

Are We Smart Enough to Develop a Smart City for Hong Kong?

香港 HONG KONG
珠海學院 CHU HAI COLLEGE OF HIGHER EDUCATION

Three policy objectives to pursue smart city

(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 business and talents; and

(3) Inspire continuous city innovation and sustainable economic development.

Urban Challenges

Common major urbanization problems and challenges:

(1) Traffic congestion;

(2) Housing shortage; and

(3) Pollution.

Innovation and Technology (I&T)

Technologies arising from digitalization:

- Internet connection
- Internet of things (“IoT”)
- Artificial Intelligence (“AI”)
- Building Information Modeling (“BIM”)
- Big data
- Blockchain

Innovation and Technology (I&T)

Internet connection

- Mobile internet connection
- Broadband connection
- Private Wi-Fi connection
- Public Wi-Fi connection



Innovation and Technology (I&T)

Internet of things

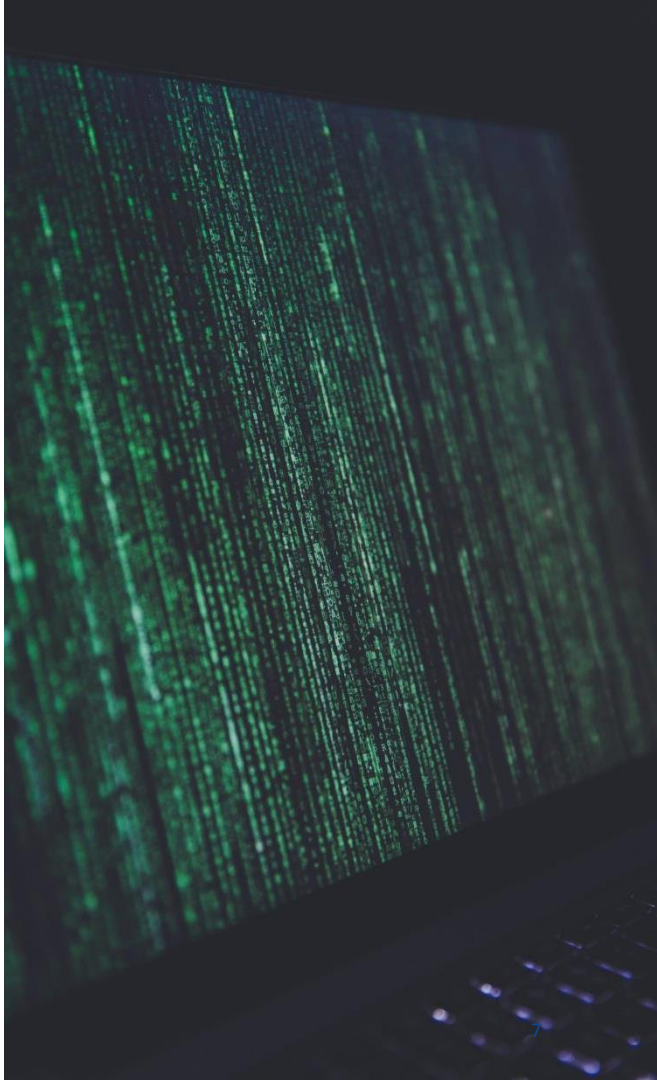
- Smart home systems with internet connection
  - Smart Refrigerator
  - Smart Thermostat
  - Smart Door Bell
  - Internet connected baby monitor / surveillance
- Internet connected CCTV
- Wearables
- Any “things” that are connected to the internet to provide information and/or be controlled



Innovation and Technology (I&T)

