Smart Learning Cities Promoting Lifelong Learning through Working Lives

Michael Osborne, Srabani Maitra and Agnieszka Uflewska

Introduction

Urbanisation is currently witnessing an unprecedented growth with over half of the global population already estimated to be living in cities. This number is expected to grow further, with the United Nations (2018) predicting that by 2050, 68% of the global population will be urban dwellers, due to a rapid rise in population coupled with an upward trend in people migrating to cities from the countryside (WES, 2020). This accelerated pace of urban growth has placed enormous pressures on public service provision for the residents of cities. In addition, the economic, environmental and educational infrastructures of cities are being strained to such an extent that governments and city planners are desperately exploring ways to ensure sustainable and inclusive urban life (Khanna, 2015). As a consequence, novel conceptualisations in urbanism have been emerging, including that of the smart city and the learning city, which depend on ideals of constant innovations. Smart cities can be defined as 'urban areas in which information and communication technologies (ICTs) are used as a tool for pro-viding a solution to the multi-faceted problems that limit their sustainable development in social, economic, and/or environmental terms' (Mora & Bolici, 2017: 252). ICTs, 'lie at the core of the smart city idea', enabling cities to utilise 'networked infrastructures' in transportation, waste management, business services, housing, health, environment and other public and private services to accelerate sustainable urban development (Hollands, 2008, 307). As a result, cities in both in the Global North and the South have been eager to develop their technological capacity to find 'smart solutions [to urbanisation] that are efficient, effective and sustainable' (Borkowska & Osborne, 2018: 356).

According to a World Economic Forum (WEF), *Future of Jobs* report (2018), four technological advancements are expected to dominate between 2018 and 2022: high speed mobile internet; Artificial Intelligence (AI); big data analytics; and cloud technology. The widespread use of these exponentially growing technologies is expected to lead to major transformations in the labour market, especially in the context of smart cities, where these technologies are considered to be the main drivers of economic growth and new employment. A limited number of studies, however, point out the possible negative consequences on workers and their skill sets that might emanate from these technological innovations. Two important concerns are expressed in this context.

First, there is the assumption that by 2022 the 'skills required to perform most jobs will have shifted significantly' (WEF, 2018: viii). Emerging technologies while favouring new skills (such as in design and programming) may end up devaluing other skills necessary for more routinised jobs (Dachs, 2018). According to WEF (2018), '[b]y 2022, no less than 54% of all employees will require significant re- and upskilling. Of these, about 35% are expected to require additional training of up to six months, 9% will require reskilling lasting six to 12 months, while 10% will require additional skill training of more than a year' (p. ix).

Second, such devaluation or redundancy of certain skills may favour particular groups of highly skilled workers while reducing the employability of others (Dachs, 2018), especially those considered low skilled and 'who already bear a considerable share of the adjustment costs of innovation' (Dachs, 2018: 5). Whilst some in middle-skills jobs may be affected by

automation, a recent reportof 32 countries by the OECD (Nedelkoska and Quintini, 2018) argues that it 'puts morelow-skilled jobs at risk than previous waves of technological progress, whereby technology replaced primarily middle-skilled jobs creating labour market polarisation' (p. 8). Furthermore, the effect is likely to be much greater on young people in their teenage years rather than older workers, and this report argues against predictions of adverse effects of automation on highly skilled professions. Nonetheless, many workers are at risk, and there is then an urgent need to focuson the effective ways smart cities can support and facilitate the learning and training ofthe workforce in tandem with technological innovations so that they can thrive in the neweconomy. As Hollands (2008: 310), argues that 'technology has to be utilisable and understandable by the communities that it is supposed to serve … and that ordinary peopleand communities need to have the skills necessary to utilise ICTs'.

While a large number of studies have focused on the 'use of new technologies and a strong pro-business/entrepreneurial state ethos' (Hollands, 2008: 309) as prerequisites for smart city success, provision forwork-related learning opportunities (along with up/re-skilling opportunities) within smart cities is often overlooked in policy literature on urban development and innovation(Campbell, 2012; Borkowska & Osborne, 2018). This omission is particularly glaring given that educational policymakers around the world are facing substantial challenges in keeping up with the new forms of technological literacy required of workers under emerging conditions of smart city growth (Osborne& Hernandez, 2021).

The development of a technological infrastructure is clearly not enough to assure equitable access to work. Changes in employmentpractices and the nature of work that in part are a function of technological infrastructuresdemand a concomitant change in education and training provision, and there is a long- standing argument that this is best faciliated at the level of the region or city. In this chapter,we argue that smart cities in order to be just, inclusive and sustainable, need to incorporatethe principles of *learning cities*, which can 'facilitate opportunities for mutual learning at individual, community and organisational levels, [as well as capture] the potential contributions of all players to a co-constructed future using a smart ecosystem' (Borkowska& Osborne, 2018: 358).

Learning cities (and regions) can bedefined as a 'vehicle to drive place-based lifelong learning across the lifespan through formal, non-formal and informal means' (Osborne & Hernandez, 2021: n.p.). Notably,the European Commission (EC) made thelink between lifelong learning and the development of place through its work in Europe in promoting the learning region concept,arguing that lifelong learning is a key driver for local and regional regeneration. In itsRegions of Lifelong Learning (R3L) initiative it called for the mobilisation of all 'players' involved in ascertaining learning needs, opening up learning opportunities for people of all ages, ensuring the quality of education and training provision, and making sure that people are given credit for their knowledge, skills and competences, wherever and however these may have been acquired. (European Commission, 2002, 174/6).

EC policy at this time placed considerable emphasis on lifelong learning as the most significant strategy for accelerating economicgrowth, creating jobs and becoming the most competitive knowledge-based economy in the world. However, it also acknowledged that lifelong learning should go beyond the economic and play a role in alleviating social

inequalities and injustices, and that a place- based approach offered great potential to meet these goals.

