

# Principles for Digital Transformation in Cities

Future of Cities

**WORLD  
GOVERNMENT  
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in collaboration with






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# Answering Tomorrow's Questions, Today

The World Government Summit is a global platform dedicated to shaping the future of governments worldwide. Each year, the Summit sets the agenda for the next generation of governments with a focus on how they can harness innovation and technology to solve universal challenges facing humanity.

The World Government Summit is a knowledge exchange center at the intersection of government, futurism, technology, and innovation. It functions as a thought leadership platform and networking hub for policymakers, experts and pioneers in human development.

The Summit is a gateway to the future as it functions as the stage for analysis of future trends, concerns, and opportunities facing humanity. It is also an arena to showcase innovations, best practice, and smart solutions to inspire creativity to tackle these future challenges.

# Foreword

This KPMG paper, **Future of cities: Principles for Digital Transformation in Cities** is published in collaboration with the World Government Summit. It aims to provide practical solutions for city leaders, public administrators and municipal stakeholders on how to build resiliency into their planning and how to prepare for future challenges using technology.

The idea is to ensure that the findings and recommendations have a long, interactive life. Complemented by continued debate in the media, regular updated reports, and thematic panel discussions – this collaborative effort takes the conversation to the next level, building on smaller and strategic events.

Digital transformation and exponential technology growth will radically change the way cities are organized and built. Central systems are becoming more efficient with the rise of big data, ubiquitous sensors, computer intelligence and transportation technologies.

We address the following issues as outlined in the WGS call for papers:



How can contemporary technologies solve present-day challenges such as increasing urban density?



Will technology help solve the challenges that urban expansion causes on sustainability endeavors?

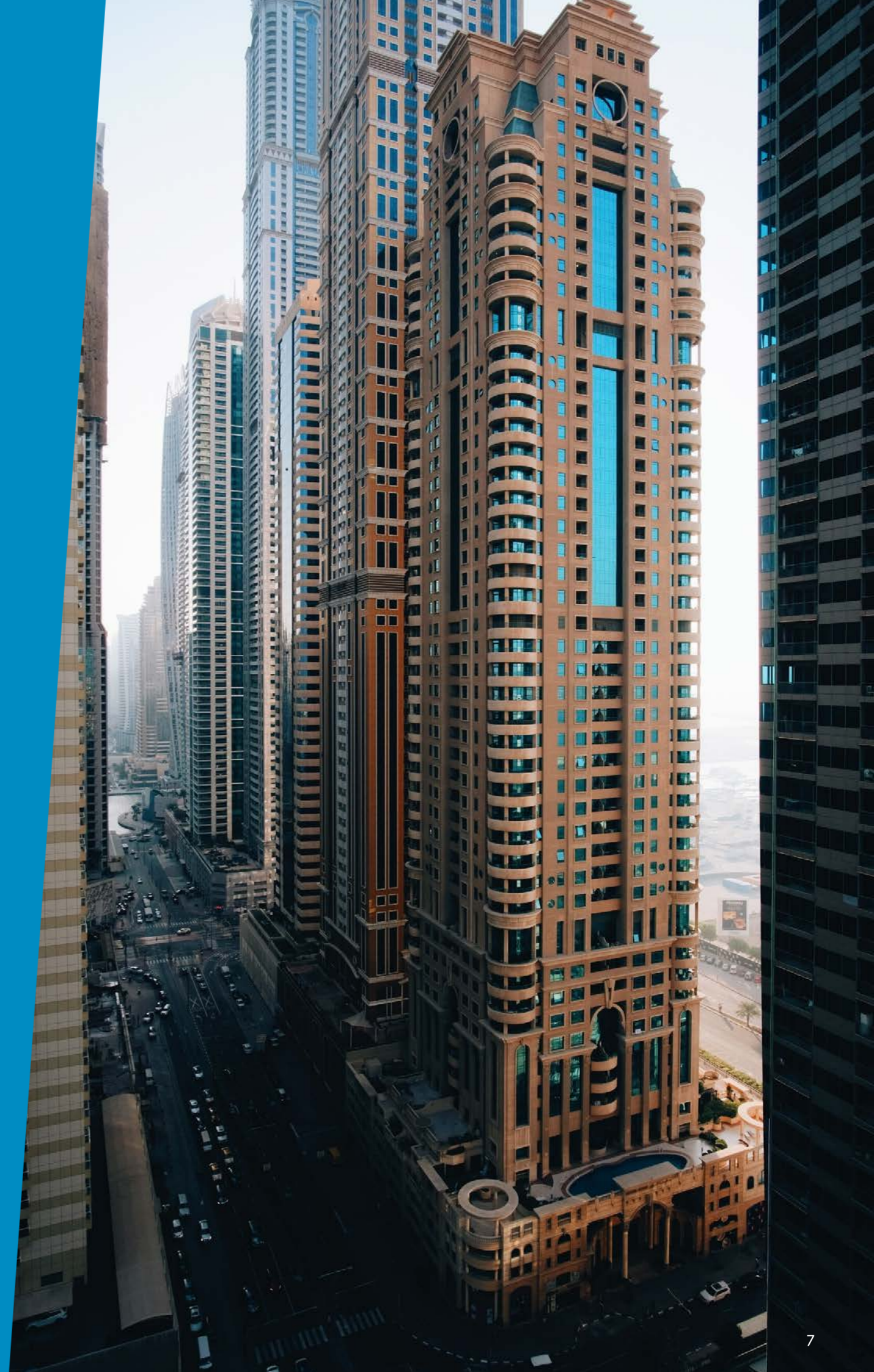


How can states reimagine their identity?

This study will explore the changing role of cities and the trends that are shaping their trajectories, using examples of successful practices from around the world. We start by introducing the customer-provider relationship that can define how cities interact with their citizens and constituents. In defining this relationship, the paper explores how we reached this moment and what the key demands of a city's customers ('citizen-customers') are.

We then pose 'smart digitalization' as a framework for addressing citizen-customer demands. Using examples, we examine how it can be used to transform cities without breaking budgets and applied to advanced or developing cities with a range of geographies and constituents. Specifically, for cities that are behind the technology adoption curve, we posit 'leapfrogging' as a strategy for getting ahead.

Finally, the paper emphasizes the importance of goal setting when pursuing smart digitalization. Creating and sticking to a vision that sets out short-, medium- and long-term goals will be crucial to the success of future cities.