Artificial Intelligence

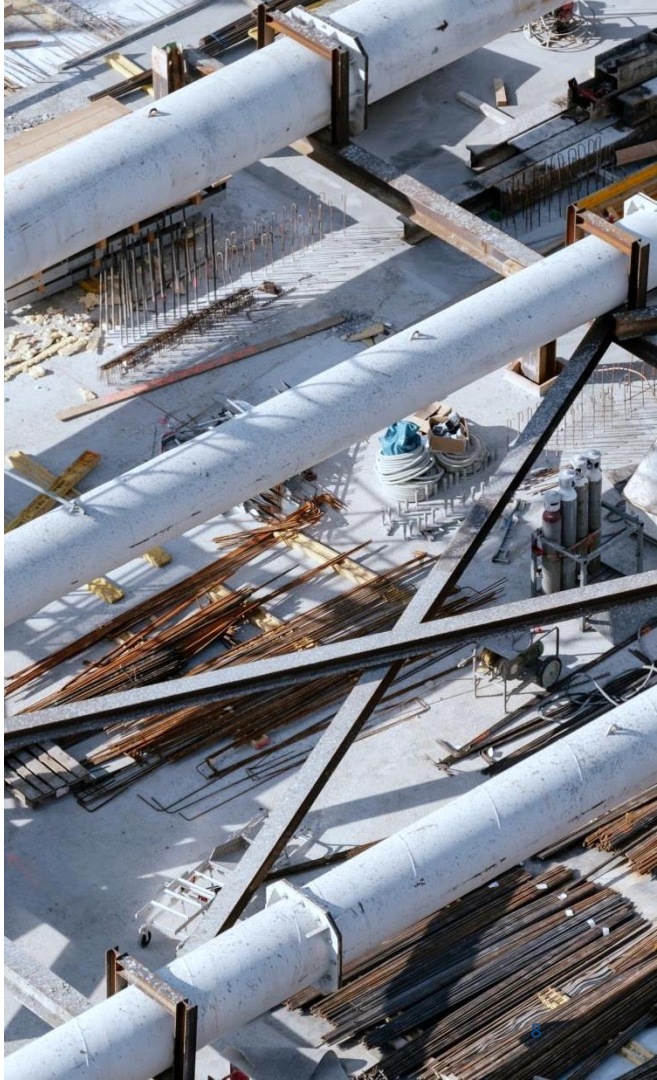
- Broad classifications of intelligence demonstrated by machines
  - Contrast with Natural Intelligence (Humans and other animals)
- Numerous goals in AI
  - Reasoning
  - Learning
  - Planning
  - Natural language processing
  - Long term goal: General Intelligence
- Example:
  - Deep Blue – IBM's Chess computer beating Garry Kasparov (1997)
  - Alpha GO – Google's GO software beating Lee Sedol (March 2016), then improved a self learning version Alphago Zero



Innovation and Technology (I&T)

Building Information Modeling

- Digitization of buildings and cities
  - Information of buildings and cities can be represented digitally
  - Conduits, cabling, HVAC, spacing and clearance can be visualized
  - Underground conduits, gas pipes, electrical, water, sewage can be modeled
- Problems or issues can be discovered earlier with modelling
- Search of material used can be conducted
- Subsequent maintenance and/or new buildings can be visualized
- Combined with 3D spatial maps of a city, planning and utilization can be clearly illustrated



Innovation and Technology (I&T)

Big data

- Fundamentally about storage and handling of vast amount of data
  - Big Data started with the digital age (circa 2002)
  - Generation of digital content / data has increased geometrically
  - IDC estimate by 2025 there will be 163 zettabyte -> 163,000,000,000,000,000 Megabyte
    - 40,750,000,000 (4 Terabyte Hard Drives)
- Extract useful information from the vast amount of data
  - Marketing (Trends)
  - Influencing (Cambridge Analytica / Facebook)
  - Health (Pandemic, Epidemic, correlated factors in spread of disease)
  - Traffic (Patterns, potential problems / bottlenecks, capacity planning)



Innovation and Technology (I&T)

Blockchain

- Utilizing hashing algorithm to ensure data has not been altered
- Data are stored in blocks
- Block hash are created for each block and are stored as the beginning of the subsequent block, thus chaining the data
    - Removes the likelihood that prior data can be modified without changing the hash value stored and linked in subsequent blocks
- Used for financial ledger, transaction records, documentation provenance, contracts, and cryptocurrency



Demo

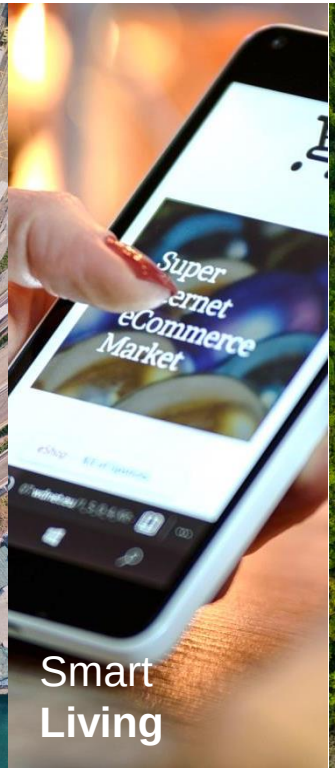
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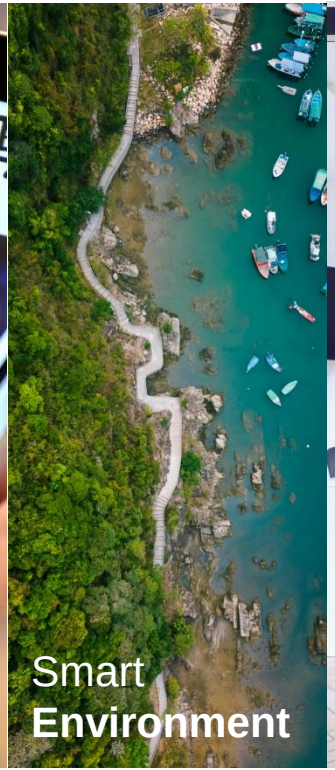
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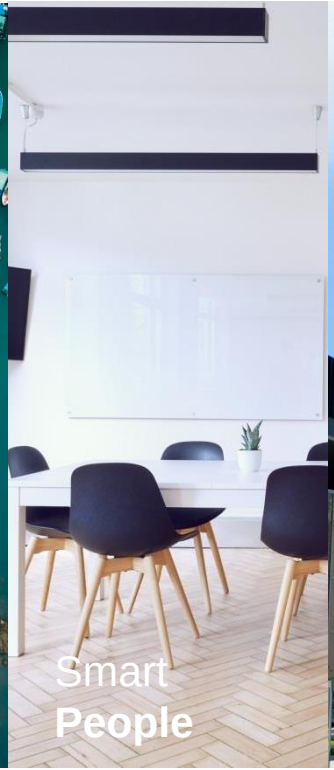
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6 smart city themes