The emphasis on learning as the means to assure the economic well-being of regions had already emerged in the regional innovation literature (see e.g. Florida 1995; Asheim1996; Morgan 1997; Rutten and Boekema, 2007). Asheim (2012) has summarised threeconcepts of the learning region as follows:

The role played by cooperation and collective learning in regional clusters and networks in order to promote the innovativeness and competitiveness of firms and regions;

A socially and territorially embedded, interactivelearning process, making knowledge the most fundamental resource and learning the most important process;

Regionally based development coalitions. (Asheim, 2012: 994)

The subsequent emergence of the *learning city* conception extended placed-based learning approaches, not simply by a narrowing ofgeography, but by the consideration of a wider range of stakeholders, activities and purposes beyond the economically instrumental (Longworth & Osborne, 2010: 373). Particularly in the 'foster a culture of learning throughout life and revitalize learning in families, communities and other learning spaces, and in the workplace' for sustainableoutcomes outcomes (UNESCO, 2015, 7).). UNESCO now promotes the learning cityconcept as a major driver for lifelong learning within its Global Network of Learning Cities (GNLC), and in the *Key Features of Learning City*, one of its six 'pillars' that represent the major building blocks of itsmodel is 'effective learning for and in the workplace' (UIL 2013).

We argue that learning environments within smart cities need to be nested in principles of lifelong learning so that individualsand communities can continue to learn, adaptand innovate 'to meet the challenges that thecognitive development of [the smart city]requires' (Laitinen, Piazza & Stenvall, 2017:120). Additionally, by illustrating our argument with selected illustrative case studies onsmart learning cities from the Global North and South (e.g. Vienna, Amsterdam, Dhaka),we will demonstrate the kind of work-relatedlearning provisions available in global urbansettings. These provisions can be useful for current and future smart cities to facilitate more holistic and equitable integration of workers in the smart economy.

EMERGENCE OF SMART CITIES

The term 'smart city' has progressively attained substantial visibility in public discourses. Primarily shaped by giant information-technology-related corporations such as CISCO and IBM, the concept of the smart city has been rapidly evolving in response to a rhetoric that smart technologies can intensify social connections, civic involvementand the transparency of cities' administrationglobally (Rodriguez & Edwards, 2019).Almost 300 smart cities are planned for China and India alone, while the global market for smart city technologies is expectedto reach $408 billion by 2020 (Saunders & Baeck, 2015). Joss et al. (2019: 19), for example, report that 'repeated mention is made of the smart city's sizeable market potential' in pronouncements by cities, citingUK government estimates as an example. Arup estimates that the global market for smart urban systems for transport, energy, healthcare, water,

and waste will amount to around $400 Billion p.a. by 2020. (Department for Business Innovation and Skills, 2013: 3). Such estimates are now dwarfed by others in the trillions.

Scholars point out that the discourse of a smart city can perhaps be traced back to other 'pre-existing urban imaginaries' as early as the 1950s (Vanolo, 2016: 27). One of the earliest conceptualisations in this context was the *Sustainable City* that became popular in the 1950s in the UK and the US. This was followed in the 1980s by the concept of *Smart Growth* developed under the framework of *New Urbanism* in the US and *Digital Cities* in the 1990s. While Smart Growth was focused on the improvement of the quality of life in cities by proposing corporate-led, technocratic solutions, the Digital City promoted digitalisation as a solution to complex urban challenges (Eremia, Toma & Sanduleac, 2017). It was, however, the concept of the *Intelligent City* that is said to have most impacted smart city visions, mainly through its provisions for e-governance, social learning and ICT infrastructures for city-based development (Vanolo, 2016). Thus the concept of a smart city may not be new. However, it is much broader than previous concepts of cities by encompassing sustainable technologies, infrastructures and communities (Dameri & Cocchia, 2013).

It was in the 1990s that the emergence of smart cities as a concept started to become popular in the US, with numerous definitions being proposed since then (Alawadhi et al., 2012), all varying in focus and functionality according to the specificities of socio-cultural and geographical contexts. These include the technology-centred ramifications of Harrison et al. (2010), emphasising the harnessing of the collective potential of the city through ICT networks incorporating social, physical and business infrastructures (see also Sujata et al., 2016). To illustrate the complicated density of networks and infrastructures, Eremia et al. (2017: 16) adapt an allegory of the 'brain', the quintessential complex web of connections. That such sophisticated complexity is emerging in smart cities' organisation has also been noted by Albino et al. (2015: 13), who through in-depth analysis of various conceptualisations of smart cities point to a tied 'networked infrastructure' as their archetypal characteristic. More recent developments, such as those of Williamson (2017: 82), capitalise on a technology-focused understand- ing, defining the smart city as an urban programmable environment governed by the capacities of coded devices and infrastructures structured and supported by algorithms, programs and codes; a type of sentient space with capacities to think of and for us.

Understood as such, smart cities may differ in their areas of focus, yet tend to be divided into six 'smart' categories, addressing economy, mobility, environment, people, governance and living conditions (Laitinen, Piazza and Stenvall, 2017). Smart cities, therefore, are not expected to be based simply on technologically deterministic visions but to ensure integration and well-being for all citizens in different areas of city life. Examples of how digital services improve the quality of life for residents include the 'Urban flow' project in Helsinki, Finland, which by integrating large geospatial data sets, including those of urban cartography and social media, have enabled instant interaction among the city's stakeholders, thereby improving transparency and creating new pathways and affordances for interconnecting residents and visitors (Soltani et al., 2016). Other initiatives include the 'Smart Nation Singapore' (Ho, 2017) and the 'Fujisawa Sustainable Smart Town' in Japan (Sakurai & Kukuryo, 2018), which are both centred on urban ecological conservation by optimising energy use and drastically cutting down carbon emissions.