# Executive Summary

Cities need to embrace smart digitalization aligned with a clear vision for the future.

The realization of 'smart digitalization' differs from city to city. It can range from the adoption of basic automation technologies that facilitate public services to advanced analytics that anticipate challenges in infrastructure development. If deployed appropriately, smart digitalization should not look the same in any two cities.

Underpinning all smart digitalization plans are clear goals to guide funding, defined action plans and enhanced transparency. This blueprint must be adapted to local requirements and citizen-customer needs, which results in a differing manifestation from city to city. Promoting service optimization, responsive delivery and end-to-end citizen-customer journeys must be the new norm for municipal services.

## Focused, intentional digital adoption

Unfocused digitalization dedicates resources to technologies that are not 'future flexible' and do not address specific needs. The focus should not be on the technology itself, but how it benefits citizen-customers. Today's smart decisions are those aligned with a city's vision for tomorrow.

To show greater intent about tech adoption without over-extending development costs, cities should deploy existing technology where possible, adapting it to their specific needs. Before choosing a digital solution, cities must address the following:

- How does this initiative chime with the city's vision?
- What need or challenge is the transformation seeking to address?
- How will this tech benefit 'citizen-customers'?

## The 'citizen-customer' paradigm

Individuals and businesses increasingly view themselves as 'citizen-customers' with growing expectations of municipal services and their surrounding urban form. In turn, cities need to model some of their functions after the best customer-oriented companies, while acknowledging that a city's mandate covers all its constituents, not just the most powerful or vocal.

Cities are facing increasing fiscal challenges requiring effective use of their limited resources. Here too, cities benefit by viewing themselves as companies serving a complex group of citizen-customers. Companies are often better than cities at rationalizing costs because their goal is profit-taking rather than the diffuse goals of cities.

Cities should not become profit-seeking entities but can move to smart digitalization by adopting rigorous cost-benefit analyses of tech solutions. While digitalization is not the antidote to all challenges, if done 'smartly' it can be applied more quickly and cost-effectively than in the past.

## Mindset shift

Digital solutions are ineffective if implemented and managed by untrained staff. Cities need to teach agile methodologies and engender critical thinking skills in their workforces. With these capabilities staff will be better placed to adopt and manage new tech, leading to better outcomes for citizen-customers.

Additionally, tech-focused continuous learning should be implemented to change old ways of thinking and upskill public sector employees. Municipal staff must engage with the dynamic new tech and data now essential for daily activities ranging from programming to analytics.

Historically, cities have turned to service companies to implement and manage new digital solutions. While they are often critical to initiating systems due to the specialization required, without competent operatives to take over and manage systems long-term, solutions may have short life spans.

## Core principles

A core set of principles can help ensure cities undertake smart digitalization and move towards a state focused on meeting both current and future needs by:



**1** Adopting a mindset prioritizing 'citizen-customers' and the 'common good'.



**2** Establishing a foundation that enables 'smart digitalization' through strong IT and cloud infrastructure, successful partnerships, clear, focused leadership and continuous learning.



**3** Utilizing conscientious 'leapfrogging' that enables strategic acceleration of the development cycle via digitalization and tech-enabled infrastructure.



# Setting the Stage - Cities and their 'Citizen-Customers'

Recent realities such as Covid-19, economic constraints and constituents' evolving expectations are creating new challenges for cities. Solutions to these issues lie in 'smart digitalization' which aligns with an effective and clear vision for the future. What is smart digitalization and how can local leaders achieve it?

Smart digitalization in a city can range from the adoption of tech solutions addressing specific needs to advanced analytics that anticipate challenges. Service optimization, responsive delivery and end-to-end citizen-customer strategies must become the new norm for municipal services. Transformation requires clear goals to guide funding with a defined action plan and enhanced transparency.<sup>1</sup> This universal blueprint must be adapted to local requirements and resident needs.

The rollout of digitalization by cities in developed markets over recent years has been anything but easy. Efforts have often been slow, piecemeal and misaligned with core service and operational needs. This has led to protracted implementation of tech solutions and a disconnect between ways in which 'citizen-customers' interact with cities compared to other aspects of daily life.

We now live, work and play online. Individuals and businesses increasingly view themselves as 'customers' with growing expectations of municipal services and their surrounding urban form. These citizen-customers are also increasingly vocal, emboldened by online anonymity.

Social media and tech have never played more vital roles. Cities will either embrace digitalization or be forced to by citizens, the latter scenario leaving them unprepared. To meet emerging challenges, cities will need to adopt a core set of principles including:



1

Adopting mindsets that prioritize 'citizen-customers' and the 'common good'<sup>2</sup>



