The HK Smart City Blueprint: an Assessment in Relation to International Smart City Performance Standards

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Introduction

In December 2017 the Hong Kong Government launched the Smart City Blueprint (www.smartcity.gov.hk). In this, a series of 76 objectives for Hong Kong were announced under six themes; “Smart Mobility”, “Smart Living”, “Smart Environment”, “Smart People”, “Smart Government” and “Smart Economy”.

Concurrent with this initiative has been the development by a number of international bodies, including the International Standards Organization (ISO), the European Committee for Standardization (CEN) and the British Standards (BSI) for formulated standards in ‘smart’ urban development (SSCC-CG 2015).

This paper provides a critique of the Smart City Blueprint for Hong Kong in relation to these international standards that have been developed, using international case studies to assess and offer alternatives to the design strategies and methodological approaches in place.

Meaning of Smart City

It is common in contemporary urban place making and phraseology to use aspirational titles such as ‘Liveable City’, ‘Sustainable City’ and ‘Innovative City’. ‘Smart City’ proposals can be considered in this context and one of the most popular directions for contemporary place marketing (Moir, Moonen, and Clark 2014). Many definitions and characteristics for smart cities have been put forward (Albino, Berardi, and Dangelico 2015). These include

-Integrated information and communications technology (ICT) infrastructure (BSI 2014c) for improving city functioning (Hollands 2008) and achieving the digital transformation of urban systems.

-The development of human capital (Hollands 2008; Caragliu, Del Bo, and Nijkamp 2011) through ICT-enhanced governance to support sustainable urban development driven by the knowledge, creativity, innovation and entrepreneurship of city actors (Hollands 2008).

-Central to the smart city concept is the inclusion of tools with which to gather and process big data (Fujitsu 2012) concerning the day to day running of the city, from water and waste resource management to traffic systems, with a feedback loop in place to finetune and improve efficiency.

Completed Smart City developments have included newly built cities on greenfield sites, including Masdar (UEA) and Songdo (S. Korea), and urban regeneration and retrofit projects, including Rio de Janeiro and Barcelona (Batty et al. 2012; Shelton, Zook, and Wiig 2015).

As these projects and policies are put in place a series of counter arguments and concerns have also been raised in relation to the ethical position of harvesting and using data gathered from urban residents for political and commercial gain (Hollands 2008; Townsend 2013; Kitchin 2014; Vanolo 2014). The risk of panoptic surveillance and control of citizens (Townsend 2013; Kitchin 2014); and public-sector marginalization through public-private city partnerships (Vanolo 2014)

has also been raised. As such, there is a need for more evidence of the benefits and drawbacks for cities and citizens.

Smart City Blue Paper in Hong Kong

From the Smart City Blueprint (smartcity.gov.hk) the policy objectives are:

1) Make use of innovation and technology (I&T) to address urban challenges, enhance the effectiveness of city management and improve people's quality of living as well as Hong Kong's sustainability, efficiency and safety;
2) Enhance Hong Kong's attractiveness to global businesses and talents; and
3) Inspire continuous city innovation and sustainable economic development

The 'Mission' is described as being:

(a) To make people happier, healthier, smarter and more prosperous, and the city greener, cleaner, more livable sustainable, resilient and competitive;
(b) To enable the business to capitalize on Hong Kong's renowned business-friendly environment to foster innovation and transform of the city into a living lab and test bed for development,
(c) To provide better care for the elderly and youth and foster a stronger sense of community. To make the business, people and government more digitally enabled and technology savvy; and
(d) To consume fewer resources and make Hong Kong more environmentally friendly, while maintaining its vibrancy, efficiency and livability.

In December 2020, an update to the Blueprint was issued, including smart city solutions to Covid virus containment and prevention. These include a focus on achieving cashless and contactless payment and ticket processing in commercial outlets and at the airport, an increase in online commerce and an increase in the use of robots for such services as airport baggage handling and robot floor cleaners.

At this stage there is a question as to whether the smart city objectives can have a more profound effect on the way urban residents live and relate to the contemporary city. Whilst the ambitious proposals point towards this, the current outcome is primarily focused on payment methods and online service systems. The application of 'smart city thinking to the healthcare system, education, public transport, elderly care, are more limited.