SMART CITIES AND WORK-BASEDLEARNING/TRAINING

While the incorporation of smart technologies has the potential to transform cities economically (Hollands, 2008), such technological innovations also need to ensure that workers, especially within the more vulnerable populations, have the necessary skills, learning and awareness in order to access andintegrate successfully within smart economies (Osborne & Hernandez, 2021). Learningand training need to be fundamental pillars ofsmart cities and can help achieve not only labour market integration but social well-being for all (Picatoste, Pérez-Ortiz, Ruesga-Benito & Novo-Corti, 2018).

Being sub-national actors deeply enmeshedin the global trade system (Herrschel & Newman, 2017), cities act as critical nodes through which the impact of the global economy is expected to intensify. This is visible particularly now when the global economy isundergoing drastic changes, with new forms of capitalist development emerging. Known as the 'Fourth Wave', the 'gig economy'(Manyika et al., 2017) and 'the age of artificial intelligence [AI]', this new type of economy, as highlighted by Pelton (2019:11, 167), has significantly altered the mean- ing of work and working life for populationsaround the world. Pelton and Singh (2019:9) emphasise that 'completely automated manufacturing is spreading to every sector worldwide, including health care, education, engineering, and governance of cities', rede- fining conventions and concepts 'that governments and economists have now depended onfor centuries'. According to Schwab (2016), a totally automated supply-side will lead to more cost-effective economic growth. This, however, is predicted to result in high unemployment as well, with '75 million to 375 million of people, [i.e.] 3 to 14 per cent of theglobal workforce' requiring to change occupational categories, as traditional jobs will undergo a wide-scale decimation (Manyika et al., 2017: 1).

Such a profound reorganisation of working conditions is particularly visible across smartcities, which are receptive to, as well as conduits for, quick technological changes, business innovations, Internet of Things (IoT) systems, as well as human-cyber-physical interconnections and interactions. Such citieshave become the critical hubs for implementing the automated solutions within services and manufacturing. The streams of change to production and services have resulted in the rise of systemic informality and marginalisation, along with the emergence of new types of employment conditions. In particular, digitally mediated on-demand (*ad hoc*) work has been mushrooming across smart cities – directly impinging on the livelihood concernsof a wide spectrum of urban residents. For example, in many South-East Asian cities, platform mediated work is gaining importance where work is contracted out to a largepool of online workers. Often, these jobs areshort-term, flexible and usually undertaken by marginalised populations with less accessto more permanent and stable employment, such as people with a disability and women with small children. According to Ménascéet al. (2017: 17), there is also an observable sharp rise in freelancers and 'slashers', thatis people with several jobs by choice; a type of employment already undertaken by 20–30per cent of the working age population acrosssmart cities in the US and Europe.

Given the rise in new types of flexible employment arrangements, a robust learning/ training provision is imperative within smartcities that would include opportunities forformal, informal and non-formal learning,and learning across different sites such as home, workplace, community and others so that all types of learning needs, styles and abilities can

be holistically accommodated (Zhuang et al., 2017). The work-based learning (WBL) model isparticularly instructive here as it recognises that learning and training related to workcannot be limited to formal institutions if itis to be accessible to all types of workers, especially the ones that are from marginalised backgrounds (Osborne, 2004; Seagraveset al., 1996). An important example in this context can be poor low-skilled workers who require significantly more opportunitiesfor training as usually they are less likely to have access to training and face several barriers such as time constraints in adult learning programmes.

The concept of WBL has been variously defined by scholars since the 1980s but perhaps one of the most comprehensive definitions was provided by Brennan and Little (1996) who defined WBL as 'linking learning to the work role, but this does not only mean preparing for a specific job' (p. 8). Thefundamental objective of WBL is to broadenand widen the participation of workers inlearning and training by promoting flexible forms of learning opportunities including adult learning and training.

Building on the above definition, scholars have defined three strands of WBL that can be crucial for smart cities as well if workers are to be reskilled and retrained around smart technologies: learning *for* work, learning *at* work and learning *through* work (Seagraves et al., 1996; Osborne, 2004). Learning for work is broad and includes anything labelledas vocational. It can be delivered through school, home, Internet of Things (IoT) or even interactive media/communicationaldevices at work. Learning at work is primarily related to training and delivered in the company either by company personnel or staff from educational institutions. Learning through work includes skills and knowledge acquired in the process of doing the job.Opportunities for WBL within smart cities will be crucial for broadening the access of all workers to continuing, further and higher education and for developing their capacity to remain economically competitive in the labour market (Osborne, 2004).

Smart cities present particularly compelling sites for adapting these three forms of WBL because of the complex challenges posed by their technology-driven environments. Simultaneously such cities present thepossibilities for creating mass unemploymentand redundancies; yet, the very technologicaland communicational affordances integral tothese cities can be productively sutured toall the three strands of WBL outlined above in order to enable pathways for integrating unemployed/under-employed populationsinto the labour market. The dynamic opportunities for WBL inherent in the IT-related media environments of smart cities must be creatively utilised at various scales to developinnovative paradigms of learning and dissemination of knowledge.

Together, the WBL models need to be underpinned by the principles of lifelong learning that encompass various stages oflife. As Osborne and Hernandez (2021: n.p.) emphasise, a lifelong learning approach to smart city development is crucial as 'the concept is rooted in the integration of learning and living'. Lifelong learning is geared towards not only increasing the employabilityand economic competitiveness of workers butalso encouraging collaboration and collective learning among the workers of the smarteconomy (Maitra & Guo, 2019). Thus, as smart cities rapidly evolve, they create largerand denser connections linking services and communities (Manyika et al., 2017; Ménascéet al., 2017). In this context, in parallel, creating more equitable access to meaningful forms of skill training and lifelong learning initiatives constitutes the basis for fairer, fulfilling and sustainable smart cities.

