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Executive Summary

In this paper I examine connectivity as an imperative infrastructure that enables innovation in London, and how government investment in digital connectivity allows other stakeholders to leverage it to increase their I-Cap and E-Cap.

According to the Connected London team, which is supervised by the Mayor of London, digital connectivity is crucial for creating a strong community, for regeneration and for creating opportunities for all. All of which are Must-Haves to encourage innovation in the city.

Moreover, with an exponential increase in demand for data - driven by increasing numbers of devices, their capacity and power, and the innovation they support – there must be a supporting infrastructure of deep, extensive fibre networks and their convergence with wireless and mobile technologies. Ofcom predicts that by 2024 there will be approximately 156 million connected devices, up from 13 million in 2016. Average data use per fixed line residential broadband connection increased by 36% year on year to 132GB in June 2016, and average data use per mobile connection increased by 44% to 1.3GB.
Furthermore, connectivity can boost productivity. A Rightmove report suggests that SMEs which were able to access affordable gigabit-capable connections could see productivity increases of 7-10 per cent, whereas properties without access to higher broadband speeds see a 20 per cent reduction in their value.
Parag Khanna words capture the importance of connectivity today: "Mankind has a new maxim - connectivity is destiny - and the most connected powers, and people, will win”1.

Introduction

The number of UK start-ups rises to a new record each year, and this start-up revolution shows no sign of ending. Half year into 2018, already 412,366 startups were launched in the U.K according to the StatrtUp Tracker2. According to GEM (Global Entrepreneurship Monitor), U.K is ranked 4th in the world for its entrepreneurial attitudes, activity and aspirations. U.K entrepreneurship success is largely attributed to government efforts since the financial crisis in 2010, to encourage people to set up businesses.

[1] Parag Khanna – Making sense of the future
[2] StartUp Britain - Start Up Tracker

Planning ahead, during London Tech week in June 2017, the Mayor of London, Sadiq Khan, set out his vision for London to become the world's smartest city – with digital technology and data as the fuel for future evolvement, to make the capital an even better place to live, work and invest.[3] According to a recent report by IESE Centre for Globalisation and Strategy[4], London is already Europe's smartest city, and is second to New York in the global rankings.

First the plan addresses London's predicted growth to over 11 million people by 2050. If action is not taken, London's growth will continue to put a strain on its environmental, housing, healthcare, transport and wider infrastructure. The application of new technologies in disciplines of energy, transportation and urban planning, is creating advanced urban services which have the potential to make cities become more productive, sustainable and liveable. Applying data and technology-driven solutions to urban services will help London to manage these pressures better.[5] Second, the plan ensures London's place as a center for innovation. Regarding education, it focuses on providing better digital skills. It provides frameworks for global and city-wide collaboration. It embraces undeserved communities. It provides access to data, to allow making smarter decisions, and it concentrates on improving digital connectivity.
One year on from the UK's vote to leave the EU, the prospect of leaving the EU worries many. The biggest concerns are labor shortages arising from potential curbs on EU immigration, and possible tariff barriers. The U.K government seeks to reassure the global tech community that it remains open to talent and investment from all over the world.
Interviewing Stakeholders proved connectivity as a major asset for innovation, and the ubiquitous of its need. Therefore, the government investment in digital connectivity is essential for London to maintain its high innovation ranking, and to stay relevant in this competitive scene.

[3] Greater London Authority: Mayor outlines ambition to make London world's leading 'Smart City', June 2017
[4] IESE Centre for Globalisation and Strategy report, 2017
[5] Medium: 'A Smarter London Together': Listening Exercise for a new Smart London Plan, January 2018

Methodology

Stakeholder 1: Government

One of the most important features of the U.K innovative ecosystem is the role of the government in its creation and maintenance. Thanks to government policies, starting a business in the U.K today is easier, cheaper and quicker than before.

In the U.K you can register a company within 48 hours, the U.K has one of the lowest corporation tax rates in the G20, the labor force is the second largest in the Europe, and the UK government offers myriad support to start-ups. The available support is published by The StartUp Britain campaign, which was launched in 2011 in response to a government's call for a recovery to the economy led by entrepreneurs. The national campaign also represents small businesses to government and urges for more support where there is an increasing demand.

The government is also encouraging a myriad of co-working spaces. A recent example is Plexal, which the Mayor of London officially opened in June 2017. It is a 68,000 square feet innovation ecosystem, built on the principles of a mini-city to provide entrepreneurs an opportunity to connect with others and have rapid prototyping (stocked with 3D printers and scanners).