Standard-setting and Smart city indices at an international level

Presuming there will be further updates to the HK Blueprint, what can be learned from the international development of smart city thinking and standards? The standards developed by the ISO, CEN and BSI include performance metrics for smart urban development (SSCC-CG 2015), standards for 'Smart Community Infrastructures' (for example, ISO/TR 37150:2014 and ISO/TS 37151:2015) (see iso.org) and the Smart City Framework, Publicly Available Specification PAS181 (BSI 2014c). Government-led research includes a European Commission (EC) EUROCITIES initiative entitled CITYkeys

(citykeys-project.eu), which has the goal of developing valid city performance measurement frameworks, Key Performance Indicators (KPIs) and standardized data collection

Two example outputs are the ESCR Model and The Smart City Index Master Indicators (SCIMI). The ESCR Model includes a framework with six city characteristics/dimensions; Smart Governance, Economy, People, Living, Environment and Mobility, and includes both development and performance indicators, building on data collected at local, regional and national spatial levels. The Smart City Index Master Indicators (SCIMI) framework is a Smart Cities Council initiative to enable ranking cities in terms of liveability, workability and sustainability indicators (smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey).

Table 1. Smart City (SC) development models

	Smart City Maturity (SCM) Model	Smart City Reference (SCR) Model
Developer	International Data Corporation (IDC 2013)	Zygiaris (2013)
Approach	Identifies 5 SC maturity phases & indicators Supports city planning, development, city benchmarking	In-depth conceptualization of SC layers measured against KPIs Supports city planning & sustainable development
Measured city dimensions and indicators	Measures SC maturity indicators linked to 5 maturity phases: 1. ad hoc project planning 2. 'Opportunistic' phase with proactive project deployments and emerging collaborative partnerships and strategies 3. 'Repeatable' projects phase with process implementation, stakeholder buy-in and formulated strategies 4. 'Managed' phase with formal systems for work/data flows, and technology and standards driving performance management and outcomes 5. 'Optimized' phase with a sustainable city-wide platform within the city system of systems	Measures KPIs corresponding to SC layers: 0. 'The City' includes traditional city components, e.g. infrastructure, networks, built environment and districts measured by city readiness to adopt smart features 1. 'Green City' eco-policies and planning measured by urban CO^2 footprint (emissions) 2. 'Interconnection' with city-wide broadband ICT-infrastructure using Wi-Fi, Wi-Max, 3G+, Ethernet, Fibre, Broadband-over-Power-Lines and radio-communications technologies measured by the economy of broadband uptake (city-wide costs per metre^2) 3. 'Instrumentation' with real-time connections infrastructure, using wireless sensor and actuator networks, radio frequency transmitters, traffic signals, smart meters, radio-frequency identification (RFID) and the Internet of Things. Measures include real-time events/system response 4. 'Open integration' providing a smart environment for open and distributed information storage on technological platforms, supporting data representation, visualization, exchange-across-sectors, and data-sharing services measured by effective integration and control of smart city applications, and open resources for open integrated space. This uses the Cloud, Application Programming Interface (API), the semantic web and ontologies, and Web services. Measures are effective integration and control of smart city applications and open resources 5. 'Applications' add value to city intelligent services, supporting government, efficient energy use etc. Aims to measure real-life intelligence 6. 'Innovation' covers new business models for economic growth, new governance structures and living labs addressing quality of life, using technologies such as the Web-of-Trust (WoT) measured by smart growth, including efficiency of public infrastructure and systems, business metrics etc

