SEAMLESS, SECURE, HUMAN

Building the cities of the future

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Human technology and the drive toward sustainability

Urbanization is increasing at a pace never before experienced. By 2030, the world will have 43 megacities, each with more than 10 million inhabitants. Combined with the overall growth of the world's population, the shift to cities will add another 2.5 billion people to urban areas by 2050, increasing the proportion of population living in urban areas from the current 55% to 68%.

This presents city administrators with an evolving set of challenges. Rather than reacting to emerging technologies, administrators of the modern city could proactively introduce innovations designed to increase the happiness quotient of its inhabitants, by making each transaction or interaction more efficient.

"Cities are growing and require a shift in thinking to develop and grow sustainably," Elias Aad, Vice President, Head of Strategic Growth Business, MENA, Mastercard, says in an interview. "Sustainable development depends on the successful management of urban growth through innovation and technology that streamlines cashless payments. Making well-informed data-based decisions around development policy accelerates local business, drives trade, and enables job growth."

At the heart of smart city development lies engagement with its inhabitants. The level and quality of engagement includes aspects such as sharing needs and wants; channels of interaction; feedback on governance; adoption of new technologies and channels; and communicating happiness or unhappiness with existing services. This helps make cities more livable, resilient and able to better respond to challenges. In the journey toward becoming smarter, the aim is to have cohesion between physical, digital and human systems.

To this end, Mastercard partnered with Smart Dubai and Expo 2020 Dubai to conduct a survey that captures the needs and wants of UAE residents. The Smart City Aspirations Survey explores how residents are stakeholders in driving smart city trends, developments, and technologies.

Almost 4 out of 5 respondents said they would be happier living in a smart city, regardless of their age or social class. The most important feature in daily life, expressed by 28% of respondents, is a single platform that facilitates greater efficiency. Better-protected privacy and more secure personal data accompanies the aspiration for efficiency, as highlighted by 24% of respondents.

80%

of respondents to the Smart City Aspirations Survey said they would be happier living in a smart city

The primary expectation of residents is sustainability. Respondents expect environment-friendly innovations in the smart city of the future, in the form of 'greener' government and business practices.

"A frictionless government experience is an integral part of any smart city. At Smart Dubai, we don't believe in the use of technology for the sake of technology. Our vision is to build an inclusive, holistic, and resident-centric smart city by leveraging the power of technology, leading to higher levels of happiness amongst residents and visitors," Meera Al Shaikh, International Relations and Partnerships Section Manager, Smart Dubai, says in an interview.

Digitalization is one of the strongest driving forces that power not just smart but also sustainable cities. Multiple sectors are being disrupted positively by the development and commercial deployment of emerging technologies. City administrators support this through a planned evolution of laws and regulations.

Smart infrastructure remains the foundation, enabled by smart payments innovation. The technologies of the Fourth Industrial Revolution (Industry 4.0 or 4IR), which are already being tested commercially, play a vital role in developing smarter cities that fulfil the expectations of their inhabitants.

"Today more than ever, people are looking for an optimistic vision of international cooperation that improves lives. With our theme 'Connecting Minds, Creating the Future' more relevant than ever before, Expo 2020 Dubai is an exceptional opportunity to bring the world together with a shared purpose, inspiring and facilitating discussions, connections, and actions that address some of humanity's most pressing challenges," Iman Alomrani, Deputy Chief Technology Officer, Expo 2020 Dubai, says in an interview.

Government payment ecosystems emerge as early adopters of new technologies and digital payments. Reduced dependance on cash is one of the strategies being employed by governments worldwide to pursue economic growth and financial inclusion, especially in the wake of the COVID-19 pandemic. Countries that prioritize digitized payment economies are better placed to mitigate the associated adverse impact of unemployment, financial exclusion, fraud, theft, cost of cash, and corruption. A collaborative approach is indicated, including not just the government but also private sector entities.

"Technology is driving our progress. But values and ethics will decide what we do with it," Gerd Leonhard, Futurist and Author, says in an interview. "We live in a world with lots of data. The problem is that to look at people as a data source can lead to abuse or misuse, overreach and bias. A smart city needs to balance security and convenience with liberty. You need digital ethics, or the ethics of technology."