To keep London's competitive edge, The Smart London Roadmap to 2020, updated in 2016 and adopted by the mayor of London, focuses on five missions:[6]

- Inclusive technology to provide accessible public services
- City data transparency and security
- **Connectivity – 5G wifi and smarter powers**
- Digital skills
- City-wide and global collaboration

London infrastructure is key to its ability to adapt and stay a global hub for technological innovation. The current provision of connectivity across London needs to improve significantly so that the city can continue to grow and prosper as a digital economy. The number of connected devices, whether on the person, in the home, the street or workplace, is increasing rapidly and is estimated to increase 12-fold in the UK by 2026 (Ofcom[7]). Mobile data use alone is growing at

[6] Smarter London Together - The Mayor's roadmap to transform London into the smartest city in the world, June 2018

[7] Ofcom – Review of the latest developments in the Internet of Things

more than 30 per cent a year.

To achieve world-class connectivity, the government will coordinate investment, mobilise public and private land and assets, lower costs for providers and consumers and increase choice. A Connected London team has been set up, that pledges to: “Improve our connectivity, making it a priority to tackle London’s ‘not spots’ (places that are currently digitally underserved), ensuring better access to public-sector property for digital infrastructure, and treating digital infrastructure with the same status as other key public utilities”.[8]

To enable this next stage, the Mayor will:

- Launch a new Connected London programme to coordinate connectivity and 5G projects.

For example, In March 2018, City Hall, TfL and London boroughs won a £8.5m Full Fibre Network grant to link 50 public buildings to the fibre network on the Tube, and provide extra local connectivity to the surrounding area.

- Consider planning powers, like requiring full fibre to the home (‘fttp’ services) for all new developments, to enhance connectivity in the future.

Today only around five per cent of London properties can afford ‘fttp’ services. Most are still limited to copper delivery methods. By developing policies and tools with boroughs and providers, and supporting their implementation through guidance and training, the government can help the capital resolve digital ‘not spots’, including the Underground and critical transport corridors.

- Enhance public wifi in streets and public buildings to assist those who live, work and visit London.

GovWifi and Govroam are public networks that are being developed, to allow London-wide wifi service, focused on improving flexible working in the public sector.

- support a new generation of smart infrastructure through major combined procurements.

London seeks seed funding from the European Investment bank for a collaborative procurement of smart lampposts for five city regions across Europe, including London. Smart lampposts can include air quality sensors, public wifi, cameras, electric vehicle charge points, electricity for filming and festivals, and potential for 5G roll-out.

- promote common standards with smart tech to maximize benefit.

Improve the design and performance of London’s future buildings, spaces and streets by sharing performance data with designers and engineers.

[8] Mayor of London – Digital Connectivity in London

Stakeholder 2: Universities

Both of my interviewees are PhD students in Imperial College. The two interviewees shed light on key universities' objectives: research, teaching and scholarship and the application of new knowledge arising from these activities. Furthermore, they explained how connectivity is crucial for their day to day operations.

UK universities play a valuable role in protecting and commercializing intellectual property developed at universities for social and economic benefit around the world. The Technology Transfer Office ('TTO') is the part of a university that is responsible for that. The UK is well known for its Technology transfer capabilities and cited as one of the best places in the world to form and scale-up new start-ups. UK universities set up twice as many new companies as the US and receive about twice the equity income from them[9].

UK universities' researchers rely on connectivity. Without connectivity it would not have been possible to:

1. Access research and knowledge online, which is the main source of information.
2. Maintain a network of connections and work with collaborators from different countries. Communication and discussion are two essential elements in research, and few weeks go by without having to connect with other universities. Sharing ideas boosts creativity and allows faster progress in research.
3. Organize tasks among team members efficiently by using connectivity-based tools i.e Trello, Google Calendar, Slack.
4. Work remotely – from home and while traveling.

Stakeholder 3: Entrepreneurs

Connectivity is key to small businesses which are building their reputation and customer repertoire[10]. Beyond its importance as a communications matter, it is the essential fabric that enables worker productivity and drives customer satisfaction. Done right, connectivity can propel a company to new heights; done poorly, it can lose the start-up's competitive advantage.