Table 2. Smart City (SC) models, measurement frameworks and indexes

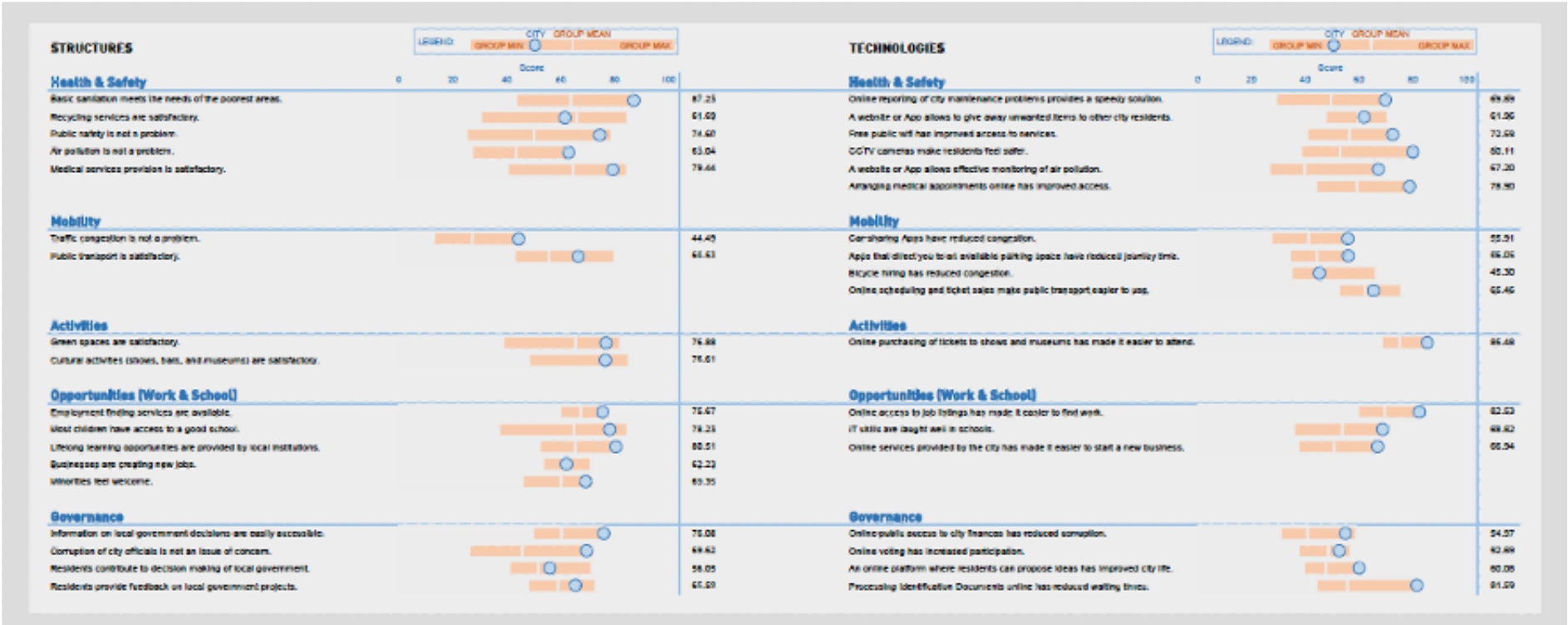
	European Smart Cities Ranking (ESCR) Model	Smart City Index Master Indicators (SCIMI)	CITYkeys indicator framework	Ericsson: Networked Society City (ENSC) Index	Cities of Opportunity (CoO) Index
Developer	Vienna University of Technology/ University of Ljubljana/ Delft University of Technology (Giffinger et al. 2007)	The Smart Cities Council (Cohen 2014)	CITYkeys (Bosch et al. 2017)	Ericsson Ltd. with Sweco Ltd. (2014)	PricewaterhouseCoopers/ Partnership for New York City (PwC/PNYC 2014)
Approach	Measures SC outcomes against 6 key city impact dimensions linked to factors & indicators	Measures SC outcomes against 6 key city impact dimensions linked to factors & indicators	Measures SC project success indicators linked to smart city-level indicators across people, planet, prosperity, governance & propagation themes	Measures impact of ICT maturity on Society, Economy, Environment city impact dimensions	Measures city outcomes linked to general city characteristics: Society, Economy, Technology including smart indicators
Measured city dimensions, indicators and factors	Governance factors: Citizen participation Economy factors: Competitiveness People factors: Social & human capital Living factors: Quality of life Environment factors: Natural resources Mobility factors: Transport & ICT-mobility (measures e.g. availability of computers in households, broadband internet access)	Government indicators: Online services; ICT Infrastructure; Open government; Online services (measures e.g. broadband & sensor coverage, real-time data-driven integrated city operations Economy indicators: Entrepreneurship & innovation; Productivity; Local & global connections People indicators: Inclusion; Education; Creativity (measures e.g. internet-connected households, smart phone penetration, smart urban living labs registrations) Living indicators: Culture & well-being, Safety, Health Environment indicators: Smart buildings; Resources management; Sustainable urban planning (measures e.g. smart meters, building automation systems, smart grids. smart water systems) Mobility indicators: Efficient transport; Multi-modal access; Technology infrastructure (measures e.g. integrated-fare public transport systems, smart cards, real-time passenger information)	People indicators: Health; Safety; Access to services; Education; Diversity & social cohesion; Quality of housing & the built environment (measures e.g. cybersecurity, data privacy, digital literacy) Planet indicators: Energy & mitigation; Materials, water & land; Climate resilience; Pollution and waste; Ecosystem biodiversity & nature conservation Prosperity indicators: Employment; Equity; Green economy; Economic performance; Competitiveness & attractiveness; Innovation (measures e.g. open data quality, innovation hubs) Governance indicators: Multilevel governance; Organisation of project/city; Community involvement (measures e.g. smart city policy, data interoperability monitoring, online services) Propagation indicators: Scalability; Replicability of projects (measures e.g. technical compatibility with standards/ infrastructure)	ICT maturity indicators include: ICT-Infrastructure development measured by Broadband quality; Availability to population of Internet access & ICT infrastructure City readiness/ Affordability measured by Tariffs; Internet Protocol (IP) transit prices Usage measured by Technology use; Individual, Public & Market use Social dimension: Health; Education; Social Inclusion Economy dimension: Productivity; Competitiveness Environment dimension: Resources; Pollution; Climate Change	Smart indicators include: Intellectual capital & innovation measured by Participation in education; Available skills; Conditions for innovation Technological readiness measured by Internet access; Broadband quality; Digital economy; Competitiveness in software development & design City gateway measured by Access to the city; Passenger flows; Attractiveness to industry & tourists; Hotel provision Quality of life indicators measured by Transportation and Infrastructure; Health, Safety and Security; Sustainability and the Natural Environment; Demographics and Liveability Economic indicators measured by Economic Clout; Ease of Doing Business; Cost for Business

