Public Policy and Skills for Smart Cities: The UK Outlook*

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ABSTRACT

The impact of information coupled with the effects of innovation is profound on all aspects of city life, from transport planning and energy use reduction to care provision and assisted living. But it also includes new ways of organising communities, as well as access to political process. The idea that information is key for the design and management of future cities matures in the relevant communities of architects, planners, engineers, computer scientists and urban innovators, so the time is right to also consider what citizenship skills are required. Familiarity, if not proficiency, in 'digital' skills emerge as essential aspect of future citizenship. We don't only mean however efficient digital consumption skills, but also digital creation skills such as computational thinking and coding, entrepreneurship and systems thinking, information architecting as well as a risk-informed perception of data privacy and security. The challenges of delivering such a skillset are many, from designing a 21st century curriculum, to ensuring fair access to technology for people of all abilities, race, gender, age and class.

CCS Concepts

• **Social and professional topics**

KEYWORDS

Smart cities; smart citizens; public policy; skills development

1 INTRODUCTION

There is a significant strategic focus on the investment, planning and development of physical infrastructure for achieving prosperous cities and regions in the face of many urban challenges in the UK. However digital infrastructure is often retrofitted and even overlooked. But to successfully enable technology promises to materialise we need to view the requirements of both the 'hard' physical utilities and the digital infrastructure as interrelated parts – as well as the process of its delivery, including the design, deployment and operation of it.

Some policies for enabling growth in this area are already in existence. For example, *InnovateUK* is a source of substantial support for future cities technology, with funding programmes orientated towards smart infrastructure, sustainable buildings, data-driven entrepreneurship, sensors and the Internet of Things. In addition, the various thematic *Catapult Centres* form a platform that provides the essential networking, seeding and incubation of ideas to drive forward developments in Future Cities, Digital, Transport etc. Many city authorities have contributed by fostering innovation through incubation platforms, such as the *EngineShed* in Bristol. Plus, a number of making networks like *FabLabs* facilitate hackathon events that aim at bringing the right people together under conditions that nurture creativity. All of these are examples facilitating development of future cities technologies.

However, there exists an underlying presumption in that these forms of support are available and accessible to citizens, who in turn have the skills and abilities to make their ideas come to life. Entrepreneurship, design, technology awareness, computational thinking and programming skills amongst others, are all part of the abilities required to develop urban technologies. If these are to become key civic technology production means, any assumption about skills and abilities of the citizen ought to take centre stage.

2 SKILLS GAP AND POLICY CHALLENGES

What would conceivably be the digital citizenship skillset in a smart city? Are our current educational processes fit for the challenges that future cities are expected to face? Alarmingly, several organisations have independently signalled issues in the pipeline of certain skillsets that would be deemed highly relevant in this context and the future labour markets: entrepreneurship and creativity, design and making, and computational and systems thinking [1]. Albeit economists debate whether there is a shortage of skills related to science, technology, engineering and maths (STEM) [2], there is certainly an imperative for nations to deliver them via their educational systems [3].

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Significant attention to the development of digital competences has been given at European level through the Digital Agenda for Europe. Evidence brought forward document its impact on many vital sectors such as future care services [4]. Across the UK a high-profile debate on reform of the traditional ICT curriculum has culminated in changes (in England from September 2014 [5], with significant reform expected in Wales) that emphasise more the scientific and conceptual aspects of computing, rather than transient skills and applications of information technology. Despite this, the UK and Europe are still perceived to be behind global competitors such as the US, Canada and China. An initiative to address future citizenship challenges e.g. has been developed in the US, where currently 19 states contribute to the 'Partnership for 21st Century Learning' [6]. It addresses leadership, innovation, technology and other key skills (e.g. information finding, presenting, critical thinking etc.).

But education is not just about skills development – and skills should not only be viewed in the context of a job market. The Speaker's Commission on Digital Democracy report [7] highlighted key areas where future citizens should be concerned. These include increased participation in political processes (e.g. engagement with elected representatives, e-petitions, social media debates) and the ability to understand and use electronic voting. Furthermore, the ability of social media to foster community relationships and nurture grass roots movements has already become a key medium for enabling political process and engagement with the public, with high profile examples coming from recent US politics. Thus, with limited or no access to emerging technologies, not only may citizens be disadvantaged with respect to future job skills, but also in terms of participation to community life and political process.

Many would argue that universities cover already aspects of entrepreneurship, design, innovation, teamwork etc. through their current curricula. A recent industrial report highlighted as exemplar several educational Smart City initiatives across the UK [8]. However, the typical university offering is still rooted deeply in 19th century disciplinary silos, delivering skills in sub-divisions of 'science', 'engineering', 'arts' etc. [9]. The traditional curricula served well the science and technology sectors of the 20th century, contributing to the unimaginable boom of digital technology development. We are now seeing however the powerful interdisciplinarity in science and engineering, with computation shaping not just *how* science is done, but *what* science is done [10].

In addition, access to university education is not universal. Traditional academic study is not suited to everyone and socio-economic barriers to university still exist in many developed nations. Therefore, university curriculum alone should not be the focal instrument of delivering these skills. On the other hand, the university as a whole, with its public engagement and widening access initiatives, can be part of the solution, along with new hybrid models of delivery and participation such as massive on-line open courses. But yet again the success of this model presupposes some mitigation of the digital divide.

Besides, for citizens to engage fully with future forms of political process, trust is an essential aspect. This can only be built upon a sound understanding of the nature of technology, public engagement and, where possible, involvement with open innovation platforms (with an example of the latter being 'Bristol Is Open'). There is a need for technology to be viewed as an enabler, as opposed to be demonised and fundamentally mistrusted – which is one of the side-effects of the ever-challenging security vs. privacy debate, especially in the light of recent whistleblowing about government surveillance. Greater transparency of these programmes and judicial oversight would assure the public of the role of technology, without harming the innovation potential of intimate and potentially intrusive technology, e.g. mobile phones, wearable devices.

Unfortunately, there are many other socio-cultural barriers that could prohibit development of these skills. Ethnic minority and female access to STEM careers is still a concern [11]. And a potential move towards a freer market approach in Higher Education may lead to a greater squeeze of funding for the humanities in the UK and globally [12]. This could deprive the field of fundamental thinking and it is hard to imagine a debate on future cities not shaped around the imagery of Fritz Lang's iconic Metropolis, or Blade Runner's dystopian urban landscapes.

3 CONCLUSIONS

Reform of the curriculum from developing baseline competencies to deeper computing, computational thinking and programming skills, is crucial in equipping young people to live and work in a more computational world, as well as changing wider public perceptions of technology and its impact on our lives. Shifting society towards digital creation rather than just consumption would catalyse a profound change in civic engagement. Developing a digitally confident and capable citizenry through long-term technology innovation strategy and industrial policy could be achieved all the way from using open data as policy instrument through to ICTs regarded as 5th utility.

ICTs are essential platforms that can no longer be treated as afterthought. It is inconceivable that an engineer would not consider how a building will be linked to power and water supplies today. In the near future, it should be just as inconceivable for a city planner not to consider how a building will be physically and logically connected to 'cyberspace'. For we cannot afford as a society the citizen to pass on the opportunity to engage with enabling and life-changing technology, given the challenges our cities and communities face.

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