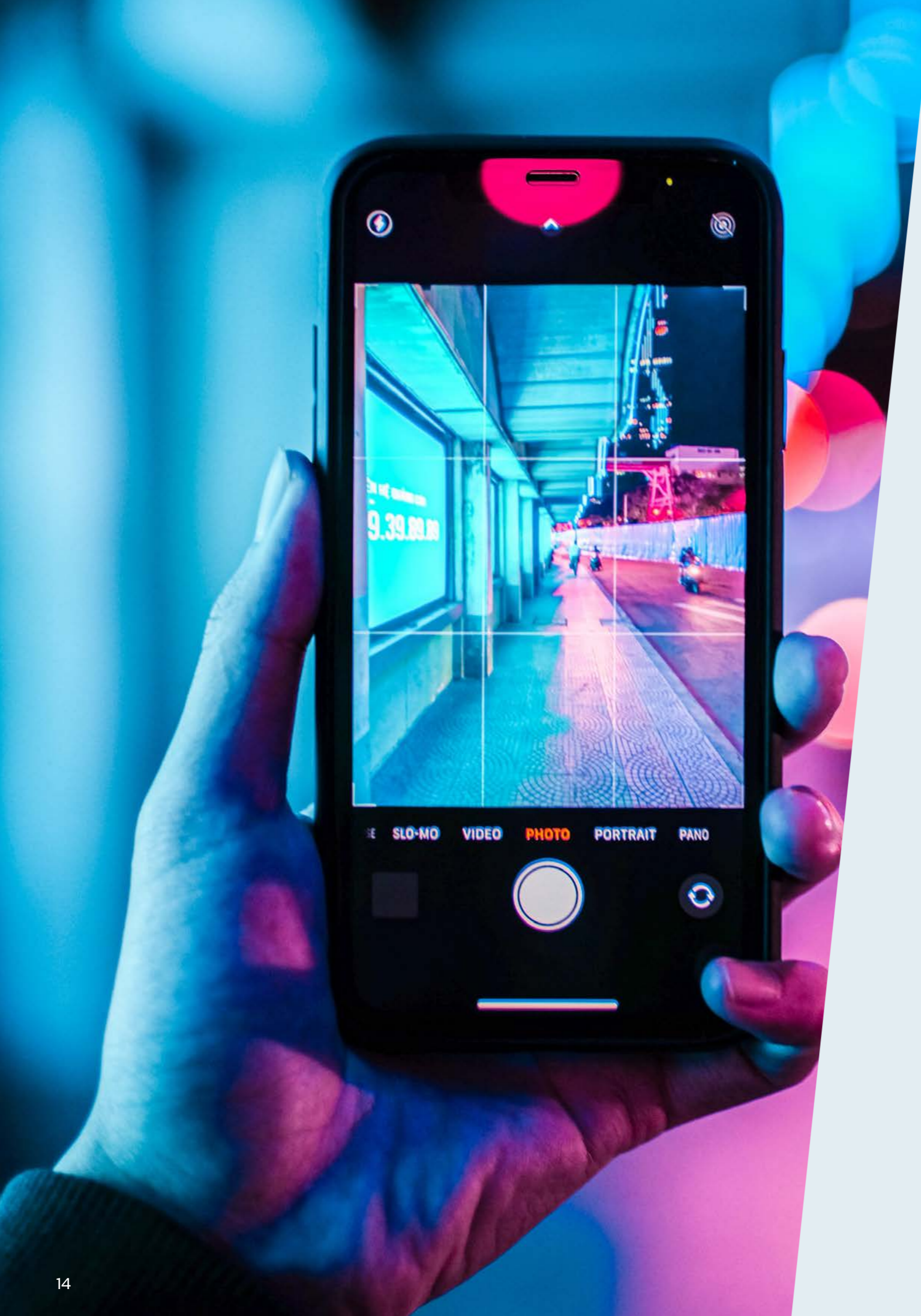
2

Establishing the foundations that enable 'smart digitalization'<sup>3</sup>



3

Utilizing conscientious 'leapfrogging'<sup>4</sup>



Once these principles are in place, cities must ensure that digitalization efforts are aligned with desired visions for the future. Initiatives to adopt tech or update processes should address the following questions: How does this align with the city's vision? What need or challenge is the transformation seeking to address? How does this benefit citizen-customers?

### THE INCREASING PRESSURES FACING CITIES

As of 2018, over 55%<sup>5</sup> of the world's population is living in an urban setting, a figure set to increase to 68%<sup>6</sup> by 2050. Migration towards cities, especially in developing countries in Africa and Asia, will be the defining change of the century. The total area of cities is expected to double by 2070. In the developed world, much civil infrastructure is no longer fit for this purpose, while in the developing world, it is often missing entirely. The World Economic Forum has estimated a \$15 trillion 'infrastructure gap' by 2040.<sup>7</sup>

This is compounded by the funding gap that municipalities were facing prior to the pandemic and has since increased. For example, municipalities in the province of Ontario in Canada are facing a projected CAD \$2.4 billion funding shortfall in 2021 due to the pandemic.<sup>8</sup> Los Angeles is facing a financial crisis so severe that city officials at the time of writing were looking to postpone contract payments.<sup>9</sup> With cities at the front-line in addressing local needs, funding shortfalls pose significant challenges to the provision of vital services.

The pandemic has increased the pace and impact of these challenges and emerging risks. At the onset of the pandemic, KPMG LLP undertook an assessment to identify key risks facing cities as a result of Covid-19. While the economic impact was identified as the most likely and severe risk facing cities, it is the combined risk of trust, leadership and politics that has the greatest potential to trigger catastrophic events in cities.

Cities need to use all the tools at their disposal to effectively address existing and emerging challenges. They will need to be smart about how they digitalize, making sure to adopt technologies geared towards addressing specific challenges and citizen-customer expectations.

Cities should be careful to avoid the lure of unfocused digitalization, such as dedicating resources to technologies that are not 'future flexible' and do not address specific needs. The focus should not be on the technology itself, but about how it benefits the citizen-customer. Being smart will mean making decisions today that are in line with a city's vision for tomorrow.



# How to Undertake 'Smart Digitalization'

Smart digitalization requires the following:



1

Adopting a mindset that prioritizes 'citizen-customers' and the 'common good'<sup>10</sup>



2

Putting in place the foundation that enables 'smart digitalization'<sup>11</sup>



3

Utilizing conscientious 'leapfrogging'<sup>12</sup>

## Principle 1: Adopting a mindset that prioritizes 'citizen-customers' and the 'common good'

As we have seen through the pandemic, we live in an increasingly connected world. The decisions of individuals can impact the health, safety and economic growth of cities. Citizens are increasingly demanding that cities and governments place more focus on the 'common good' and citizen wellbeing.

Cities bring together individuals, families and businesses into a single ecosystem with a shared identity and common rules. By belonging, citizens and businesses gain access to a set of services and infrastructure. The wrapping of traditional public-private partnerships into a fire sale of public assets in the name of innovation has resulted in the 'commodification' or selling of city resources to the highest bidder. This is often accompanied with deregulation to accommodate special interest groups.

Vulnerable populations are being disconnected from cities' infrastructure and services. Conversely, increased urbanization and short-term self-interest can lead to a tragedy of the commons. This can result from too much usage, in volume or intensity, of public assets such as parks or streets, leading to decreased quality.

As citizen-customers' needs are increasingly being taken into account, cities will shift to prioritizing the 'common good' as they develop policies and programs, and rethink the urban form. Additionally, digitalization and its wealth of data can equip cities with better tools to address unequal consumption of services.



Central to successful digitalization is a shift in mindset for cities.

Increased connectivity, sensors, artificial intelligence (AI) and the internet of things (IoT), can provide cities with usage information and help forecast growth areas. This digital and physical forecasting can help support urban planning and the provision of efficient city services by

focusing on evidence-based decision-making, which considers current and future needs. With the pandemic negatively impacting city finances, this efficiency will become increasingly important.