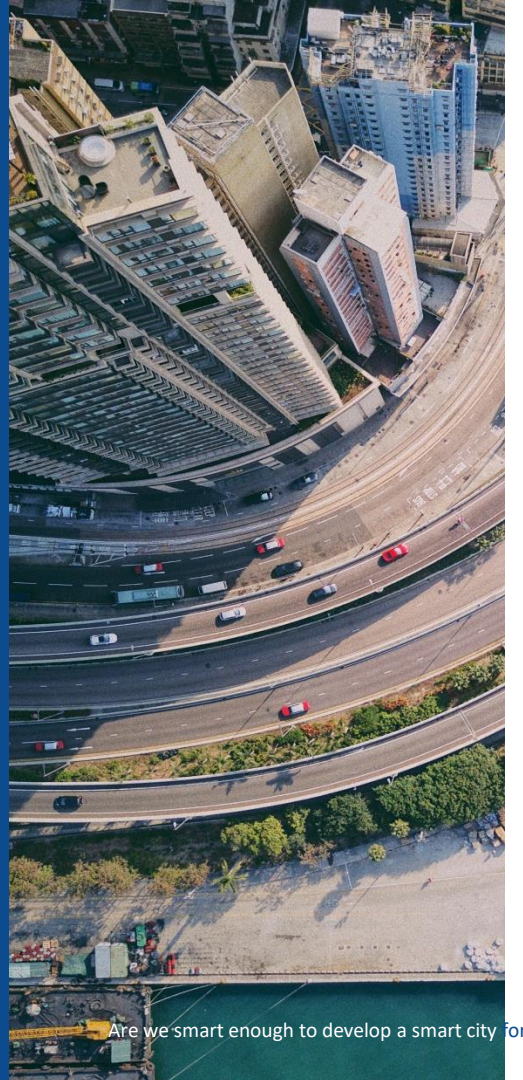












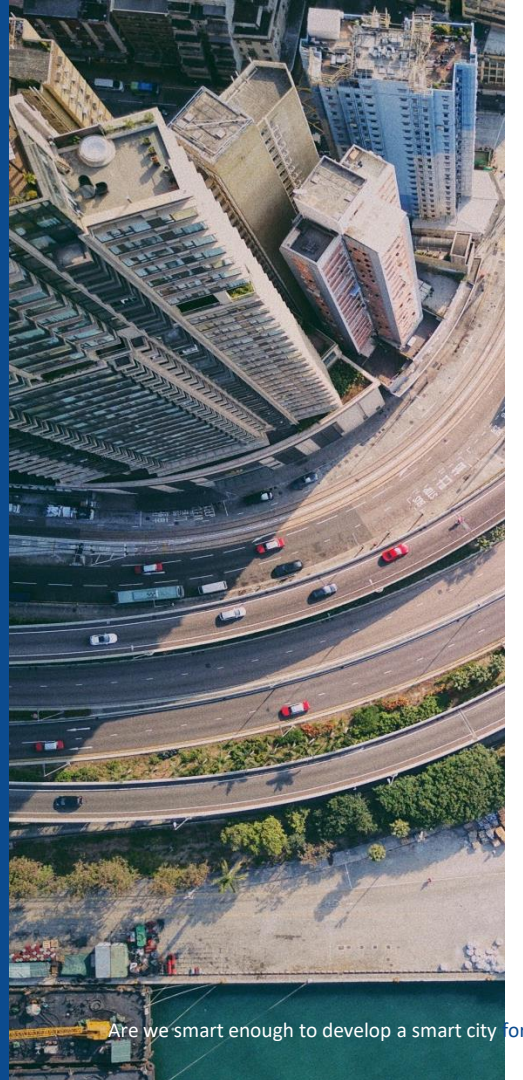
Smart **Mobility**

(Potential Pilot) Smart Public Transport Interchange or Bus Stops

- Sensors for gases & air quality
- Provide Wifi Access
- Information for user, time, temperature, schedule, etc
- Mobile charging outlets