In the final analysis, while emerging technologies are playing a robust role in delivering city services in line with resident expectations, the goal of making urban systems smarter is to increase the sense of human security and the quality of life, leading to happiness.

KEY INSIGHTS

Urbanization is increasing at a pace never before experienced. By 2030, it is estimated that the world will have 43 megacities, each with more than 10 million inhabitants.

Smart cities are proactive in meeting the aspirations of their residents, using big data and 4IR technologies to transform policies and processes.

Government payment ecosystems are early adopters of new technologies and digital payments. Reduced dependance on cash leads to economic growth and financial inclusion.

At the heart of smart city development is a continuing engagement with residents on how digitalization should be deployed to make cities more livable and resilient.

An early adopter, Dubai is implementing this via its Smart Dubai goals, using new and emerging technologies to transform service delivery and optimize use of resources.

KEY FINDINGS FROM THE SMART CITY ASPIRATIONS SURVEY

4 out of 5 respondents to the Smart City Aspirations Survey said they would be happier living in a smart city, regardless of their age or social class.

'Living in a sustainable and environmentally friendly city' emerged as the most exciting innovation by far, with 53% of respondents choosing that option.

The most important feature of daily life was higher efficiency and a single app or platform, followed by better privacy and security of personal data.

Over 54% respondents said the COVID-19 pandemic will accelerate the development of smart cities. They also agreed that cashless payments are likely to stay.

Job security and staying active were perceived as the biggest challenges of digitalization, followed by the fear of becoming over-reliant on technology.

Cities that respond to their residents' evolving needs

In the New York City of the late 1800s, horse-drawn carriages moving on tracks carried 120,000 passengers a day. The city's administration employed street cleaners to remove more than 150,000 tons of manure every year. The introduction of the 'horseless carriage', which came to be known as the 'automobile', in the 1900s caused a great lifestyle, regulatory, social, and industrial transformation.[1]

This disruptive mobility solution, much as the emerging driverless cars are being viewed today, needed its own set of regulations, infrastructure, and a business supply chain, attracting both critics and early adopters.

The introduction of new technologies aimed at enabling urbanization requires the adaptation and updating of regulation and infrastructure.

Urbanization is increasing at a pace never before experienced. By 2030, it is estimated that the world will have 43 megacities, each with more than 10 million inhabitants.

68%

of humanity will live in urban areas by 2050, with Asia and Africa at the heart of this shift

Understanding urbanization is crucial for the implementation of the global 2030 Agenda for Sustainable Development set by the United Nations.[2]

Combined with the overall growth of the world's population, the shift to cities is expected to add another 2.5 billion people to urban areas by 2050, increasing the proportion of population living in urban areas from the current 55% to 68% by 2050. Asia and Africa are at the heart of this shift with close to 90% of this increase taking place on these two continents.[2]

The phenomenon of urbanization has been presenting city administrators with evolving sets of challenges. Rather than reacting to evolving technologies, guardians and administrators of the modern city should proactively introduce innovations designed to increase the happiness quotient of a city's inhabitants, with the aim of making each transaction and interaction faster, easier and more seamless.

A deeper look into the operational maps of cities reveal that they function on the networks, infrastructure and environment of six core systems: people, business, transportation, communication, water and energy.[3] As more and more people move to urban areas, these core systems face significant challenges to maintaining effective service delivery.

How a city meets the challenges of providing high-quality housing, energy, infrastructure, employment, health and education to its expanding population is likely to determine how sustainable and inclusive the city is. Smarter cities are proactive, using big data and the technologies of the Fourth Industrial Revolution (4IR) to transform policies and processes, ensuring that the benefits of urbanization are fully shared and inclusive. Infrastructure to deliver e-government services, structuring and analyzing data to inform decisions, and using technology to ensure inclusion, sustainability and economic growth are some of the imperatives.