### Urban Environment Quality Index - Russian Federation

Russia's Urban Environment Quality Index seeks to evaluate the quality, popularity and attractiveness of city infrastructure and identify areas that need improving. This monitoring tool is applied to over 1000 cities across the country. Additionally, the government's Housing and

Urban Environmental program was launched in 2018 in an attempt to increase the Index score by 30% by 2024. The innovative assessment model seeks to prioritize projects at the national level and ensure consistent public space quality across the country.<sup>44</sup>



### Open Data Roadmap - Maputo, Mozambique

Nearly 75% of Maputo's population lives in informal settlements. Lack of clear land titling has created roadblocks for city public-private partnerships (PPPs) and private sector investments and restricts the use of land as financial leverage for basic urban infrastructure and to attract private investments. To address the reduced city revenues resulting from this situation, the Mayor of Maputo launched the Open Data Roadmap to improve transparency and accountability. With World Bank support, the city held a Hackathon in 2017 to develop an ecosystem of data producers and consumers, involving stakeholders from banks, universities, incubators, and software development associations. Several apps emerged, providing citizen-centered, data-driven, transparent governance, addressing problems associated with land titles by making city records more accessible.<sup>45</sup>

With the pandemic's impact on mental health, cities should shift their focus to incorporating well-being measures in planning and budgeting processes. Healthcare systems alone cannot tackle this.

Holistic re-thinking of the urban form is needed, requiring city leaders and civil servants to shift their thinking. This needs to begin with cultural change: a move from cities exclusively seeing themselves as gatekeepers, to protecting the wellbeing of their citizens and focusing on the 'common good'. Certain cities have started to implement this change through concerted efforts to quantify and track the happiness of citizens in real-time and publishing their results in open-data formats.





### Smart Dubai Happiness Meter UAE

The city of Dubai created an app designed to capture citizen-customer happiness data in a consolidated city dashboard: their first connected initiative. The goal was to allow private sector and government entities to evaluate citizen-customer experiences with live iterative

data within industry sectors and geographic areas, providing clear directions for service improvements. Implemented in multiple phases it was rolled out to 172 public- and private-sector entities in all citizen-customer interaction channels.<sup>16</sup>



### Santa Monica Well-being Project - California USA

Convinced that economic growth is just one indicator of a city's strength, Santa Monica developed the Wellbeing Project. Findings and insights from evaluation of wellbeing data are incorporated into planning and budget allocations to improve residents' quality

of life. Data collection and analysis are undertaken continuously, with inputs from resident surveys and social media. The associated Wellbeing Index is at the heart of the project. A guidebook has been created to help other cities develop their own well-being indices.<sup>17</sup>

Guiding many of these developments are the United Nations Sustainable Development Goal (SDGs), in particular, Goal 11: "Make cities and human settlements inclusive, safe, resilient and sustainable." In a recent interview, Kari Eik, Secretary General, OiER and Leader of the U4SSC Implementation Programme, described the importance of data driven solutions to ease the transition to smart sustainable cities.

**"A smart sustainable city is an innovative city that uses information and communication technologies and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects."**



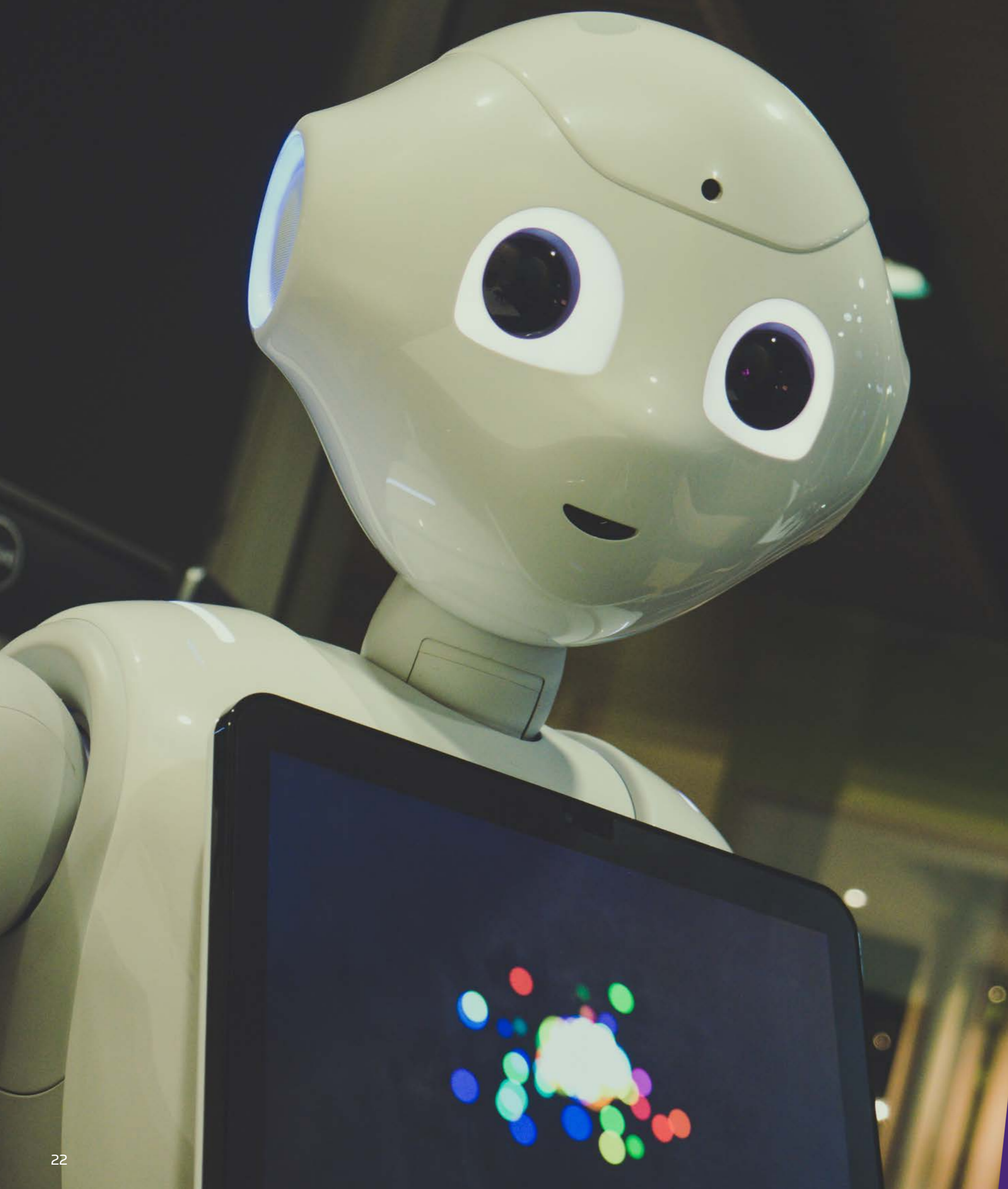
### United for Smart Sustainable Cities

United for Smart Sustainable Cities (U4SSC) is a UN program initiated by United Cities in 2016 by 17 UN entities, with the U4SSC key performance indicators (KPIs) for cities and communities at its core. These KPIs are being used worldwide to measure progress on SDGs and tech integration. The U4SSC is supporting cities with mechanisms to raise capacities and accelerate project delivery.