(Potential Pilot) Smart Parking

- Details of available spots
- Provision of data on mobile application



Smart **Mobility**

(Potential Pilot) Intelligent Signalised Junctions and Pedestrian Lights

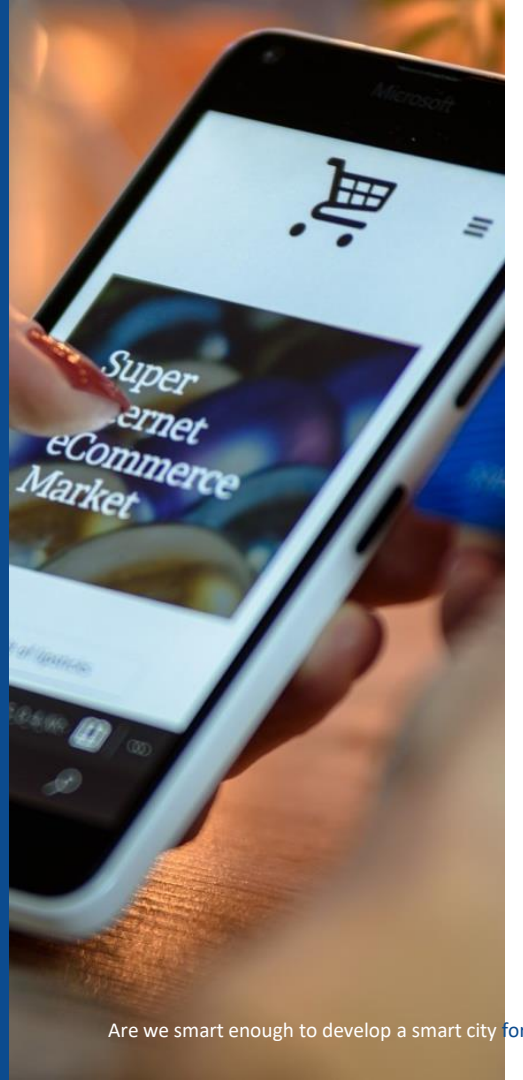
- Provide more time for elderly to cross junctions
- Provide real time data and information to vehicles

In-vehicle Units

- Electronic road pricing (toll)
- Tracking of vehicle via junctions

Automated vehicles

- Vehicles to vehicles data communication
- Automated traffic and routing updates to vehicles



Smart **Living**

Digital Persona

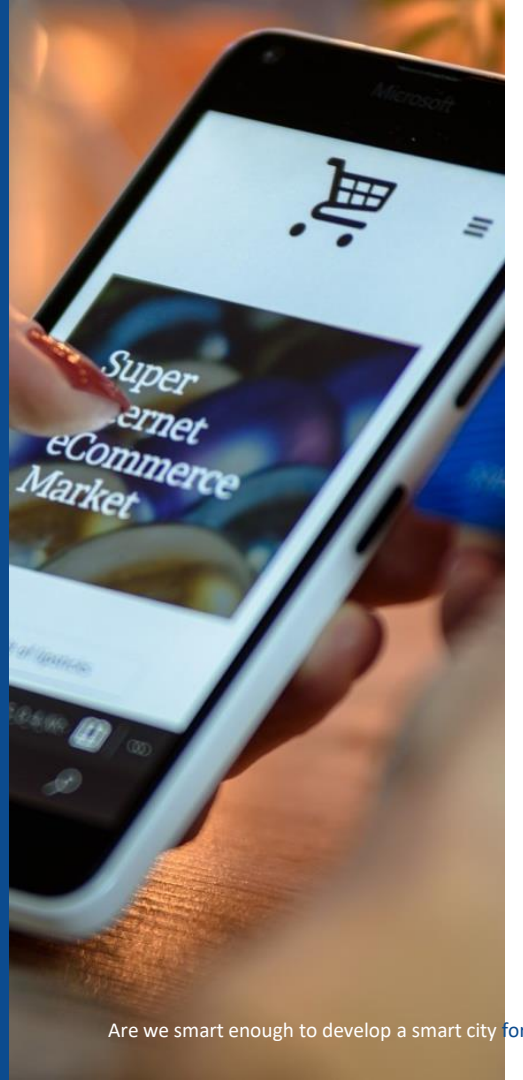
- Biometric authentication
- New type of ID to authenticate, allows faster banking, access to governmental services, medical and other personal data