TOWARDS SMART LEARNING CITIES

Based on some leading examples from cities that have focused on learning to underpin their development, we provide three pre- conditions which can be useful for making 'smart learning cities' that can enable work- based learning opportunities for all. These have commonalities with the fundamental conditions for building a learning city that have been laid down by UNESCO (2013) for learning cities in general: strong political will and commitment; governance and participation of all stakeholders; and mobilisation and utilisation of resources.

It is important here to point out that each city, adopting a learning city approach, will do so in relation to its own contexts and circumstances. Furthermore, no city is homogeneous across its different neighbourhoods, with different strategies being emphasised from area to area. Therefore, each city, whilst having commonalities with others, will need to act in nuanced ways in order to achieve its goals. Nonetheless there are three common pre-conditions for success that we highlight: multisectoral collaboration; a robust governance and legislative system with strong community participation; and provision for work-based learning.

Multisectoral Collaboration

Smart learning cities need to be built on collaboration and collective effort. The need to involve different stakeholders and channelize their potential agency in planning a successful smart learning city is imperative as city and regional authorities in many countries have limited power to control education in their areas of jurisdiction. This is despite the fact that integrated policymaking at the sub- national level is frequently highly effective in tackling inequality and discrimination in urban areas, especially in the context of employment and learning (Osborne & Hernandez, 2021).

In line with above, the cities described below have been able to involve multifarious stakeholders, including at neighbourhood level, whose support is crucial in taking their smart learning cities projects forward. The Learning Neighbourhood project in Cork City, Ireland is particularly notable in this context. Cork, the Republic of Ireland's second most populous city is one of the first 12 cities globally to receive a UNESCO Learning City Award. In collaboration with Cork City Council, University College Cork, and Cork Education and Training Board, it piloted the Learning Neighbourhood programme in 2015 to improve and develop learning. Through its engagement with the PASCAL Observatory, it became an active adopter of EcCoWell (Ec = ecology and economy; Co = community and culture; Well = well-being and lifelong learning) (Kearns, 2012), which is a flexible, reflexive platform that allowed cross-community engagement of severely disadvantaged people with lower levels of formal education or technical training over a wide diversity of fields. Other examples of collective efforts and collaboration with communities in building successful learning cities are evident in other parts of the world, and have been highlighted in cases made available by UNESCO and the PASCAL Observatory[1] amongst others. This is particularly the case in Asia, where Han and Makino (2013: 466) have spoken of 'a community relations model' that considers 'activities to heal and stabilise social issues and foster cultural unity'.

However, whilst Cork and other learning cities have placed their emphasis on multisectoral collaboration, it is notable that social inclusion tends to trump economic development in many initiatives. This is illustrated in Cork by Ó Tuama (2016: 3). The level of engagement with the

economic sector was not as robust. However, given the Beijing Declaration's second commitment – 'Enhancing economic development and cultural prosperity' – the Learning City committee, GLLiC (Growing Lifelong Learning in Cork) co-opted a representative of industry onto the committee in 2015, with the intention of enhancing participation of the economic sector.

One initiative internationally has however overtly addressed the link between learning cities and enterprise. The key objectives of the PASCAL Observatory's Entrepreneurial Learning Cities Network has been as follows:

Working in partnership to contribute to the economic regeneration of a city region through developing skills, knowledge and entrepreneurial attitude in all learners.

Providing examples of good practice to enable entrepreneurial cities to learn from each other.

Researching and developing understanding of successful interventions.[2]

A number of illustrations of the outcomes of that work are found in James, Preece and Valdés-Cotera (2018).

Governance, Legislation and Community Engagement

These features are perhaps most evident in the Republic of Korea, where cooperation between multiple stakeholders is evident at four geographical levels: national; provincial; city/county/district; and neighbourhood. Policies are centrally designed yet locally organised according to the needs of each city. This has been possible because of legislation that mandates the promotion of lifelong learning at national and state level through the National Lifelong Learning Act. One element of the Act saw the creation of the National Institute for Lifelong Education in 2008 to provide national oversight of efforts to develop and implement national lifelong education policies and realise individualised lifelong education services.

Various parts of the Act make specific reference to workplaces and the role of the business sector:

The State and local governments shall aggressively encourage implementation of lifelong education to the founders of organizations, facilities, business places … (Article 5)

The State and local governments shall make efforts to informatize education and to develop a curriculum for lifelong education related therewith in coalition with various levels of schools, civil organizations, and corporations … (Article 22)

The systematic way in which lifelong learning is organised at different levels of geography is illustrated by the structure of 17 metropolitan/provincial institutes for lifelong learning across the country. These promote connectivity between educational organisations and their stakeholders in their jurisdiction, and link with municipal institutes of lifelong learning in 228 cities. These city level entities are charged to provide 'lifelong learning services to local residents in connection with city development projects such as job creation' (Lee, 2019). Further cascading down occurs through creating a lifelong learning ecosystem with a library or lifelong learning centre within 30 minutes travel from every resident, a community centre

within20 minutes, and a very local ‘learning light- house’ within 10 minutes. These organisations offer learning provision of different levels of formality and social/professional orientation. Hence the lighthouses offer basiclife skills, citizenship, and moral and cultural education, whilst the libraries and lifelong learning centres focus on advanced and professional training for work.