United Cities and the SDG Impact Fund established the United Cities Fund (UCF) to help cities with data management and reporting, digital solutions, finance,

and capacity-building. United Cities and the UCF have partnered with private and public sector entities as well as international organizations to reach its targets in supporting cities implementing the SDGs.

The first national U4SSC Implementation Program was set up in Norway, a five-year scheme to support cities and stakeholders in the transition to smart, sustainable development. KPMG LLP and United Cities are working together throughout Norway and gearing up to scale this partnership globally.



## Principle 2: Enabling smart digitalization

Putting in place the right foundations that enable digitalization is essential for improving connectivity within cities. Smart digitalization can also deliver improvements in service delivery and asset management within cities, ranging from better energy distribution to intelligent trash collection and reduced traffic congestion.

A key purpose of connected cities is to enable municipalities to leverage an intelligent network of connected objects and machines, leading to improved quality of life.

To achieve this, key pillars must be put in place to enable the shift towards smart digitalization, including:



Strong information technology and cloud infrastructure



Continuous learning and agile development



Successful partnerships



Clear and focused leadership

## Infrastructure as an enabler

Adopting appropriate tech infrastructure is the foundation of connected cities. Several cities have initiatives focusing on tech-driven infrastructure projects. Projects often fall into the following categories: hardware, software, data, systems, apps, sensors, blockchain and fiber optic broadband. These projects aim to improve services on all levels, from healthcare to mobility to security.

The goal of these projects is simple: to make cities smart and connected. They also seek to gather enough data to facilitate decision-making and improve increasingly tailored services to citizens. The city should therefore have strong IT infrastructure to enable digitalization, including city-wide Wi-Fi, efficient fiber networks, broadband internet access and strong, scalable cloud-based infrastructure.

Additional infrastructure investments are required to maximize the benefits of these technologies. For example, to fully deploy 5G technology, cities typically need to put in place between 10 to 100 more antenna locations than are required for 4G or 3G. While this requires a higher up-front cost, 5G technology allows for the use of wireless technology at full capacity, providing benefits such as higher-speed network connectivity and improved vehicle traffic management.



A recent report by the **Ontario Centre of Innovation** highlighted that smart mobility and tech solutions have great potential to ease congestion and improve road safety.<sup>18</sup>

“Traffic signal coordination allows more efficient traffic flows and reduces gridlocks at intersections. Real-time collision and road work alerts help drivers choose alternative routes and avoid congestion. Similarly, automated tolling and congestion pricing can improve traffic flow and decrease the likelihood of collisions”, remarked Raed Kadri, Senior Director, Automotive Technology and Mobility Innovation.

Moreover, cities should consider coupling smart mobility with other advanced technologies such as big data analytics and machine learning algorithms to further enhance traffic control systems.

### IT Infrastructure Case Study - Stratford / Municipal broadband network and free Wi-Fi

Stratford, Canada, implemented free wireless access through its city-owned internet provider Rhyzome Networks. Free wireless access is provided at a speed of

1Mbps, adequate for web surfing, checking emails and watching short videos. To accomplish this, a municipally owned company was formed in 2001 to manage more than 50km of dark fiber, enabling city-wide Wi-Fi with more than 300 wireless access points, allowing diversification of Stratford’s economy and providing wireless internet to under-serviced areas.

The city has also installed light and motion sensors; data from these is uploaded to publicly accessible databases, creating an innovative digital infrastructure that has allowed Stratford to become a testing facility for self-driving cars as well as other tech companies (Cisco; Toshiba). The city’s focus on digital innovation saw the University of Waterloo establishing a satellite digital media campus in Stratford, helping the city to reverse its ‘brain drain’.

Cities also need to ensure that infrastructure projects aimed at technological advancement provide value and address a specific need or problem. The following examples refer to cities and companies that provided valuable services through the use of technology.<sup>19</sup>



#### Dynamic pricing through the pay-as-you-go model

City: **Malindi, Kenya**  
 Service: **Finance and funding savings using real-time data**  
 Tech: **Analytics and computation**

‘Untapped’ enables water operators to adopt smart water systems to provide safe water up to the ‘last mile’. Untapped and Mathira Water & Sanitation Company (MAWASCO) ran a proof-of-concept project in Malindi, a coastal town with over 300,000 residents, installing 6,500 pay-as-you go smart meters in an 18-month capital lease. Over 3 years, MAWASCO recorded arrears and saved operating costs amounting to 111% of lease payments. Cashflow going through the Untapped payments platform was 5.4 times lease payments.<sup>20</sup>



#### Cloud-based analytic solutions for project delivery

Organization: **PCL Construction**  
 Service: **Project delivery streamlines through data analytics**  
 Tech: **Cloud and data storage**

Cloud-based analytics solution Job Site Insights uses IoT tech to improve site performance. IoT sensors provide real-time information for analysis which improves productivity, decreases risk and reduces material costs. To take full advantage of the service, companies must overcome resistance to electronic reporting and wearable tech to generate insights.<sup>21</sup>



#### New manufacturing processes and materials

City: **San Juan, Argentina**  
 Service: **Improving project delivery using robotics**  
 Tech: **Devices and Automation**

Argentina’s Aqueducto Gran San Juan project involves installing a system to bring water from wells 25km west of San Juan to complement the existing system. New robotic welding tech transformed the project’s economics, allowing fabrication to be completed in 162 days rather than the forecast 730 with traditional methods.<sup>22</sup>

## Successful partnerships

Covid-19 has resulted in significant government and municipality budgetary deficits. Partnering with the private sector offers alternative funding, although cities should be aware of certain PPP risks. The private sector aims to maximize profits and lower costs, while the public sector seeks to create jobs and increase public services over the long-term. The public sector must bridge these goals for the benefit of their citizen-customers.

