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Smart Cities

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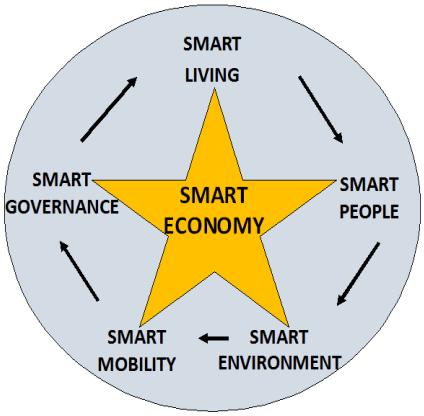
Migration to cities is increasing to the extent that by 2050, approximately two thirds of the world's total population will be living in cities according to the UN. For economic, social and political reasons we have to do more than just cope with this level of urbanisation. As well as efficient and operational, we have to make cities creative, innovative and sustainable places to do business. We also have to make them attractive places to live and work, to attract both skilled people and leading firms. They also need to be inclusive, not exclusive. These challenges gave rise to the concept of 'smart cities', which has been defined as "the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens" (BSI).

Introduction – Smart Cities

For some a smart city comprises of six smart components: smart economy; smart people; smart governance; smart mobility; smart environment; and smart living (see Figure 1). Although each of these components has received individual attention in the past, the smart city conversation focuses on the interactions, interconnections and interdependences between them all. Only by being smarter across these complex systems can we realise the true concept of the smart city, i.e. one that is 'connected, intelligent, innovative and adaptive'

Policy Context

Figure 1: Components of a Smart City



Urban transport systems vary in cost, reliability, efficiency and the places that they connect, in different city-regions. They have a major influence on labour mobility and economic efficiency, linking available workers and jobs that are located in different parts of the city-region. But they also influence the business cultures and social communities of urban environments, connecting or separating clusters of firms and people.

The UK government's call to prohibit the sales of new cars that use petrol and diesel as fuel by 2040, will promote electric vehicles and further the green agenda. Poor air quality has been named as 'the biggest environmental risk' to the health of individuals and dealing with this risk is at the heart of the government's initiative. However, this new £3bn initiative, dubbed the clean air strategy, will affect a range of other components of the urban ecosystem. The smartest cities will not only implement this policy effectively, but leverage a range of other opportunities from this legislation.

It will be hugely challenging to change the current infrastructure for generating and distributing electricity across the UK. A report by the National Grid suggested that peak demand for electricity could add around 30 gigawatts to the current peak of 61GW, which is an increase of over 50 per cent. But this presents significant opportunities to improve both energy usage and transport logistics through connected and intelligent demand-supply systems. Sensors will be able to optimise traffic flows to reduce daily commute times and allocate open parking spaces, therefore making life easier for commuters and urban dwellers. Public transport systems would equally benefit from more precise, real time monitoring of people flows and alternative routing options across dynamic networks.

Public transport systems would equally benefit from more precise, real time monitoring of people flows and alternative routing options across dynamic networks. In fact, the CityVerve project implemented by Manchester City Council is already putting in place 20 kinds of sensor to achieve some of this. This is one element of the broader 'internet of things' enabling data connectivity, monitoring, intelligent pricing and use of our resources and infrastructures.

Smart Firms, Smart People, Smart Places

The other side of the smart city conversation focuses on how to both grow and attract innovative firms to improve economic growth in city-regions. Places compete around the world for skilled people and high-performing firms. According to the SMMT last year there were over 5,000 unfilled jobs in the UK automotive industry.

Regional Context

Therefore, even though city populations are increasing, the demand for particular skills is not being satisfied. In the case of Birmingham, the skills shortage is affecting the automotive sector's ability to maintain growth, let alone flourish, impacting on firms such as Jaguar Land Rover. These attract each other and both are attracted to city-regions that offer good schools, housing, services, amenities and cultural assets and attractions as well as efficient transport systems and clean air. Smart cities are those that continuously leverage their assets to attract great firms and skilled people and are able to invest to improve these assets. They are managing a virtuous cycle of growth and renewal, rather than a vicious spiral of declining investment, poor infrastructure and amenities, low skills and poor-performing firms.