This model is systematic, and it is evident that different stakeholders in the system take clear roles, and cities themselves shape the learning offer. The importance of leadership by specific stakeholders is evident in other learning city initiatives, albeit without thenational steerage found in the Republic of Korea. Leadership, for example, can emanate from a formal institution as in the case of Bahir Dar in Ethiopia, where the development of a learning city was led by Bahir DarUniversity (UIL/NILE, 2015: 46). However,other non-formal institutions can also lead, asin the case of Australia and Canada where thecity library has been the main coordinator in cities such as Hume, Townsville, Victoria andVancouver.

By contrast with the top-down approach, wecan also find initiatives that have overtly soughtthe participatory engagement of communities from the outset, in what is often describedas Smart City 3.0, where citizens become active co-constructors of developments(MacPherson, 2017). A prominent example ofsmart city planning is the Amsterdam Smart City Program, launched in 2009 to address issues around pollution, energy consumptionand environmental equality in the city. From itsvery beginning, the project encouraged activecitizen participation in formulating smart initiatives. Decision-making was made a collaborative process by fostering ‘strong cooperationbetween key stakeholders – namely, social bodies/citizens, public bodies, universities/research centres and companies’ contributingto the creation of a regional knowledge net- work (Borkowska & Osborne, 2018: 366). It isthus an initiative that brings together citizens,innovative companies, knowledge institutions and the public (the quadruple helix, seeBorkowska & Osborne, 2018) within one plat-form and affords the opportunity to collectivelyshape the direction of the city. The fact that thecity makes all its data online and open has significant implications since this is the basis forcitizen-led innovation. This creates opportunities for self-employment and entrepreneurshipthrough an incubator, StartupAmsterdam, thatcreates related data-driven challenges for start-up companies.

What is particularly notable about the Amsterdam Smart City project is how the proposed smart solutions were not a top-down implementation of smart technologies,but were attentive to the ‘cultural profile of the country where attention to environmentalissues, digital experience and high democraticvalues are central components in generating sustainable change’ (Borkowska & Osborne,2018: 367). Amsterdam’s comprehensive andcommunity-based approach to smart city development is significant given that many other cities around the world have not been able to incorporate citizens as active users and co-producers of urban environments.

Provision for Work-Based Learning

As pointed out earlier, within smart cities, the requirements for skills and competenciesof the workforce evolve rapidly. In order to address such needs, cities require not only public institutions of higher education butalso private training providers, community groups and employers so that they can work collaboratively in developing provision for work-based and lifelong learning. It is important however, to keep in mind that the work-force within smart cities is not homogenous and can constitute different vulnerable and marginalised groups

based on their gender, class, age or ability. As such, work-basedprovision needs to respond to the learning and training needs of these different groups by foregrounding different forms of formal, non-formal and informal learning and training opportunities. While formal learning is more institutionalised with a defined curriculum and qualification, informal and non- formal learning are considered to be more flexible, experiential and non-institutional,specifically focused on the needs of vulnerable groups of learners (Foley, 2004; Malcolm, Hodkinson, & Colley 2003). It is the synergy of these different forms of learning that we see in some of the examples of smart cities that provide successful WBL opportunities for its citizens.

An exemplary programme in this context is the SkillsFuture movement that started in Singapore in 2015. The purpose of the pro- gramme was to support the Singaporean workforce by drawing on a multi-stakeholderapproach working across government agencies, employers, unions, educators and trainers 'to draw up a range of skills frameworks covering various levels of job roles organisedby job families across all major industry sec-tors' (UIL, 2019: 21). What is unique about this programme is that it caters to the needs of not only the future workforce but alsocurrent employees, thereby integrating all three strands of WBL within the programme:

learning for work, learning at work and learning through work. Current and future workers are thus taught various technical, generic,emerging as well as traditional skills setsalong with big data and technology toolsto increase the agility and the responsiveness of workers to meet the industry needs (UIL, 2019). The programme provides various informal and non-formal types of learning opportunities so that different groups of workers can get information about the labour market as well as job opportunities and can accordingly create their own individualised learning and career profiles aligned with the industry needs (UIL, 2019).

While the Singaporean model is gearedtowards different types of workers at different stages of their careers, other learning cities have focused more on the learning for work strand, especially in the context of the marginalised workforce. An important example in this context is the Start Vienna initiative by the Youth College in the smart city ofVienna, Austria. The initiative was designedin 2015 in collaboration with several other educational and funding agencies for migrantyouth who were not in education, employment or training (NEET). The programme itself started in 2016, under which free education, training and mentoring were provided to asylum seekers and refugees between the ages of 15 and 21 coming from countries such as Afghanistan, Syria and Somalia. Subjects like Maths, English and ICT were taught along with lessons to foster peaceful integration in Austria (Osborne & Hernandez, 2021). On successful completion of the programme a school-leaving certificate is given to the students. Admission to the programme is based on a two-day assessment of potentiallearners for knowledge and motivation. Thisis in line with scholars like Picatoste et al. (2018), who have argued the need for assessing existing knowledge bases of citizens in order to plan appropriate technology-related learning and training opportunities within smart cities. The success of the Start Vienna programme is evident as 'since it started 1,270 young migrants have participated in the initiative with 160 having completed it and entered further training or employment' (Osborne & Hernandez, 2021: n.p.). The ability to pursue further opportunities for these young people is also evidence of the principles of lifelong learning that are embedded in the conceptualisation of the Start Vienna programme, so we see that the

marginalised youth are not simply provided with a certificate but are also supported in their long-termsearch for productive livelihoods.