City officials should be proactive in leveraging alliances and partnering with academia and research bodies.

These partnerships can play a critical role in accelerating digital transformation, furthering job creation and supporting long-term competitiveness. Partnerships with academia also unlock university resources as well as enhancing the local talent pool. Certain cities, such as Barcelona have effectively leveraged partnerships to further their digitalization efforts. The city's public-private partnerships, including 5G Barcelona, have helped to provide opportunities for the public and private sectors to test new technologies and approaches aimed at improving the citizen experience.



### Wakayama region, Japan

Partnership purpose: **Citizen-Centric Mindset**

Technology: **5G**

Partnership: **government study**

The Wakayama region in Japan is remote and sparsely populated, with limited expertise and capacity at the region's hospital. The local government, in studying how 5G tech could enhance healthcare and medical outcomes, found that 5G enabled real-time communication and sharing of images taken by a 4K close-up camera, high-definition echocardiographic video, and MRI images using a 4K videoconference system. NEC was responsible for the setup of a 28 GHz 5G base station and the associated 5G core network.<sup>23</sup>



### India

Partnership purpose: **Investing in Communications Infrastructure**

Technology: **Fiber**

Partnership: **infrastructure investors**

In July 2019, Canadian-based investment company, Brookfield Asset Management signed an agreement with India's Reliance Jio to invest USD 3.7 billion in Reliance's telecom tower and infrastructure assets. The investment quantum in the tower assets represents the largest-ever private equity deal in India. Reliance Jio owns over 175,000 telecom towers (built and under development) along a significant fiber footprint (over 100,000 route kilometers).<sup>24</sup>



### Patras, Greece

Partnership purpose: **Ecosystem Partnerships to Improve Citizen Outcomes**

Technology: **Internet of Things**

Partnership: **Several national and local partners enabled the network, devices, data analytics, infrastructure operations and maintenance.**

The city of Patras has implemented a narrowband IoT to power two services on the same network – smart parking and lighting. Through a PPP, Patras aimed to enhance the use of tech and communication solutions to help the municipality become more efficient and cut costs.<sup>25</sup>





### Clear and focused leadership

A key criterion in digitalizing a city is strong, focused leadership. Municipal leaders must blend traditional ways of working with new skills to guide their cities into the future. The transformation can only take hold with a vision that mobilizes people, creates conditions that enable digital maturity and attracts talent to the city.

Cities must develop frameworks to guide connected city implementation and appoint a dedicated person or group to lead this transformation. Many cities have established a chief tech officer (CTO) role to lead their digital transformation.

New management frameworks are needed to account for tech risks, specifically technological evolution. Nobody knows what the future will hold and how cities, citizen-customers and governments will respond. A new generation of solutions are emerging that require focused leadership to unlock potential. The question of balance remains key to managing the shift from a centralized approach to a user-focused decentralized model.

Managing this change requires new lenses through which risks are viewed to understand how to achieve the lowest viable cost of capital, while maximizing value for society at large. If one side is forced to take too much of the risk, solutions will be suboptimal.

### Continuous learning and agile development

Cities must implement continuous learning for staff. Rigid, bureaucratic structures should not be allowed to hinder development. Cities will need to re-examine their processes and structures to allow leaders to adopt digitalization to address their citizen-customer needs.

Tech-focused training programs are emerging to change old ways of thinking and to upskill public sector employees. Training municipal staff to work with dynamic new technologies and data is now essential for daily activities ranging from programming to analytics. Due to the rate of change, cities should leverage insights and resources from industry. Specifically, partnering with industry to design a learning curriculum will help ensure that staff skills match market realities and keep pace with emerging tech trends.

Partnerships with industry can also enable an iterative creation process, through the living lab approach to innovation.<sup>26</sup> When responding to new challenges, cities that prioritized investments in tech were able to provide residents with upgrades, such as personalized transportation services, accurate marketing initiatives and on-demand access to infrastructure.

These partnerships help cities foster innovation by becoming early adopters of cutting-edge tech and supporting entrepreneurs in developing proofs-of-concept.

Citizen-customers and businesses are increasingly expecting access to information and looking for real time feedback. As cities seek to digitalize, they should avoid incorporating technology in silos, and instead ensure that they are incorporating agility into the city's approach to digitalization.

Agile development includes adopting an iterative approach to new technology implementation, allowing cities to test for risks and gaps, as well as mitigation strategies prior to tech being implemented. With this approach, citizen-customers are able to provide feedback throughout the project development phase.

### Principle 3: Implementing conscientious 'leapfrogging'

Emerging cities face challenges including urban sprawl, immigration, population growth and infrastructure access inequality. With 440 emerging cities expected to account for close to half of expected global GDP growth until 2025,<sup>27</sup> it is important that these issues are addressed to maximize future economic potential.

If leveraged properly, 'leapfrogging' can be an effective tool to accelerate growth in these cities.



Emerging cities no longer need to follow the historic development cycles and can 'leapfrog' to more mature states through digitalization and technology-enabled infrastructure.

'Leapfrogging' is the ability to bypass traditional development cycles by capitalizing on established technologies. It creates opportunities for emerging markets to use technology to create new services, address development gaps and stimulate economic growth. Increased tech adoption can help emerging cities transition rapidly to a knowledge-based and data-driven economy built on digital services and citizen-centered, smart ecosystems.

It is critical that leapfrogging be adopted in a conscientious way, to enable cities to truly reap the benefits that new tech provides. Not doing so runs the risk of propelling cities to a state in which they are ill-equipped to address new challenges, or change course. It can also lead to cities adopting expensive new tech that is neither suited to the city's specific challenges nor fully utilized.

Leapfrogging strategies include stage-skipping (jumping directly to the latest tech) and path-creating (technological development involving emerging tech by creating new benefits and opportunities). Cities have used these techniques to reduce deficiencies in infrastructure or address unequal access to basic services.

A famous example of leapfrogging is the mobile revolution that put phones in the hands of millions of citizens in emerging markets. The need to invest in landline infrastructure was bypassed, citizen connectivity was increased, and access to online banking, healthcare and other public services was enhanced.<sup>28</sup>

The case studies below demonstrate ways in which leapfrogging was used to propel jurisdictions to development.