Digital Payments

- New ways to handle small payments

Smart Community Healthcare

- Wearable tech for people, in particular elderly



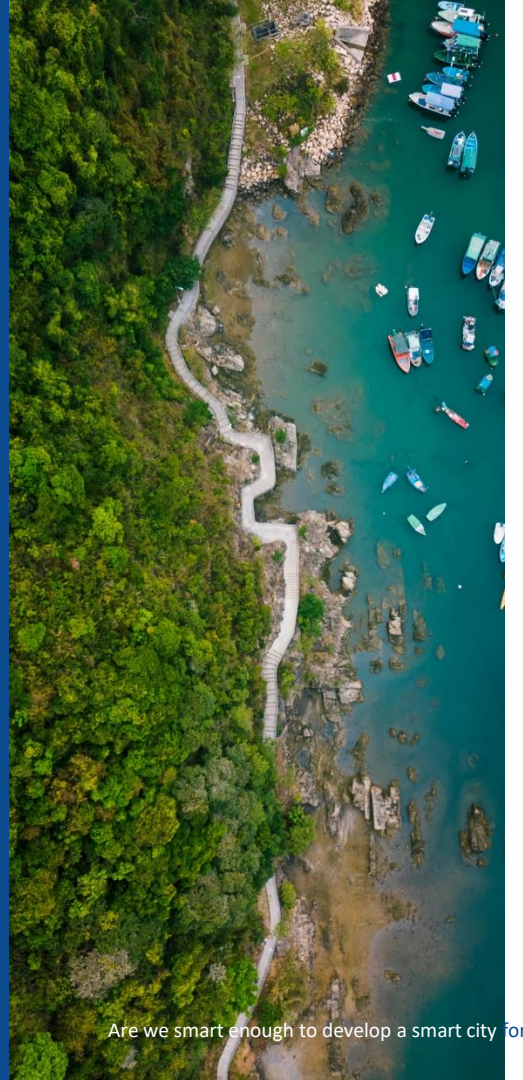
Smart **Living**

Smart Hospital Services

- Self services Kiosk
- Promote self-help services

Smart Work Place

- Remote work
- ICT, AI, Cloud for businesses



Smart **Environment**

Climate Action Plan 2030

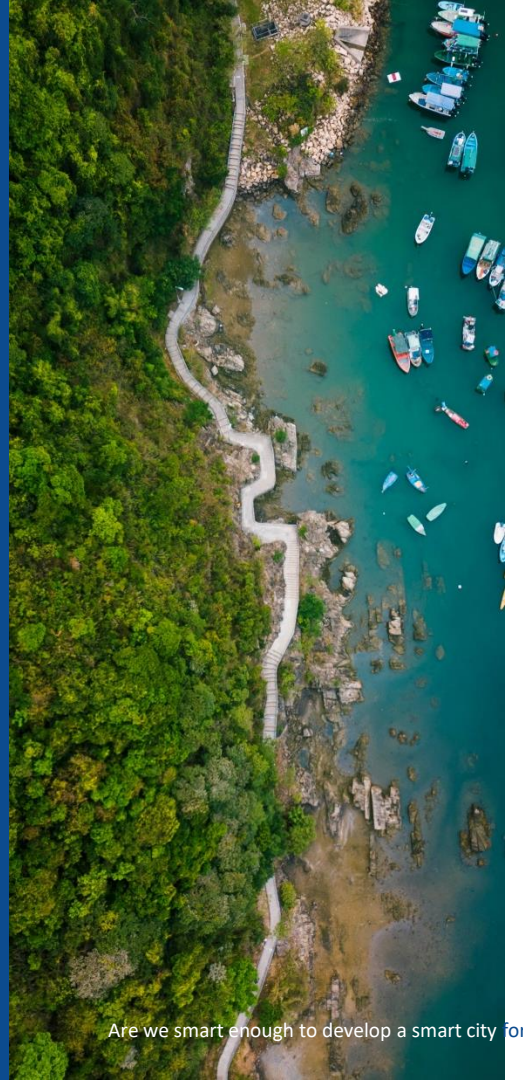
- Expanding renewable energy wind / solar in HK
- Automated environment control, combined cooling/heating/power CCHP
- Adoption of electric vehicles

Green and Intelligent Buildings

- Tech in construction and maintenance to efficiently manage resources and energy use in building
  - Utilize BIM and Asset Management
  - Retrofit energy saving technology in existing buildings

Smart Grid

- Electrical network to create a grid that connects sensors, meters, and appliances
- Remote monitoring of energy usage, allows users to manage their own energy
- Reduce peak hours usage
  - Study pilot schemes for the power companies to test smart grid tech