A similar holistically developed programme for NEET youth is the Bladerunners programme in Vancouver Canada. Based on a partnership model, this programme provides work-based learning opportunities to disadvantaged youth (in the 15–30 age group) andsupports their transition to employment. Thelearning opportunities are not however short term, temporary arrangements but to 'foster long-term attachment to the labour force andthe social integration of young people with multiple barriers' (Osborne & Hernandez,2021: n.p.). The recognition of indigenous knowledge is an important objective of the programme. The programme has an 88% jobplacement rate, with 32% female and 66% indigenous participation rates.

Other inspiring examples of learning cities providing various formal and non-formalwork-based learning opportunities can be evidenced from Africa and Asia. These programmes aim to develop the employability and productivity of the workers not merely through training and learning opportunities but also through apprenticeship and otherwork experiences so that young workers are able to gain the kind of experience required for entering the labour market. Ghana's YouthInclusive Entrepreneurial Development Initiative for Employment (YIEDIE), is a private sector programme in the cities of Accra and Takoradi. It offers 16 training sessions oneight weekends to young people aged 15 to 35 who want to build their soft skills for the construction industry (UIL, 2019). The programme is free of cost with an annual intake of 1,600 young people and offers apprenticeshipin the construction industry so that workers are able to build their networks in the industry. Another significant opportunity in this regard is the non-formal programme called 'A second Chance for Education' started in the cities of Dhaka, Chittagong and Rajsahi in Bangladesh. The programme is for children (with or without a disability) workingin informal sectors who have not completed their primary education. The programme is condensed but flexible, and through it children can complete their primary education and choose to obtain either short-term vocational skill training at the programme's para-trade centres or apply for long-term technicaltraining. Subsequently students are assisted with job placement (UIL, 2019).

Thus, what is evident in the preceding discussions is how learning cities by fostering collaboration between multiple stakeholders can play significant role in providing 'life- long learning opportunities to workers at all levels through formal, non-formal and informal delivery mechanisms, using multiple and flexible learning pathways, entry points and re-entry points' (Osborne & Hernandez, 2021: n.p.). If implemented in smart cities, such WBL provision can not only develop the skills levels of the existing workforce forthe smart economy but can also support the expansion of participation among the work- force, particularly among vulnerable groups such as the long-term unemployed, indigenous populations, mature and older people and women.

CONCLUSION

In this chapter we have argued that the technological infrastructures and affordanceswithin global smart cities do not necessarily enable equitable access to work for their urban populations. Transformations in employment practices and the very nature ofwork within smart city frameworks, heavily dependent as they are on innovative technological

infrastructures, necessitate a concomitant change in learning and training provisions, especially for the socio- economically marginalised resident populations. The concept of learning cities is therefore crucial in this context for the utilisation of the technological potentials embedded in Smart Cities for effectively creatingan inclusive urban environment. Particularly in the last decade, learning cities have been popularised globally as a vehicle for promoting provision 'to revitalize the virtue of learning in families and communities, to facilitate learning for and in the workplace, fostering the culture of learning throughout life for sustainable outcomes' (Osborne & Hernandez, 2021: n.p.). Technological networks in smart cities would be ideally structured to provide the multifarious and often non-conventional sites of learning and training visualised within the dynamic practices of learning cities. By drawing on selected examples of learning cities from across the world, we have thus emphasised three pre- conditions that can be useful for effective organisation of 'smart learning cities'. Thesethree preconditions, namely multisectoral collaboration, legislative and communityengagement, as well as provision for WBL, together can facilitate holistic and equitable smart cities. Furthermore, learning cities has a people-centred and learning-focused approach,which provides a collaborative, action-orientated framework for working on the diverse challenges that cities increasingly face. (UIL, 2019, 6).

This emphasis on a people-centric and collaborative approach enables the principle of learning cities for a more meaningful participation of smart city residents at multiple social scales. Citizens and communities are thus at the core of learning cities along with their empowerment as effective co-creators ofthe learning city-scapes: this possibility of co-creation and collaboration effectively ensuresa greater degree of sustainability of the economic and cultural lives of urban spaces by providing continuous access to learning and training to citizens (Osborne & Hernandez, 2021). Building smart learning cities, however, is a continuous process: it is only through'participatory cross-sectoral governance structures and multi-stakeholder involvement, bothof which must extend to the levels of the localcitizens' (UIL, 2019, 26) that smart learning cities can support inclusive and lifelong learning and training opportunities for all.

ACKNOWLEDGEMENTS

The authors would like to thank the Scottish Funding Council (SFC) and Global Challenges Research (GCRF) Fund UK [grant number 308265-01] for supporting the research for this chapter.

Notes

See UNESCO Institute for Lifelong Learning (UIL)and National Institute for Lifelong Education (NILE)(2015), UNESCO Institute for Lifelong Learning (UIL) (2017) and http://lcn.pascalobservatory.org

See http://pobs.cc/15kk9

REFERENCES

Alawadhi, S., Aldama-Nalda, A., Chourabi, H.,Gil-Garcia, J.R., Leung, S., Mellouli, S., Nam.T., Pardo, T.A., Scholl, H.J., & Walker, S. (2012). 'Building understanding of smart cityinitiatives'. In H.J. Scholl, M. Janssen, M.A. Wimmer, C.E. Moe & L.S. Flak (Eds.), *Elec-tronic Government: EGOV 2012, Lecture Notes in Computer Science Book Series*, Vol. 7443 (pp. 40–53). New York: Springer.

Albino, V., Berardi, U., & Dangelico, R.M. (2015). Smart cities: Definitions, dimensions,performance, and initiatives, *Journal of Urban Technology*, *22*(1), 3–21.

Asheim, B.T. (1996). Industrial districts as 'learning regions': A condition for prosperity? *Euro-pean Planning Studies*, *4*(4), 379–400.

Asheim, B.T. (2012). The changing role of learning regions in the globalizing knowledge economy: A theoretical re-examination, *Regional Studies*, *46*(8), 993–100.