At the heart of smart city development lies engagement with its inhabitants so that digital technology is used to maximize social capital. The level and quality of engagement includes aspects such as sharing needs and wants; channels of interaction; feedback on governance; adoption of new technologies and channels; and communicating happiness or unhappiness with existing services or channels.

This helps make cities more livable, resilient and able to better respond to challenges. In the journey toward becoming smarter, the aim is to have cohesion between physical, digital and human systems.[4]

Cities that adopt this path are classified on Rogers' diffusion S-curve as innovators, early adopters, early majority, late majority and laggards.[5]

In the Middle East, for instance, Dubai has emerged as one of the early adopters of innovation at all levels, working to create an interconnected, intelligent city with digital technology embedded across its functions. The purpose is to apply technology to enhance the benefits and diminish the shortcomings of urbanization for all inhabitants.
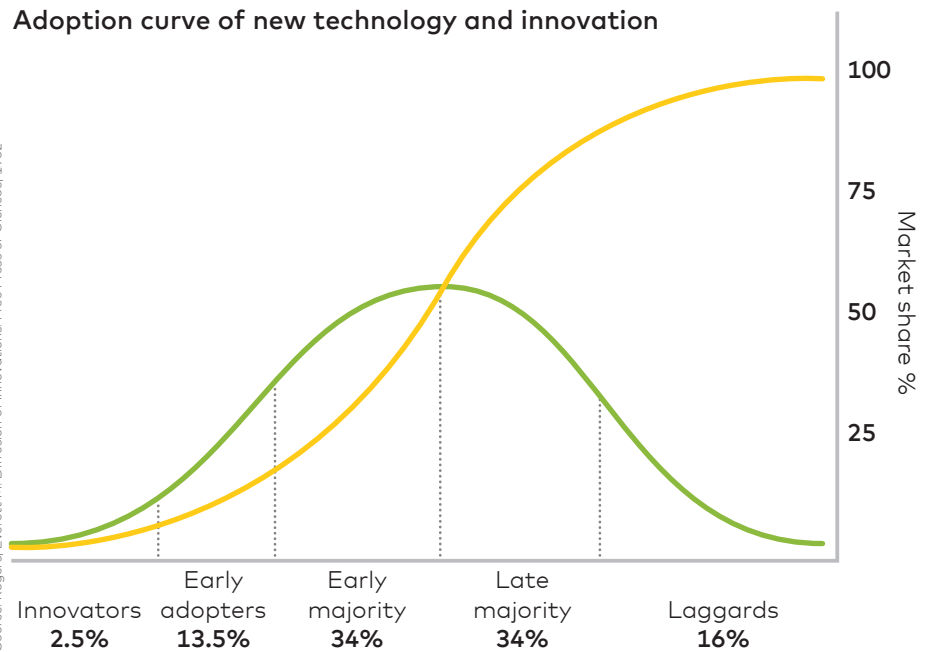
Adoption curve of new technology and innovation

| Innovators
2.5% | Early
adopters
13.5% | Early
majority
34% | Late
majority
34% | Laggards
16% |

Market share %

The introduction of new technologies aimed at enabling urbanization requires that regulation and infrastructure are adapted and updated

The Smart Dubai Strategy 2021 is envisioned as a blueprint to achieve the mapping of six city dimensions and identifying ambitious targets to fundamentally transform the way people live, work and interact with the city.[6]

Dubai is implementing this via its smart city goals, using new and emerging technologies to transform core systems and optimize use of resources. The transformation is championed by the Smart Dubai Department launched in 2015 as the government entity charged with facilitating Dubai's citywide smart transformation to empower, deliver and promote an efficient, seamless, safe, and impactful city experience for residents and visitors.

Technology is the tool used in delivering goals that tackle human happiness and wellbeing in various contexts. In the case of Dubai, for instance, which announced its Smart City project in 2013, the goal is simple: "To create the happiest city on earth". The stakeholders in this value system include communities, businesses, international trading partners, and visitors, for whom the city will "leverage the seemingly limitless potential of technology and, more specifically, data, to maximize innovation potential and value creation."[7,8]

The Happiness Meter, implemented in Dubai in 2015, granularly captures live sentiment, which measures on a daily basis public satisfaction.[9] This a crucial aspect making a city 'smarter', by capturing residents' feedback on existing services and also on future paths of development.