Using cloud-based technology, with Wi-Fi and cellular data capabilities, can create real-time manufacturing and inventory processes. One of my interviewees is the CEO and founder of Rejuvenation Water, the World's first Amino Acid enriched spring water. He stressed that further transparency and connectivity between all elements of the supply chain is imperative to operate

[9] Imperial Innovations - Technology Transfer in the UK
[10] Inc: Connectivity: The Force that Drive Business, March 2018

more efficiently. In his words: “There are many times where the information we receive is out of date and inaccurate which hampers our ability to make effective and informed decisions”.

Moreover, connectivity allows flexibility and can spur future innovation. There are some real-time applications in Virtual Reality or Augmented Reality that may require super-fast mobile internet connections. This will be especially the case if the input data is large (i.e video streams) or if the computation cannot be handled by the mobile device itself (i.e needs to be performed in the cloud).

Finally, internet coverage came up as a requirement for entrepeneurs. Entrepreneurs tend to work in different places, and thus need the possibility to work efficiently anywhere.

Stakeholder 4: Risk Capital

The main sources of venture capital in the UK are venture capital firms and "business angels" - private investors. When an entrepreneur is looking to start-up or expand venture capital could help do this.

Venture capital in the UK originated in the late 18th century, when entrepreneurs found wealthy individuals to back their projects on an ad hoc basis. In the late 1970s and early 1980s venture capital firms were founded, and this method of financing became an industry. There are now over 100 active venture capital firms in the UK, which provide several billion pounds each year to unquoted companies mostly located in the UK.[11]

Today, it is a world leader in the financial technology (fintech), enterprise technology, e-commerce, property, and travel sectors.[12] The UK’s strong venture-capital scene has created a fertile environment for disruptive tech companies. Despite fears of Brexit-related uncertainty, that slowed investments in 2016, the UK VC market seems to have rebounded. 2017 was a blockbuster year, in which $8 billion+ were invested within the UK. In the last quarter of 2017 the UK financed seven of the top 10 European deals[13].

Venture Capital companies rely on connectivity for their operations. First, to access information and research new trends and businesses. Second, to connect with clients and access clients’ information, which is stored in the cloud. Storing information in the cloud allows saving large amount of information, that is accessible by multiple people, and thus allows working more

[11] Tutor2u: Finance: Venture Capital
[12] Barclays: Venture capital in the UK
[13] KPMG: 2018 VC investment in UK takes a breather after a bumper 2017

smoothly and conveniently.

Stakeholder 5: Corporations

Many large corporations have set their foot in the UK. Corporations enjoy benefits such as a 20% corporation tax rate (the joint lowest in the world's largest 20 economies), tax credits for R&D involvement, the 2nd largest workforce in Europe, and trade agreements with EU and non-EU countries.[14]

Large businesses engagement is a vital part of UK innovation ecosystem. Companies have realized that innovation cannot be achieved in isolation, therefore the dominant model of individual company internal R&D labs, have largely transitioned to open innovation platforms and collaborative networks. The rise of corporate accelerators is one route used to engage with Small and medium-sized enterprises (SMEs). Corporate accelerators support startups through a structured growth phase, with the money, expertise, and potential customer base of the large business. An example in London include the WayraUK, which is supported by Telefonica. Moreover, large firms benefit UK innovation ecosystem with their marketing reach capabilities (i.e brands, sales forces, links to customers) and the ability to get to scale quickly.[15]

Corporations rely on connectivity to enable efficient team work. Inside the organization, all the collaboration tools are cloud-based: Slack (for day-to-day communication), Google Drive (for document storage and collaboration), Asana (for managing tasks), Intercom and Zendesk (for managing customer support tickets and communicating with customers). To conduct meetings with people outside the organization, who are in different countries, corporations need an infrastructure that can support UHD video and voice streaming, including presentations and screen sharing.

[14] Department for International Trade: Why overseas companies should set up in the UK
[15] Nesta: Rethinking the role of big business in the UK's innovation ecosystem

Stakeholders KeyFindings

Stakeholder 1: Government

- The government's comprehensive endeavors, after the financial crisis in 2010, have made it easy and appealing to set-up a business in the UK.

- The Smart London Roadmap to 2020 ensures the necessary infrastructure to support London's prospective growth by applying data and technology-driven solutions to urban services.

- Digital infrastructure and world-class connectivity technologies are prioritized, and treated with the same status as other key public utilities.

Stakeholder 2: Universities

- UK universities' objectives focus on research, teaching and scholarship and the application of new knowledge in the industry.

- Researchers rely on connectivity for cooperation with other universities and access to new information.