Smart **Environment**

Intelligent Waste Management

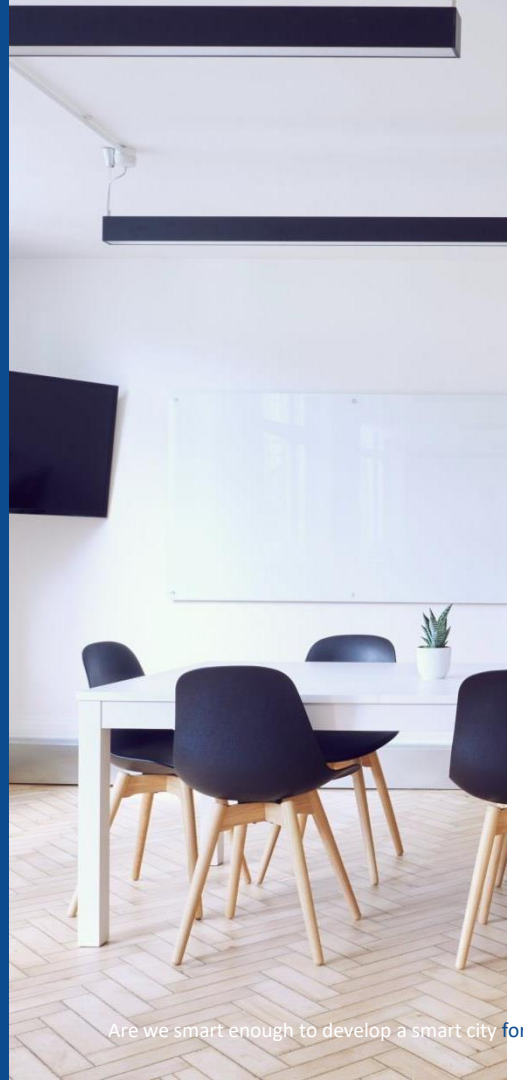
- Increase recycling, improve efficiency in overall waste management processes

Pollution Management

- Remote sensing tech to monitor and reduce pollution
  - Roadmap to implement remote sensing LIDAR tech to measure 3-D pollution distributions
  - Sensors for water pollution

LED Lighting

- Reduce power consumption of illuminated signboards (neon light or incandescent) with LED



Smart **People**

Cultivate Data Science Expertise

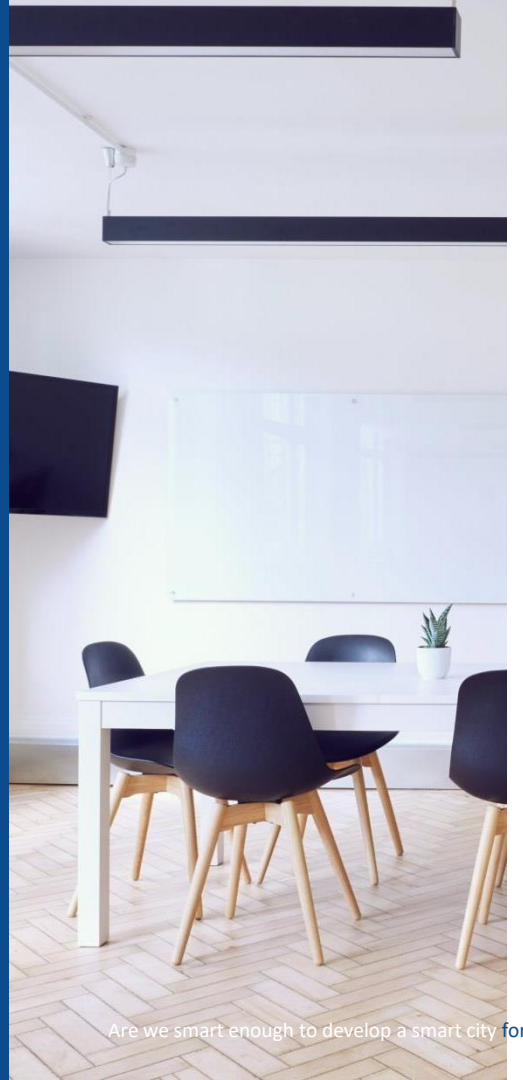
- eLearning, facilities to teach necessary data science skills
- Partnership between private sector and tertiary institutions

One-Stop Shop

- Provide simple and easy access to multiple public and private services in one on-line location
- Utilize and integrate user's digital persona
  - Integrate governmental number 1823 and www.gov.hk
  - Private sector services in one-stop