By early 2016, as many as 31 entities gathered a million interactions with the public.[10] By the end of 2018, this number reached 22.5 million, with 119 private sector and 53 public sector entities participating in 4,400 customer touch points.[11]

"We help build smarter and more inclusive economies"

What role does Mastercard play in the smart city ecosystem?

Cities are growing and require a shift in thinking to develop and grow sustainably. Sustainable development depends on the successful management of urban growth through innovation and technology that streamlines cashless payments.

Mastercard has a collaborative and connected approach to urban development and is working with over 150 cities across the world. Through our global expertise, Mastercard is the ideal technology partner, aiding optimization of government spending, funds allocation, budgeting, and access to economic opportunities.

We apply design thinking methodology against today's consumer journey and ideate solutions to customer issues using LaunchPad. Thinking through the customer journey helps us come up with ideas that, for instance, see you leave an airport, go through passport control, get a cab, and check in to a hotel simply using biometrics.

Making well-informed, data-based decisions around development policy accelerates local business, drives trade, and enables job growth. Insights derived from anonymized and aggregated Mastercard transaction data can help city officials better understand the impact of planned and unplanned events on their city's economic health.

We build smarter economies by forming strategic public-private partnerships (PPPs), providing access to leading-edge technology, sharing critical insights, and working with industry leaders to commercialize and scale solutions.

Mastercard's model for urban innovation is City Possible, in which a global network of cities, companies and communities work together to promote inclusive and sustainable urban co-development. Through this global network of cities, Mastercard is helping organize the transfer of learnings between cities.

Mastercard has included Dubai in its City Possible program. Mastercard is also working with Dubai's Roads and Transport Authority to enable frictionless, faster and more secure public transport payments to simplify the journey for commuters.

What technologies and trends do you see shaping the cities of the future?

Going beyond payments, examples of technologies that are changing the way people go about their lives are:

Demand-based and energy-efficient multimodal transportation: Urban mobility has evolved from owning and driving cars, seamless multi-modal transportation, coupled with the development of tech startups that simplify trip planning via one-ticket issuance and invisible and seamless digital payments, among others. We will continue to see new innovations building on the opportunities of the internet of things and autonomous vehicles. This will allow development of connected, sustainable and energy-efficient cities with seamless experiences for riders.

Data-driven planning, development and responses: The power of data will continue to be instrumental in developing cities of the future. Data analytics will play an ever bigger role in (a) organizing the cities' flows (e.g. the development of traffic heat maps and directing traffic), (b) developing resident-centric policies based on better, quicker and more efficient decisions from evidence and insights, and (c) improving quality of life. These will be empowered by the continuous development of artificial intelligence and data analytics dashboards. For example, analytic tools can help governments understand how to support their citizens and better respond to crises such as the COVID-pandemic.

A future shaped by further collaboration and convergence: Effective public-private partnerships and collaboration among tech companies present a tremendous opportunity to drive sustainable and diversified development. Harnessing the expertise of both the private and public sector, powered by Blockchain and advanced software development technologies, solutions and platforms, cities can build connected and more inclusive communities that allow residents to provide real-time feedback and conduct processes and transactions in real time.

How can payments go beyond transactions to create a value-added experience for consumers?

There are numerous examples where we work with cities to utilize technologies that drive efficiency in the daily lives of residents and visitors. Some of these are:
- Tap in to access the metro service with fare computed and paid as you tap out to exit.
- Pay with a wearable device for coffee when headed to work.
- Book a table for lunch with friends and split the bill by just finding them in your contact list.
- Order flowers online for your partner on your way back and just pay in-app with the touch of a button.
- At home, order your voice assistant to pay for your utility bill as you prepare dinner.

These experiences are enabled across global businesses and consumers, securely powered by Mastercard on a card designed to be Digital First – accessible in its virtual form on your phone or wearable for making contactless, in-app and online payments.