## Mobile banking leapfrogging through connectivity of mobile telecommunications



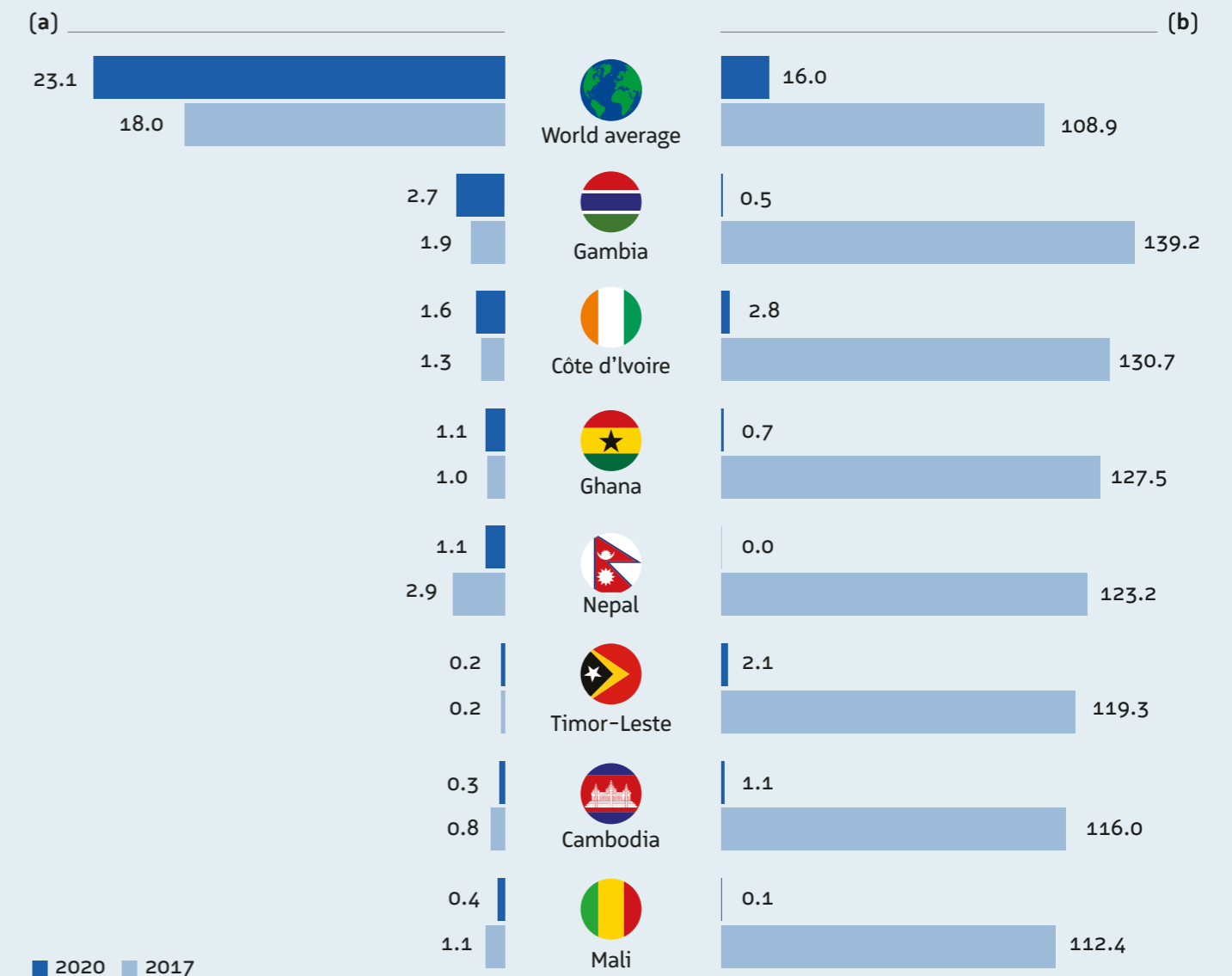
### Leap:

Telephone banking in Kenya was able to bypass the development of landline infrastructure by leveraging increased adoption of mobile phones. Tech advances and cost reductions in ICT tech enabled countries such as Kenya to skip the development of landline infrastructure by using satellite and mobile telecoms, increasing productivity and access to new markets.

### Implications for financial technology services:

As a result of these advancements in 2017, countries in sub-Saharan Africa had the highest proportion of adults with a mobile money account: a regional average of 21%. According to the Global Financial Inclusion Database, Kenya became a leader in mobile financial inclusion. With 59% of adults in the first four income brackets using a mobile account service, this is significantly higher compared with the worldwide average of 4%.

Countries that leapfrogged to mobile technology: A comparison of (a) fixed-telephone and (b) mobile subscriptions per 100 inhabitants, 2000 and 2017



Source: UNCTAD calculations based on data from the International Telecommunication Union.  
 Note: Earliest data for Timor-Leste is for 2003; latest data for Gambia and Mali is for 2016.

## Leapfrogging centralized grid systems using off-grid renewables



Kenya/ Expanded to African Continent

### Leap:

Effective off-the-grid solar-powered systems designed to address development gaps in Kenya enabled rural locations to bypass the need for a centralized grid system. M-Kopa offers off-grid systems that use solar power generation, low-energy LED lights and mobile payment to provide electricity to locations across the continent. The adoption of solar-powered energy also helped increase the provision of renewable sources in the region

### Social outcome implications:

M-Kopa was able to deliver affordable solar energy products by packaging payments similar to mobile payment structures. As a result, rural communities had access to a consistent energy source that created positive community impacts such as reducing the burden of collecting firewood, enabling children to study after school.<sup>29</sup>

## Leapfrogging transportation infrastructure through flexible policies and strategic partnerships



Rwanda

### Leap:

Rwanda's policymakers partnered with Zipline (a California-based drone start-up) to support the deployment of drones to deliver medical supplies (such as units of blood) to remote villages. To enable this, policymakers created performance-based regulations for drone flights, allowing unmanned aircraft on a mission-specific basis to access Rwandan airspace. The use of drones has reduced the need for roads and highway systems.

### Implications on connectivity

Regulatory flexibility and a positive outlook towards experimentation has helped Rwanda take advantage of drone leapfrogging opportunities to improve the lives of rural citizens.<sup>30</sup>

Each leapfrogging example demonstrates how technology can help governments to connect, empower and improve the lives of citizens. Tech not only bypasses the need for traditional infrastructure, it also provides social advantages such as increased access to financial institutions, education and healthcare.