Use of On-line Applications and Social Media for Stakeholder Engagement

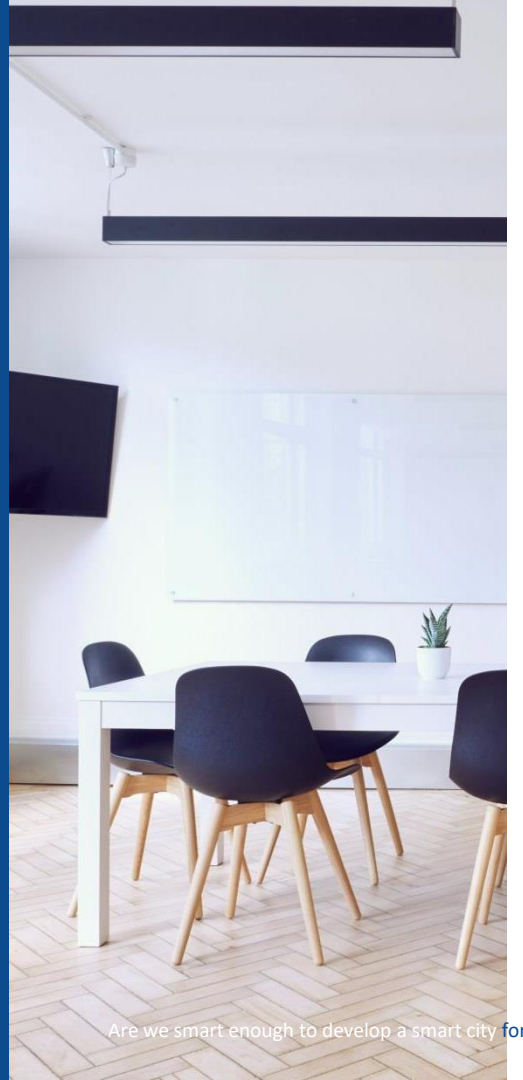
- Public engagement via dedicated portal
  - Online / Ideas crowdsourcing, promote portal as stakeholder engagement platform
- Internet based tool for public engagement
- Integrate stakeholder engagement



Smart **People**

Technology Education

- Promote and support technical skills and creative thinking through education
  - Assess and evaluate STEM and Data science vs. global practices
  - Continuous learning program for STEM
  - Cultivate data science expertise
  - Curricula to include IoT, M2M, sensor network, data warehouse etc
- Promote entrepreneurial and innovative appetite
- Embrace new technology and retool and learn new relevant skills to manage a smart city
- Academies can be setup to train up professional expertise



Smart **People**

Education and Skill Retooling

- Trainings and learning seminars to be conducted
- HK Gov facilitate partnerships between private sectors and innovation centres (HKSTP, Cyberport, HKPC)
- Increase confidence in managing transitions in fast living and working environment
    - Programs for public/private on the challenges, opportunities and trends from innovation
    - PPP to adopt innovation in business



Smart **Government**

(Pilot) Smart Intelligent and Integrated Poles

- Integrated sensors, and hardware across the city to provide multidisciplinary functionalities
- Monitor city's environment, strengthen services, operations and increase efficiency and environmental friendliness
- Air quality index, temperature and relevant information
- CCTV and security equipment to enhance safety
- WiFi provision, sensors, transponders for data sharing
- LED lighting, lowering the city's overall carbon footprint
- Utilization of 5G on smart pole, enabling more IoT and edge devices
- Assist in government agencies in making more informed decisions

5G Communication

- Broadband / Spectrum allocations
  - Future investments are 5G compatible
  - HKSTP and Cyberport to be a testbed for 5G



Smart **Government**

Building Information Modelling (BIM)

- 3D digital representation of building data
- Technology tool in construction
- Clash detection, cost estimation, fabrication and shop drawings, asset and facilities management
- Use in conjunction with GIS for enhanced analysis
- Utilized with VR, AR, and IoT can bring data to life
- Project management tool
  - Adoption of BIM in new developments
  - Encourage adoption of BIM for private construction projects

Virtual Hong Kong

- Spatial data and maps
- Creation of Smart Map, interlay of 3D information of the city
- Common Spatial Data Infrastructure (CSDI)
- Virtual HK platform leverage Lands Department spatial map as well as other building data and real-time sensors data to improve city management
  - Utilization of CSDI and enhance it with 3D digital map of HK with enriched spatial data



Smart **Government**

Underground Integrated Ducts

- Utility corridor (utilidor) allows multiple utilities (electricity, water supply, sewer pipes, fiber optics and other cables) minimize disruptions and allows rapid deployment
  - New Development Area to incorporate utilidor

E-Government Services

- Delivery of governmental services in a more agile manner to meet public demands and business needs
- Delivery of relevant governmental services from information integration to service integration
- Expedite responses, better collaboration between development and operation
  - Develop new applications architecture framework
  - Start delivering e-government services in more agile and efficient/effective manner



Smart **Government**

Data-analytics-as-a-service for government departments

- Big data infrastructure by the government to be shared between departments and bureaus
- Allows secure and effective sharing of necessary data analytics and warehousing tools
- Big Data analytics application:
  - Food safety inspection
    - Target food that more likely to suffer from contamination for inspection
  - Fire safety inspection
    - Early inspection of most at-risk buildings, fire hazards
  - Healthcare demand prediction
    - Based on weather, prevalent influenza strain, global health, issue warning and distribute manpower to attend to emergency admission
  - Safety inspection on E&M
    - Big data to analyse E&M inspection and failure probability and likely failure etc.
  - Social listening
    - social media feedback and continuous analysis on latest data from social media