Greater efficiency and better privacy top the list

Globally, challenges related to a happy urban experience for residents come from transport and mobility issues, lack of professional growth, and underwhelming sustainability initiatives. Lack of community and cultural activities is also cited as a challenge.[12]

Cities can meet these challenges or bridge these gaps by listening to what residents have to say. Many inhabitants of urban areas with smart city ambitions are digitally literate and socially and politically aware. As consumers of digital experiences, they have similar expectations from their government. The gap between what inhabitants experience in their lives and what they expect from smart government is narrowing.

Research has pointed to the emergence of 'Digital Super-Users', who use their computer or mobile device multiple times every day. It also emphasizes the importance of benchmarking smart services to the habits, preferences, and expectations of such inhabitants and preparing for a future where everyone will be a Digital Super-User.[13]

MOST IMPORTANT FEATURES IN DAILY LIFE:
A single platform with better protected privacy

Feature	Percentage
More efficiency, via a single app/platform	28%
Better protected privacy and more secure personal data	24%
City-wide cash-free services	18%
Higher speed of transaction and services	13%
More personalization	11%
Seamless payments wherever you might be	5%

0%　20%　40%　60%
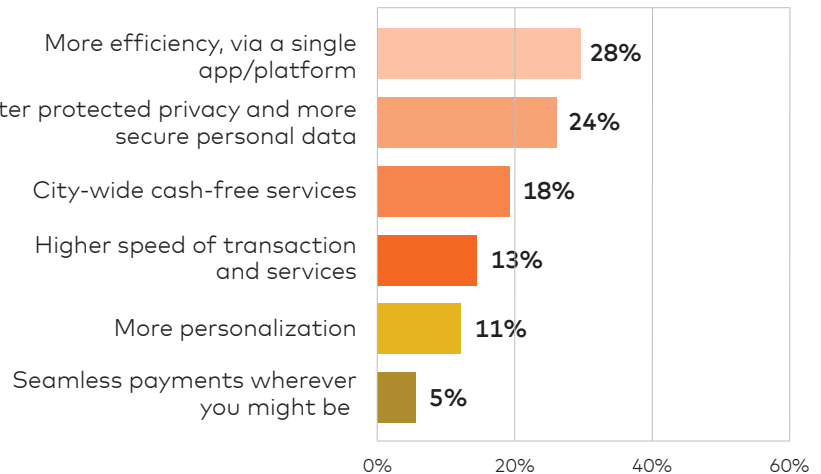
Improved government digital services would have even greater positive impact on Digital Super-Users' views toward government. A survey in 2014 found that 73% of inhabitants expected the same or higher quality from government digital services as from commercial organizations.[14]

Within two years, by 2016, this number had surged to 85%. While privacy and access remained universal, personalized digital experience (54%), access to user tips and comments (47%), smartphone access (44%), and integration with social media (47%) emerged as new expectations.[14]

In the 2019 edition, interaction and not transaction emerged as a key expectation, with 67% of respondents considering ease of interaction important to the appeal of their favorite apps and wanting their government to make it easier to interact with digital services. Over 50% indicated a preference for a single portal to access multiple services.[14]

In every study, the smartphone has emerged as the primary channel of interaction, with younger respondents expressing the need for a diversity of channels. Always-on, connected devices have emerged as a great tool for connecting residents and governments via super apps, such as DubaiNow, where most services are available in a single place. These enhance inhabitants' willingness to use smart initiatives.

This global trend found resonance in the Smart City Aspirations Survey where almost 4 out of 5 respondents said they would be happier living in a smart city, regardless of their age or social class.

Smartphones were the chosen channel of communication for 67%, with variations across age groups – 73% of those 45 years and more opted for it, compared to 55% of 18- to 24-year-olds.

This shows how crucial 'smart inhabitants' are to the growth of smart cities. Resident-centric strategies place the inhabitant of the city at the center of all smart policies, infrastructure and initiatives, which are ultimately more effective in delivering the goals of smart cities.