Another index recently published is the first edition of the IMD Smart City Index 2019, which ranks 102 cities worldwide, published by the IMD World Competitiveness Center's Smart City Observatory, in partnership with Singapore University of Technology and Design.

The index shows the ranking position of the city amongst the 102 cities measured, based upon the rating and its components. Each city is assigned to one of four groups, based upon its UN Human Development Index (HDI, 2019). values are calculated from the city's performance relative to the other cities within the group. The IMD Smart City Index as an international level, focuses on how citizens perceive the scope and impact of efforts to make their cities 'smart', balancing "economic and technological aspects" with "humane dimensions".

Table 3 shows the detail of the components of assessment in relation to City 'Structure' and 'Technologies', with 5 categories and the score measurements for Singapore. The scoring system is a relative measurement to the other cities within the measurement group in the study.

Table 3. Smart City Structures and Technologies (source: IMD Smart City Index, IMD World Competitiveness Centre, 2019)



From the Index, the top 10 smartest cities in 2019 are: Singapore (1st), Zurich (2nd), Oslo (3rd), Geneva (4th), Copenhagen (5th), Auckland (6th), Taipei City (7th), Helsinki (8th), Bilbao (9th) and Dusseldorf (10th). And Hong Kong is ranking 37 out of 102 countries.

From this table the main strengths of Hong Kong in its Smart City structure are the easily accessible public services, institutes and hospitals, and a stable and safe online access to work and education. In order for a city to improve its ranking on this form of measurement list requires a comprehensive and holistic approach, not just to the technological infrastructure but to the complete virtual and physical service network in the city, linking up the involvement of the public and private stakeholders. This raises the question: what does Hong Kong need to do to establish a holistic approach to smart city development and design in the city and governance system?