Borkowska, K., & Osborne, M. (2018). Locatingthe fourth helix: Rethinking the role of civilsociety in developing smart learning cities. *International Review of Education*, 64, 355–372.

Brennan, J., & Little, B. (1996). *A Review of Work-based Learning in Higher Education*. Sheffield: DfEE.

Campbell, T. (2012). *Beyond Smart Cities: HowCities Network, Learn and Innovate*. Oxon: Earthscan.

Dachs, B. (2018). *The Impact of New Technologies on the Labour Market and the Social Economy.* Brussels: Scientific Foresight Unit, European Parliament. Available at https:// www.europarl.europa.eu/RegData/etudes/ STUD/2018/614539/EPRS_STU(2018)614539_EN.pdf (accessed 10 March 2020).

Dameri, R.P., & Cocchia, A. (2013). Smart city and digital city: Twenty years of terminologyevolution. *In X Conference of the ItalianChapter of AIS, ITAIS* (pp. 1–8). Department for Business Innovation and Skills.(2013). *Smart Cities: Background Paper*. London: DBIS.

Eremia, M., Toma, L., & Sanduleac, M. (2017).The smart city concept in the 21st century',*Procedia Engineering*, *181*, 12–19.

European Commission (2002). *Call for Proposals (EAC/41/02) European networks to pro- mote the local and regional dimension of lifelong learning* (The 'R3L' Initiative). Brus- sels: Commission of the EuropeanCommunities.

Florida, R. (1995). Towards the learning region, *Futures*, *27*(5), 527–536.

Foley, G. (2004). *Dimensions of Adult Learning:Adult Education and Training in a Global Era*. England: Open University Press.

Han, S., & Makino, A. (2013). Learning cities in East Asia: Japan, the Republic of Korea andChina, *International Review of Education*, *59*(4), 443–468.

Harrison, C., et al. (2010). Foundations for smarter cities. *IBM Journal of Research and Development*, *54*(4), 1–16.

Herrschel, T., & Newman, P. (2017). *Cities asInternational Actors: Urban and RegionalGovernance Beyond the Nation State*.London: Palgrave Macmillan.

Ho, E. (2017). Smart subjects for a SmartNation? Governing (smart)mentalities in Singapore, *Urban Studies*, *54*(13), 3101–3118.

Hollands, R.G. (2008). Will the real smart city please stand up?, *City*, *12*(3), 303–320.

James, J., Preece, J., & Valdés-Cotera, R. (2018)*Entrepreneurial Learning City Regions*. Cham: Springer.

Joss, S., Sengers, F., Schraven, D., Caprotti, F.,& Dayot, Y. (2019). The Smart City as globaldiscourse: Storylines and critical junctures across 27 cities, *Journal of Urban Technol- ogy*, *26*(1), 3–34.

Kearns, P. (2012). *Living and Learning in Sustainable Opportunity Cities.* Available at http://pie.pascalobservatory.org/eccowell (accessed 3 April 2020).

Kearns, P. (2018). *Building Entrepreneurship in Sustainable Learning Cities*. Available at http://pascalobservatory.org/sites/default/files/briefing_paper_15_kearns_english.pdf (accessed 3 April 2020).

Khanna, P. (2015). Urbanisation, technology, and the growth of smart cities, *Asian Management Insights*, *2*(2), 52–59.

Laitinen, I., Piazza, R., & Stenvall, J. (2017). Adaptive learning in smart cities – the casesof Catania and Helsinki, *Journal of Adult andContinuing Education, 23*(1), 119–137.

Lee, S. (2019). *Tripod for building learning citiesfor the future*. Presentation at DVVI Conference, Minsk, 5/6 December. Available at http://pobs.cc/1nqa1 (accessed 3 April 2020). Longworth, N., & Osborne, M. (2010). Six agestowards a learning region: A retrospective, *European Journal of Education*, *45*(3), 368–401.

MacPherson, L. (2017). *8 Years On, Amsterdam isStill Leading the Way as a Smart City*. Available at https://towardsdatascience.com/8-years-on- amsterdam-is-still-leading-the-way-as-a-smart- city-79bd91c7ac13 (accessed 21 August 2019).

Maitra, S., & Guo, S. (2019). 'Theorising decolonisation in the context of lifelong learningand transnational migration: Anticolonial and anti-racist perspective', *International Journal of Lifelong Education*, *38*(1), 5–19.

Malcolm, J., Hodkinson, P., & Colley, H. (2003). 'The interrelationships between informal andformal learning', *Journal of Workplace Learning, 15*(7/8), 313–318. https://doi.org/10.1108/13665620310504783

Manyika, J., et al., (2017). 'Jobs lost, jobsgained: Workforce transitions in a time of automation', *McKinsey Global Institute* [Online]. Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Public% 20 and% 20 Social% 20 Sector/Our%20Insights/What%20the%20 future%20of%20work%20will%20 mean%20for%20jobs%20skills%20 and%20wages/MGI-Jobs-Lost-Jobs-Gained-Executive-summary-December-6-2017.pdf

Ménascé, D., Vincent, Ch-E., & Moreau, M.M.(2017). 'Smart cities and new forms of employ-ment', *Field Action Science Reports, The Journal of Field Actions*, Special Issue 16, 16–21.

Mora, L. & Bolici, R. (2017). How to become asmart city: Learning from Amsterdam. In Adriano Bisello, Daniele Vettorato, Richard Stephens, & Pietro Elisei (Eds.), *Smart and Sustainable Planning for Cities and Regions: Results of SSPCR 2015* (pp. 251–266). Switzerland: Springer.

Morgan, K. (1997). The learning region: Institutions, innovation and regional renewal, *Regional Studies*, *31*, 491–504.