Again, as an example, the new clean-air legislation offers opportunities for city-regions to catch a wave of investments in new technologies, products and services to increase local economic growth. But not all will benefit. Smart specialisation means focusing investment into industry sectors or technologies where a city-region already has a number of competitive advantages. These include existing skills, firms, R&D centres, entrepreneurial clusters and Universities which form the basis for a superior capacity for innovation in the selected field compared to other competing city-regions. In the context of a national industrial strategy the Birmingham city-region does have elements of a competitive advantage for future low-carbon automotive products and technologies. It has a wealth of skills, world-leading flagship firms like JLR and a large number of smaller supply-chain firms as a result of its historical focus on automotive engineering and advanced manufacturing. New investments in alternative fuel sources and battery technology, complementing University-based expertise, such as the Warwick Manufacturing Group, Birmingham's Energy Institute and the Manufacturing Technology Centre at Ansty amounts to a significant head-start if smartly leveraged. Nevertheless, there is a major challenge concerning smart cities which revolves around privacy and data security. In light of recent cyber-attacks, it is vital to consider how these may be prevented as new cars are becoming smarter. In the UK, the government aims to protect consumers and users by implementing strict new guidance, to improve the resilience of smart vehicles in the face of cyber-attacks from hackers. With regards to the future of the automotive industry, this is crucial to prevent hackers from being able to access personal data, start and steal cars that use keyless entry, or take of control of other electronic devices.

This new legislation certainly demonstrates that the UK is taking cyber-attacks seriously and places the nation at the forefront of the new technological developments in smart vehicles. This epitomises the UK's commitment to smart governance and is also linked to improving smart living.

Smart city-regions: opportunities and challenges

The smart city-region concept captures some key opportunities arising from the growing volume of data providing information about all elements of the urban ecosystem. Reliable, detailed data can be distributed and accessed by people and businesses for better decision-making, in the neoclassical economics sense that markets operate more efficiently when we reduce information gaps and asymmetries. More effective connections are also created between technological possibilities and market opportunities, which is at the heart of innovation. Smart city-regions will help businesses leverage data connect their potential products and services to the real demands and desires of customers. The intelligent analysis of data can also support more precise interventions for policymakers to shape city-regions in terms of not just growth, but inclusive growth, creating local opportunities for disconnected and disadvantaged groups as well as high-performing firms.

But there are several key challenges when we look past some of the smart city hype to the realities of implementing smart city visions. Although we have access to growing volumes of data, investment is required to make it reliable, useful and accessible and to enable the real-time integration of multiple data sources needed for many of the smart city applications we read about. Perhaps the biggest hurdle stems from the lack of smart skills and capability in today's workforce. Data, infrastructure, the internet (even the one 'of things') are not smart, in fact cities are not smart. People (some) are smart. Our major challenge is to develop a sufficient volume, level and variety of expertise to be able analyse, interpret and derive meaning from this data. Without the distributed capability to exploit the opportunities presented by a connected, data-rich world, our city-regions may well get bigger but they will not be smart.

Policy Recommendations

City-regions compete with each other to attract skilled and talented people and the most innovative firms. Part of their challenge is to manage and develop the infrastructure, assets and capabilities that underpin their attractiveness, in smart ways. 'Big data' and new analytical techniques can help local organizations monitor and manage across complex city-regions but this in turn needs a particular skill set. This leads to a number of key recommendations for all city-regions.

Recommendations:

- **Developing the right kinds of skills and expertise is central to unlocking opportunities for growth in most city-regions, but particularly Birmingham's.**
- **This refers mainly to the skills and talent to drive up productivity and innovation in firms and regional organisations. But analytical skills and expertise that can help us improve how we monitor and shape the growth of the region are also critical. Resources and incentives to upskill the Birmingham city-region in both ways are needed. This includes steps to improve the retention of skills within the region.**
- **Investment is required to make large volumes of data reliable, useful and accessible. Investment is also required for real-time data to be distributed and processed in smart ways, to optimise decision-making.**
- **Being smart and connected inevitably means that organisations, as well as individuals, are more susceptible to cyber security attacks, so we must invest more into software and systems that make us more resilient to such attacks.**
- **Policymakers and the governance infrastructures they rely on must view each of the components of a smart city as a single, interrelated system, as opposed to dividing it into component parts (housing, transport, skills etc.) and focusing on each separately.**

Sources:

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. Journal of Urban Technology, 22(1), 3-21.
Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for smarter cities. IBM Journal of Research and Development, 54(4), 1-16.
https://www.smartiscity.eu/single-post/2017/02/24/Building-smart-cities-with-sensors
http://ieeeaccess.ieee.org/special-sections-closed/new-era-smart-cities-sensors-communication-technologies-applications/
https://smartcitiesworld.net/transport/transport/uk-takes-the-lead-on-connected-car-protection
https://www.smmt.co.uk/2016/02/5000-jobs-vacant-in-uk-automotive-due-to-skills-shortage/
https://www.forbes.com/sites/iese/2017/05/31/the-smartest-cities-in-the-world-for-2017/#7eddc9db5c4c
http://www.centreforcities.org/reader/smart-cities/what-is-a-smart-city/1-smart-cities-definitions/
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