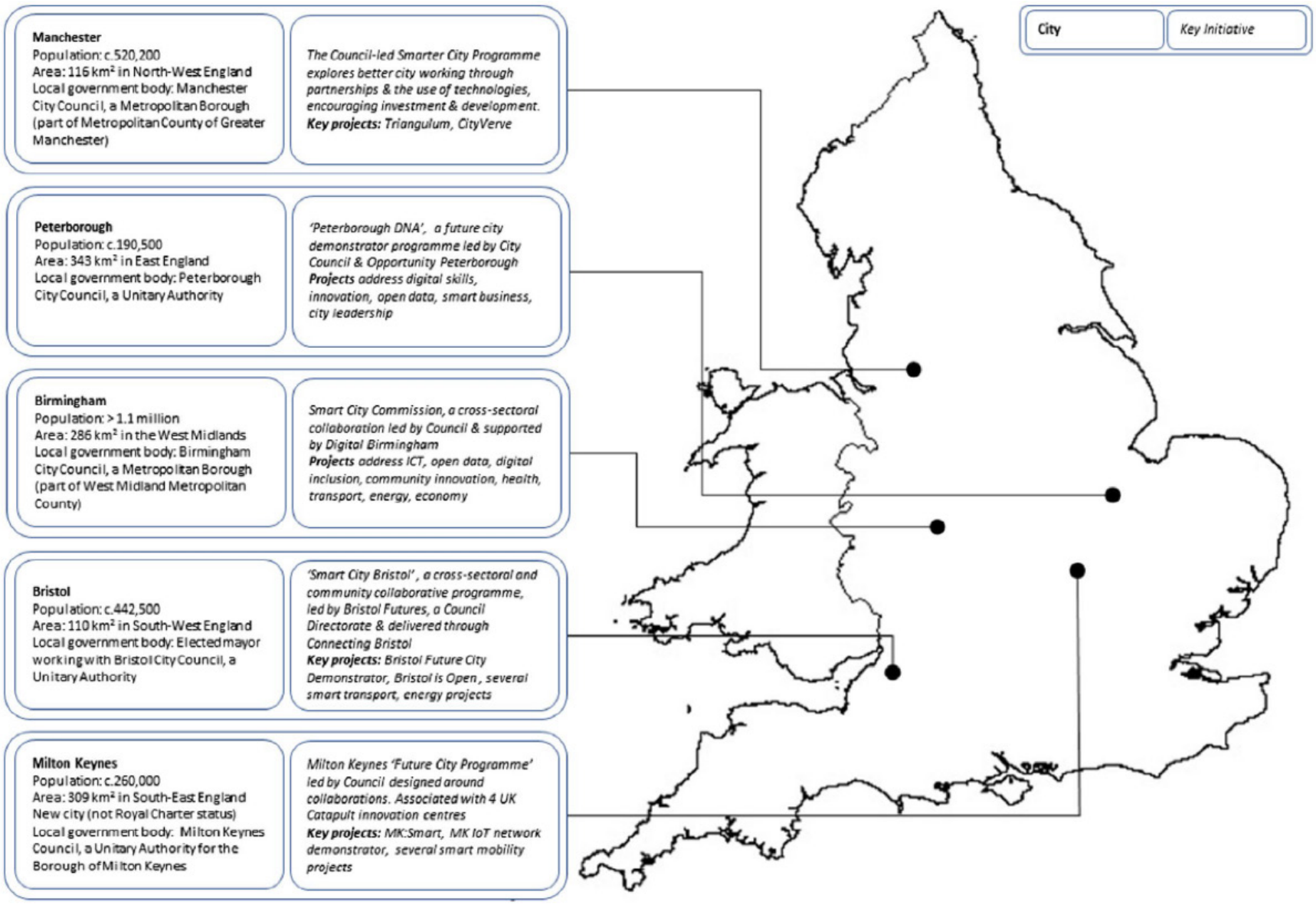


Figure 1. Overview of UK smart city case studies

For instance, as shown on the map, the case studies in UK showed that the cities were at the early stages of developing plans to evaluate the city-level impacts of smart city developments and were working in partnerships, mainly with local universities, to address evaluation challenges. Although most were not advanced with evaluation plans, Birmingham has made progress in developing a city-level evaluation framework, aligned with their smart city strategy and Roadmap. Manchester's progress includes the development of an Impact Assessment Framework for their Triangulum project and a plan to assess city-level impacts. Other cities, including Milton Keynes and Peterborough, have developed many measures through their city programmes to contribute to a smart city evaluation framework, although this work was at an early stage.