Nedelkoska, L., & Quintini, G. (2018). *Automation, Skills Use and Training*, OECD Social, Employment and Migration Working Papers,No. 202, Paris: OECD.

Osborne, M. (2004). Work process knowledgeand lifelong learning policies. In M. Fischer,

N. Boreham, & B. Nyhan (Eds.), *European Perspectives on Learning at Work: The Acqui-sition of Work Process Knowledge* (pp. 366– 386). Luxembourg: Office for OfficialPublications of the European Communities.

Osborne, M. and Hernandez, S. (2021). 'Sustainable learning cities: Inclusion, equity and lifelong learning'. In: A. Howells and R. Valdes-Cotera, (Eds.), *Inclusive lifelong learning in cities: Policies and practices for vulnerable groups*. Hamburg, UIL.

Ó Tuama, S. (2016). *Cork Learning City: Towarda community wide learning environment.* Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2897831 (accessed 3 April 2020).

Pelton, J.N. (2019). *Preparing for the Next Cyber Revolution: How Our World Will BeRadically Transformed – Again!*, Cham, Swit-zerland: Springer Nature.

Pelton, J., & Singh, I. (2019). *Smart Cities of Today and Tomorrow*. Switzerland: SpringerInternational Publishing.

Picatoste, J., Pérez-Ortiz, L., Ruesga-Benito,S.M., & Novo-Corti, I. (2018). Smart cities for wellbeing: Youth employment and their skills on computers. *Journal of Science and Technology Policy Management,* (*9*(2), 227–241.

Rodriguez, E., & Edwards, J.S. (2019). AI in smart cities development: A perspective of strategic risk management. In: P. Griffithsand M. Nowshade Kabir (Eds.), *Proceedings of the European Conference on the Impact of Artificial Intelligence and Robotics, EM- Normandie Business School, Oxford, 31 October – 1 November 2019*, Reading: Aca- demic Conferences and Publishing Interna-

tional Limited, pp. 277–286.

Rutten, R., & Boekema, F. (2007). *The Learning Region: Foundations, State of the Art, Future*. Cheltenham: Edward Elgar.

Sakurai, M., & Kokuryo, J. (2018). 'Fujisawa sustainable smart town: Panasonic's chal- lenge in building a sustainable society', *Communications of the Association for Information Systems*, 42(1, 19), 508–525.

Saunders, T., & Baeck, P. (2015). *Rethinking Smart Cities from the Ground* Up. London: Nesta.

Schwab, K. (2016). The Fourth Industrial Revolu-tion: What it means and how we respond, *World Economic Forum* [Online]. Available at: https://www.weforum.org/agenda/2016/01/ the-fourth-industrial-revolution-what-it-means-and-how-to-respond/ (accessed 24 January 2020).

Seagraves, L. et al., (1996). *LISC Final Report*. Stirling: University of Stirling/Employment Department.

Soltani, K., Soliman, A., Padmanabhan, A., & Wang, S. (2016). *UrbanFlow: Large-scale framework to integrate social media and authoritative land use maps*. Proceedings of the XSEDE16 Extreme Science and Engineering Discovery Environment Conference on Diversity, Big Data and Science at Scale, No.2, pp. 1–8.

Sujata, J., Saksham, S., Tanvi, G., & Shreya (2016). Developing smart cities: An integrated framework, *Procedia Computer Science*, 2016, 902–909.

UNESCO Institute for Lifelong Learning (UIL). (2013). *Key Features of Learning Cities –Introductory Note*. Hamburg: UIL.

UNESCO (2015). *Recommendation on Adult Leaning and Education.* Available from https://unesdoc.unesco.org/ark:/48223/ pf0000245179 (Accessed January 2019).

UNESCO Institute for Lifelong Learning (UIL). (2017) *Unlocking the Potential of UrbanCommunities*, Volume II. Hamburg: UIL.Available at: https://unesdoc.unesco.org/ark:/48223/pf0000258944

UNESCO Institute for Lifelong Learning (UIL) (2019). *Inclusion: A Principle for Lifelong Learning and Sustainable Cities, Background paper*, Fourth International Conference onLearning Cities, Medellin, 1–3 October 2019'. Hamburg, Germany.

UNESCO Institute for Lifelong Learning (UIL) and National Institute for Lifelong Education(NILE). (2015). *Unlocking the Potential ofUrban Communities: Case Studies of Twelve Learning Cities*. Hamburg/Seoul: UIL/NILE. Available at: https://unesdoc.unesco.org/ ark:/48223/pf0000234536_eng

United Nations (2018). *68% of the world population projected to live in urban areas by 2050, says UN.* Available at https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html(accessed 15 March 2020).

Vanolo, A. (2016). Is there anybody out there?The place and role of citizens in tomorrow'ssmart cities, *Futures*, *82*, 26–36.

Williamson, B. (2017). Computing brains:Learning algorithms and neurocomputation in the smart city, *Information, Communication & Society*, *20*(1), 81–99.

World Economic Forum (2018). *The Future of Jobs Report.* Geneva, Switzerland: World Economic Forum. Available from http:// www3.weforum.org/docs/WEF_Future_of_ Jobs_2018.pdf (accessed 9 March, 2019).

World Economic Forum (2020). *70 years of urban growth in 1 infographic.* Available fromhttps://www.weforum.org/agenda/2019/09/ mapped-the-dramatic-global-rise-of-urbani- zation-1950-2020/ (accessed 10 March).

Zhuang, R., Fang, H., Zhang, Y., Lu, A., & Huang, R. (2017). Smart learning environ- ments for a smart city: From the perspectiveof lifelong and lifewide learning, *Smart Learning Environments*, *4*(1), 6.