**Example of Successful Deployment:** Shrewd has now been successfully deployed by CCGs in Kent, Southampton, Hampshire and is rolling out to Surrey and Sussex CCGs this year. A longitudinal impact and cost benefit analysis study are being planned. Thus the main impact to date has been the development of an agreed comprehensive whole health system data set, which is operational and built in to agreed action and recovery plans – giving users the capability and confidence to handle any crisis.
world of education to raise awareness of the employment opportunities afforded by the
digital economy, encourage more young people to pursue ICT Apprenticeships and, crucially,
to simplify the process for SMEs and microbusinesses.

Table 5. Apprenticeships in Greenwich 2005-2014

![Graph showing Apprenticeship Programme Starts in Greenwich (2005/06 to 2014/15)]
(vi) **The Council to create its own Innovation Budget and establish Digital Greenwich to play an active role in bidding for projects:** The importance of the Council piloting new ideas, to tackle some of the acute challenges it faces, and to set aside a small Innovation Fund for that purpose, was discussed in the previous chapter. Such a fund not only indicates the seriousness of intent regarding developing innovative solutions to urban challenges, but will also enable the Council to develop its own priorities for action, while enabling it to leverage in external funds and partners as the opportunity arises. Our aim is to develop our own capability in urban innovation and design linked to smart city capabilities (including Building Information Modelling) and, instead of being a passive partner and location for experimentation, Digital Greenwich will take an active role in commissioning pilots on behalf of the Council, identifying potential partners, managing projects and being accountable for the outcomes. It will thus help to de-risk innovation for the Council and become a focal point for the Borough's digital ecosystem.

(vii) **Disseminating and Raising Awareness – developing an Urban Solutions Platform:** An important part of the shift to a digital economy has been the shift to developing cloud or platform based approaches to matching service offers with demand and providing secure collaboration space for partners to develop their projects. The Council believes these concepts apply with equal force to the broad area of urban innovation. To this end, Greenwich is working with partners to develop the concept of a cloud-based data integration and Urban Solutions Platform. This will provide a data management, data analytics and visualization capability to enable the effective use of operational data, and open up new innovative opportunities, based on new insights obtained from the data. We believe this will be an important attractor for innovative SMEs.

(viii) **Creating Export Opportunities:** As the BIS report 35 on the global opportunities for smart city solutions indicated, this is a rapidly growing market that is projected to increase to over $400 billion by 2020. The report also considered that UK expertise should result in UK firms securing some 10% of that market. Moreover, research by UKTI indicates that firms that export are typically more productive than counterparts who only sell in the domestic market. Thus, a more export oriented Greenwich cluster will be a more dynamic and prosperous cluster. Having proven their capability, we therefore need to ensure that Greenwich businesses are aware of, and well placed to seize, this huge opportunity. There are two important avenues:

i. Horizon 2020 is providing a focus on this topic which is opening up opportunities for UK businesses to collaborate with European partners to provide the solutions to urban challenges;

ii. The Mayor of London’s Export Programme 36, working in collaboration with UKTI, provides support to London SMEs to export and one of the areas identified for activity is urban innovation.

5.07. The Strategy outlined above aims at nothing less than a significant transformation of the Greenwich economy to capitalise on the digital revolution and specifically the application of digital technologies within the urban environment and field of smart city innovation. It requires not only a considerable degree of policy alignment and co-ordination between the Council, other agencies and its business community, but also the flexibility to take a leadership role in European and Innovate UK projects.

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36 https://www.london.gov.uk/priorities/business-economy/for-business/trade-missions
5.08. To achieve this, the Council will:

- Lead the development of the Greenwich Digital Cluster and work with Visitor Greenwich to bring about a “smart” visitor economy.

- Further promote the growth of digital businesses by building on its current activities including the Innovation and Skills Centres in the Borough to provide space, knowledge transfer and skills/business support programmes to Greenwich entrepreneurs.