Some cities were unconvinced of the need for an overarching, standardized smart city framework, which might not be sufficiently relevant to their unique city challenges, strategies, circumstances and projects. Moreover, cities already have statutory obligations to measure and report numerous Key performance indicators (KPIs) against city strategies and actions. For example, Bristol authorities in UK mentioned that there are approximately 150 KPIs that the Council report on annually, which they considered burdensome. Rather than developing new smart city KPIs, some city authorities would prefer to measure the contribution of smart city projects and programmes against existing city KPIs in establishing city-level impacts.

Smart city policy development in Hong Kong

The main evaluation challenges identified by cities centred on choosing suitable methodologies to measure the causal impacts of their smart city work on city outcomes, and how to prove the value for cities and citizens. A synthesis of the Council authority recommendations suggests that the design of smart city evaluation should be appropriate to the project, programme or city level, and to the innovation development maturity and scale of city projects. Evaluation approaches should reflect strategic city objectives and be open to improvement and evolution (as recommended by EIP-SCC 2013). Evaluation frameworks should be flexible, relevant and adaptable to different city challenges and circumstances. Some city authorities also considered that evaluation should have a diagnostic utility, helping cities identify both gaps in their smart city development and emergent innovation opportunities.

Rather than focusing on arbitrary or easily-measured indicators, the choice of measures should include quantitative and qualitative, meaningful and comprehensive indicators that reflect the multi-faceted nature of smart cities and the complexity of urban systems. Overall, evaluation design should build on city data intelligence to support development of future city visions and strategies, which some authorities noted should be based more on a vision of liveable cities with embedded smart technologies rather than simply a digital city vision.

Further enhancement of Hong Kong's development as a smart city by 2030, KPMG China (2020) noted with eleven options, 47 percent of respondents identified development of technology infrastructure as critical. Forty-one percent say that they believe physical infrastructure will be adequate to keep pace with smart city development, and industry players say the situation could improve with the rollout of 5G technology.

According that report, the GBA is viewed by Hong Kong's larger corporates as the preferred destination for outbound direct investment including R&D. Meanwhile, small and medium-sized enterprises, including start-ups, plan to prioritise trade and investment with ASEAN countries, but also collaboration between industry and university. As well as, it would be important to acting as drivers for growth and the creation of future employment opportunities for Hong Kong citizens in details with consideration of local needed and programs, indications, and assessment tools.

Conclusion

Although the Hong Kong government has prepared and published a vision for a 'smart city', there seems to be a more limited understanding and approach to achieving this in a holistic way that is broader than the digitization of payments and certain services. There are no case models and case studies to conduct the design strategic with detailed design guideline for smart city in multiple levels of built environment. Whilst smart mobility and infrastructure have been developed using big data and a vision for AI, there are no holistic criteria and indices to evaluate the smart city at a street, public realm and neighbourhood level.

Looking back at the 'U-City's urban planning and strategies in early 2000s, there was no clear platform to share its investigation and construction between planners, and public and private sectors' involvement, as well as citizens' participation. The next steps to optimise Hong Kong's development as a smart city can include greater connectivity between individual government departments, best practices for effective governance, improving community participation, as well as increased collaboration between the public and private sectors. Corporates should also expand their partnerships with universities, start-ups and other companies, while focusing on sustainability and talent development. This would help not just at a local level within Hong Kong, but also for the Greater Bay Area and within the international network of cities that share similar ambitions.

Dr. Hee Sun (Sunny) Choi's Biography

Following higher education at RMIT in Melbourne, the AA School and UCL in London, Dr Sunny Choi completed her PhD in urban design at Oxford Brookes University and conducted Post-doctoral research at Oxford University. A specialist in digital infrastructure, cultural identity and environmental sustainability, she has practiced as an urban designer and architectural designer in the UK, Hong Kong and in Seoul, South Korea, and within the design and master planning department of the United Nations Headquarters in New York. Currently she is working as an editor of the HKIUD U+U journal, teaching at Polytechnic University of Hong Kong and founding partner at Choi-Comer Asia, an architecture and urban design practice and research lab in Hong Kong.

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