### The key considerations for successful leapfrogging include:

#### Focus on addressing development gaps

Decision-makers first need to identify service gaps before implementing new technology. Leapfrogging is most successful when a development gap is properly identified and matched with a specific and applicable tech solution. Adopting a 'problem first, solution second' mindset when addressing gaps can provide effective and efficient outcomes.

This was seen in Kenya with M-Kopa's approach to electricity and grid-systems in rural areas. Once the company identified a gap, they created an innovative off-grid solution that also utilized their successful mobile payment structure.

#### Strategic partnerships are pivotal to fostering sustainable development

A notable criticism of leapfrogging is its lack of sustainable development for countries, regions or cities. While the introduction of tech solutions provides additional services to citizen-customers, the benefits can be reaped by companies that provide little contribution to the local economy.

For example, the increased offering provided by mobile phones in Africa has benefited citizen-customers, with little evidence that this consumption leads to sustainable growth. This gap can be avoided by adopting a strategic partnership approach, including an openness to experimentation by working with industry and multinational organizations.

As seen with Rwanda's partnership with drone tech companies, cities can work together with private entities and multinational organizations to offer advanced solutions to citizen-customers while retaining local economic benefit. Through strong governance, innovation can be fostered where both the city and organizations become developers and innovators that support local transformation by creating robust, dynamic ecosystems.

## Leapfrogging and the 'digital push' created by the Covid-19 pandemic

Prior to the pandemic, cities were already adopting tech solutions and increasingly embracing digitalization. Covid-19 has rapidly pushed cities to an inflection point where utilizing tech is now a necessity, rather than a convenient option.

New businesses have been created and traditional 'bricks and mortar' businesses have converted to digital platforms. Many of these businesses will require new regulatory regimes to protect consumers. Often, the creation of new regulations was deferred to allow the businesses to succeed (and citizen-customers served) during the pandemic.

Pandemic-boostered businesses requiring regulatory consideration include: blockchain-based epidemic monitoring platforms, robots that deliver food, medicine and screen body temperature; online education platforms and home-based working solutions; and robotics and 3D-printing technologies to enable physical distancing in manufacturing plants.

Some governments have embraced these new digital platforms to provide social welfare. While necessary, accelerated digitalization has also created challenges. The digital divide between cities and their citizen-customers who are digitally connected and those who are not is now greater than ever, and especially in emerging economies.



The Covid-19 pandemic has accelerated the adoption of technology, forcing cities and citizen-customers to adapt to a digitally connected economy.

# Looking Forward – The Move Towards ‘Smart Digitalization’

As cities look to embark on the path of smart digitalization, they first need to have a clear vision for the future in place. Visions help leaders make critical decisions required to digitalize effectively and foster their new identity. There are three types of visions:



Aspirational visions set long-term targets and the final desired destination



Focused visions are directed towards specific, medium-term targets



Basic visions prioritize core functions and/or basic needs of citizen-customers in the short term

The implementation of smart digitalization requires a clear focus on the future. Cities need to articulate what kind of smart city they want to be, and by when. If the primary goal is to ease access to information and resources, the city may seek to implement an ‘around the clock’ model allowing citizens to access online information and resources at any time.

A focused vision will help prioritize resources and identify which services or parts of the enterprise to digitalize. A basic vision will drive infrastructure and technology investment for a defined outcome.

Leadership is required to effectively apply smart digitalization, ensuring manifestation of the overarching visions. As cities continue to face challenges, including fiscal, health and safety pressures, they need to ensure effective use of their increasingly limited resources. Leaders need to ask the following questions before proceeding with any digitalization initiative:



How does this initiative align with the city’s vision?



What need or challenge is the transformation seeking to address?



How will this technology benefit the citizen-customer?

Cities need to be smart about how they digitalize and make decisions that are in line with the future visions. Implementing this transformation requires the following:



**1** Adopting a mindset that prioritizes 'citizen-customers' and the 'common good', which considers current and future needs.



**2** Putting in place a foundation that enables 'smart digitalization' through strong information technology and cloud infrastructure, successful partnerships, clear and focused leadership and continuous learning and agile development.



**3** Utilizing 'leapfrogging' that enables strategic acceleration of the development cycle using digitalization and technology-enabled infrastructure.



# About KPMG



For almost 50 years, KPMG Lower Gulf Limited has been providing audit, tax and advisory services to a broad range of domestic and international, public and private sector clients across all major aspects of business and the economy in the United Arab Emirates and in the Sultanate of Oman. We work alongside our clients by building trust, mitigating risks and identifying business opportunities.

KPMG Lower Gulf is part of KPMG International Cooperative's global network of professional member firms. The KPMG network includes approximately 227,000 professionals in over 146 countries. KPMG in the UAE and Oman is well connected with its global member network and combines its local knowledge with international expertise, providing the sector and specialist skills required by our clients.

KPMG is widely represented in the Middle East: along with offices in the UAE and Oman, the firm operates in Saudi Arabia, Bahrain, Kuwait, Qatar, Egypt, Jordan, the Lebanon, Palestine and Iraq. Established in 1973, KPMG in the UAE and Oman employs 1,485 people across four offices, including about 100 partners and directors.

Our latest initiative, KPMG IMPACT, aims to help clients future-proof their businesses amid times of increasing focus towards issues such as climate change and social inequality. The goal is to help them achieve success across 17 major Sustainable Development Goals (SDGs) and become more resilient and socially conscious. For financial year 2021, the firm has earmarked a global budget of USD 1.43 million for the initiative.

Our Emiratization initiative highlights our commitment to work closely with the local community and support the nationalization program of the UAE government. KPMG Lower Gulf is closely collaborating with Abu Dhabi Global Market Academy (ADGMA), the Abu Dhabi Human Resources Authority and Abu Dhabi Accountability Authority to deliver the program, Pre-Audit Qualification Training (PAQT).

As we continue to grow, we aim to evolve and progress, striving for the highest levels of public trust in our work. Our values are:

- **Integrity:** We do what is right.
- **Excellence:** We never stop learning and improving.
- **Courage:** We think and act boldly.
- **Together:** We respect each other and draw strength from our differences.
- **For Better:** We do what matters.

To meet the changing needs of our clients, we have adopted an approach aligned with our global purpose: Inspiring Confidence, Empowering Change. Our three pillars – exceptional quality of service, an unwavering commitment to the public interest, and building empowered teams – are the foundation of our firm.



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