- Use the Innovation Fund to enable Digital Greenwich to commission pilot projects in support of the Council’s objectives for service transformation and business growth and encourage innovative SMEs to come forward with solutions.

- Work with partners to develop the concept of a cloud based data integration and Urban Innovation/Solutions Platform and attract innovative businesses to develop new digital apps with the data.

- Play an active role in helping Greenwich businesses internationalise through EU programmes and London’s own Export Programme.

- Create stronger links between businesses and schools working through the Greenwich Education Business Partnership and training providers to promote stronger links with Greenwich digital firms and encourage the greater uptake of ICT Apprenticeships, and promote work experience opportunities in the sector, including for those in local colleges and universities, to establish a pool of talent.

- Maintain our current commitment to the E-business programme to help established firms to become more digitally aware and to capitalise on digital technologies. We shall look for other funding opportunities to develop complementary programmes.

- Work with University of Greenwich and Ravensbourne to create opportunities for graduates and local residents to develop new business start-ups and support incubation programmes.
Section 6

The Way Forward
6. The Way Forward

6.01 It is clear from the foregoing that, over the next decade or so, Greenwich will experience a period of extraordinary change, which will present a significant challenge to the Council and to Greenwich citizens. The Council could carry on as it is and wait for events to unfold, and then respond to challenges and opportunities as they arise, or alternatively, seek to change the way it operates, to try to anticipate those challenges, and build in resilience to unforeseen events. The Council believes the latter to afford a far better approach, one that enables a more efficient use of resources, with better outcomes. This report sets out our Vision and how it proposes to proceed.

6.02 The Council’s ambition is to place Greenwich, once again, at the forefront of innovation, particularly urban innovation. To achieve this goal the Council will use all the assets at its disposal, including Greenwich’s prized location in London - Europe’s financial capital and the 8th largest economy in Europe - the space that is available, the knowledge and enterprise of the people of Greenwich, and access to research excellence. The aim is to build on these assets with world class digital connectivity as well as the rapid transport links, which Crossrail, City Airport and Eurostar afford. It is also to become a model of good practice in public service delivery but this cannot be achieved alone: the knowledge and understanding within the Council has to be combined with that of partners and residents, to transform the built environment, the services developed in collaboration with citizens, and to enable the growth of new innovative firms to provide high quality employment. It is, self evidently, a multi-faceted approach which requires leadership, drive and co-ordination. As noted earlier, that leadership begins at the highest levels within the Council, cascading down to empowered officials, and the drive and co-ordination will be delivered by Digital Greenwich, a team focused on developing a smarter Greenwich, which will report to the CEO.

6.03 The role of Digital Greenwich will be to:

- provide the Council with a holistic and integrated vision of urban development, one that successfully anticipates future challenges and balances the economic, social, environmental and spatial agendas to deliver a sustainable, resilient and responsive Borough.

- support the CEO in the process of service transformation and innovation by working with policy teams, within the framework of the British Standards Institution’s PAS 181, to develop priorities and a roadmap and to help manage that change, including managing the risk of innovation by piloting new approaches and developing the business case for scale up.

- act as a point of contact between the Council and Government agencies and other organisations, responsible for research, innovation and good practice, such as Innovate UK, the Catapults, NESTA, the Open Data Institute, and BSI, thereby ensuring that the policies of the Council are informed by the latest developments and others’ experience.

- provide the Council with a global vision in relation to urban innovation and economic development, by maintaining global contacts - particularly in Europe and with the EU Commission - and working in close collaboration with UKTI to ensure that Greenwich businesses are able to exploit their innovations.

- promote the concept of Open Data within the Council and to work with colleagues to encourage the more strategic use of data in policy development.

- ensure that the process of service transformation is transparent, both on the Digital Greenwich web site and in preparing an annual report on progress.

- promote citizen engagement and ensure that service transformation is citizen centric and rooted in neighbourhoods and communities.