Stakeholder 3: Entrepreneurs

- Connectivity is crucial for entrepreneurs. It is used as communications matter, enables productivity and drives customer satisfaction.
- Better Connectivity can spur future growth in technologies that are not fully developed today, such as Virtual Reality, Augmented Reality, drones video streams, IoT and autonomic cars.

Stakeholder 4: Risk Capital

- Despite Brexit-related fears, The UK still has a strong venture-capital scene that creates a fertile environment for new tech companies.
- Connectivity is required to access customers information that is stored on the cloud, to research new businesses and technologies and collaborate efficiently.

Stakeholder 5: Corporations

- Large companies play a significant role in London ecosystem, by cooperating with SMEs (Corporate accelerators) and their market reach abilities.
- Companies rely on connectivity for communication and tasks management. A suitable infrastructure is essential to work with other locations and to work remotely.

Recommendations:

Despite entrepreneurial advantages in the UK, Brexit ramifications make both SMEs and large companies concerned, especially innovative and export-oriented companies. The UK has three key challenges holding the economy back, which could be further accentuated by Brexit: a large trade deficit (imports exceed exports), poor productivity growth (inability to adopt new technologies), and low levels of SME innovation (small resources limit investments).

However, there is opportunity for SME growth post-Brexit. Government-supported initiatives that create the needed infrastructure for SMEs prosperity can spur their progress, for the nation's future industrial success. Investment in supply chains could add £30 billion to the UK economy, create more than 500,000 jobs by 2025 and reduce the UK trade deficit by £4 billion[16].

1. Reliable Connectivity Infrastructure

   Establishing better connectivity infrastructure, by providing London-wide Wifi, 'fttp' services and 5G projects, will maximize collaboration and efficient production. It will boost creativity, allow execution of new ideas and access to up-to-date performance data. Since cooperation and knowledge exchange are the basis for entrepreneurship, connectivity is an imperative component for UK innovation ecosystem.

2. Keep privacy in mind

   Aside the benefits of adopting new technologies, it is crucial to remember privacy and security issue. As the dependence on connectivity increases, the amount of collected and online information expands. Therefore, policies and safety steps must be taken to avoid harming privacy and citizens safety.

3. Training and advertisement of new technologies

   London must adopt new technology to keep up with global competition. However, new technology must be introduced wisely, to ensure that citizens have no problems in adapting

[16] The Conversation: The UK's post-Brexit economy hinges on small businesses and innovation

to technological change. The key to help citizens deal with the changes is to explain what the changes are, why they are necessary, how they will be implemented, and how they are positive and will benefit everyone.

Conclusion

The actions that stakeholders must take to empower innovation are:

- Government involvement and investment in new technologies that leverage data to help with efficient urban management.

- Offer government incentives to keep the presence of large companies, large multi-national workforce, investors and entrepreneurs.

- Treat connectivity with the same status as other urban utilities.

- Offer and encourage open innovation platforms for entrepreneurs from all over the world, and between entrepreneurs and experienced corporations (i.e. Incubators, co-working spaces).

In light of Brexit insecurities and the increasing global competition, these actions can help handling the associated risks and maintain London reputation as a world-renowned place for innovation.

References

1. Parag Khanna – making sense of the future
2. StartUp Britain - Start Up Tracker
3. Greater London Authority: Mayor outlines ambition to make London world's leading 'Smart City', June 2017
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5. Medium: 'A Smarter London Together': Listening Exercise for a new Smart London Plan, January 2018
6. Smarter London Together - The Mayor's roadmap to transform London into the smartest city in the world, June 2018
7. Inc: Connectivity: The Force that Drive Business, March 2018
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14. Department for International Trade: Why overseas companies should set up in the UK
15. Nesta: Rethinking the role of big business in the UK's innovation ecosystem
16. WayraUK
17. The Conversation: The UK's post-Brexit economy hinges on small businesses and innovation

Interviewees

1. Yves-Alexandre De Montjoye, special adviser in the European Commission
2. Axel Oehmichen, leading the development of OPAL, funded by World Economic Forum, worked with Senegal and Colombia governments
3. Ali Farzanehfar, PhD student Imperial College
4. Florimond Houssiau, PhD student Imperial College
5. Pascal Wichmann, co-founder, co-CEO and CTO
6. Kris Ingham, Founder and CEO of Rejuvenation Water
7. Ilya Nazarov, senior solutions architect for fin-crime technologies
8. Yoav Rosenberg, lead Marketing activities for Converge
9. Maurice Kennedy, accountant
10. Clément Weber, Founder and CFO Green Giraffe
11. Connected London team, Mayor of London