Implementation: Setup a central big data office with expertise to facilitate big data analytics applications across the government



Smart **Economy**

FinTech

- (HK) Strong in Fin, not strong in Tech
- Financial services contribute 18% of HK's GDP, and 6% of employment
- Small market, heavily served by principal incumbents
- Little tradition of technological innovation and high cost
- Subset of start-up ecosystem
  - Enhance transaction security through biometric authentication
  - Fintech Supervisory Sandbox
  - Feasibility of Distributed Ledger Tech on trade financing, insurance claims, cross-boundary remittance (reduce risk and enhance transparency)
  - Cashless economy, using digital currencies?
  - Feasibility for leveraging tech in regulatory monitoring, reporting and compliance



Smart **Economy**

Smart Manufacturing

- Re-industrialisation in HK
- Emerging tech: robotics, IoT, drones 3D printing, AI and analytics
- Advanced manufacturing centres and data centres
  - Encourage and support collaboration between universities, industry and government/public organisations in support of re-industrialisation

Foreign Investment

- HK to serve as a melting pot of knowledge and experience
- Start-up support programmes
- Show case HK's creativity, innovative spirit and human capital
- FS in 2017-18 Budget to address the problem of a narrow tax base
  - Expand the number of annual / biennial events
  - Marketing campaign to position HK as a preferred investment destination
  - Attract foreign investment and technology for smart city HK via PPP
  - Attract talents by enhancing quality migrant admission scheme



Smart **Economy**

Start-up Ecosystem

- Develop HK start-up ecosystem to accelerate the deployment of innovative product and services
- Robust start-up ecosystem, expand incubator programmes and support start-ups
  - Explore procurement approach in government that focuses on outcome and innovation
  - Lower barriers to access funds for start-ups
  - Continue to expand incubation programmes (HKSTP / Cyberport)
  - Expand scholarship programmes with universities
  - Programmes to promote entrepreneurship

R&D Platform

- Establishment of a platform dedicated to R&D at the HK/SZ Innovation and Technology Park (Lok Ma Chau Loop)
- Complement existing innovation hubs at HKSTP/Cyberport/ASTRI/Universities

Smart Tourism

- Enhance and reinforce attractiveness of HK as a travel destination
- Enhance the digital experience to tourists

Nine smart city strategies

1. Invigorate the ecosystem for innovation to support the development, commercialization, scaling up and export of solution
2. Engage the public and business and co-create smart solutions with stakeholders to better meet the needs and fulfil the aspirations of the people
3. Cultivate a culture of embracing changes and collaboration for smart city development
4. Integrate with city planning
5. Establish a sound digital framework to support further improvement to the operations of urban infrastructures and provision of services

Nine smart city strategies

6. Provide support to reduce the digital divide and ensure inclusiveness of smart city development
7. Equip students and workforce with the knowledge and skills to seize opportunities in a smart city
8. Develop and innovative strategy for procuring smart solutions
9. Improve preparedness, prevention, and mitigation of adverse events

Thank You

Other aspects

Safety in city



Industrial safety



Monitoring of high building workers



AI to recognize lack of safety harness



Alert and warn management

Potential issues

How to benefit Hong Kong in the long run

- Not only Smartcity benefits, but new industries to be created
- Creating new revenue sources for Hong Kong
- Big Data application, not just data centres
- Support

Discussion topics

Issues and observations

Privacy

- CCTV, who can access?
- How long to keep the data?

Security

- IoT Security
  - Wearable, sensors, health
- Data integrity

Blockchain

- Use it to improve transparency and for big data
- Not only for financial transactions

Discussion topics

Issues and observations

Governmental Procedures

- Procedures are designed to be step-by-step
- Smartcity requires speed and agility currently not available in Governmental procedures

ICAC

- Stringent process removes flexibility and speed required to adapt city
- Public Private Partnership
  - Increase penalty, reduce procedural process / red tape?

Mobility

- Vertical transport; 50 Hours spent annually on elevators
  - Assume 2 minutes per trip and 6 trips a day
  - Solution available to reduce that time?

Discussion topics

Issues and observations

Mobility

- Spoke and Hub transportation for Hong Kong?
  - Key stations for express routing (hub to hub)
    - (Potential) Express MTR major station connection (Admiralty – Mong Kok – Kowloon Tong – Kwan Tong)
  - Buses with less intermediate stops but more trunk routing
- Improve policing of traffic issues?
  - Smart car registration – allows law enforcement officers to complete a ticket in under 1 minute
  - Utilize blockchain for provenance

Smartcity

- More about development, less fundamental research
- Public involvement
- Cultural change