42%

respondents chose environmentally friendly innovation among their top 2 expectations

On the other hand, initiatives that focus more on technology at the expense of user experience and adoption may be unable to deliver what the residents of a city need and want. This can spell the difference between success and failure for any smart city transformation.[15]

According to the results of the Smart City Aspirations Survey, the most important feature in daily life, expressed by 28% of respondents, is a single platform that facilitates greater efficiency. Better-protected privacy and more secure personal data accompanies the aspiration for efficiency, as highlighted by 24% of respondents.

A lot of development to create smarter cities that look after their people hinges on the right balance between privacy and convenience. In the case of Dubai, this is achieved by making data available for use to improve lives while safeguarding consumer data using a judicious mix of legislation, policy and standards.

Dubai Data has very clear policies on how data should be treated. The Dubai Data Law (2015) was issued to ensure that data gathered by Dubai government entities is effectively shared amongst such entities and with the private sector, to maximize the benefit for the city's residents, visitors and economy.[8]
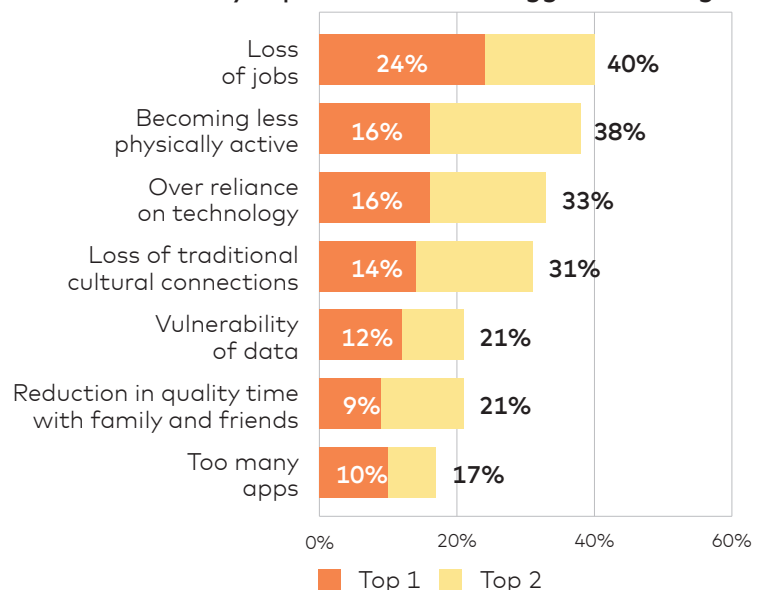
Cashless services

The evolving expectations of a city's residents come with the challenge to all stakeholders of responding with agility. City-wide cashless services have emerged as one of the top three choices in the Smart City Aspirations Survey, as highlighted by 18% of respondents.

In 2020, contactless payments have seen an unprecedented uptick in demand globally. A consumer poll in April 2020 by Mastercard, studying changing consumer behavior in 19 countries around the world, paints a picture of accelerated and sustained adoption of contactless payments.

40%

respondents perceived job security as their biggest challenge, followed by becoming less physically active

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CHALLENGES: Job security is perceived as the biggest challenge

Challenge	Top 1	Top 2 (total)
Loss of jobs	24%	40%
Becoming less physically active	16%	38%
Over reliance on technology	16%	33%
Loss of traditional cultural connections	14%	31%
Vulnerability of data	12%	21%
Reduction in quality time with family and friends	9%	21%
Too many apps	10%	17%

0%   20%   40%   60%

■ Top 1   ■ Top 2

Top 1 indicates number one expectation/challenge
Top 2 indicates if expectation/challenge is within the top 2 (either first or second choice)

Source : Smart City Aspirations Survey

EXPECTATIONS: Environmentally friendly innovations top the list

Expectation	Top 1	Top 2 total
More environmentally friendly government and business practices	26%	42%
Paperless government services without visits to service centers	19%	38%
Affordable and fast city wide Wi-Fi/internet connectivity	13%	26%
Growth in the number of hi-tech and bio tech businesses	11%	23%
The majority of people working from home	11%	21%
Universal cashless payment acceptance	9%	20%
An integrated public transportation system	9%	20%
Increase in the use of AR and VR in products and services	4%	11%

■ Top 1   ■ Top 2

Top 1 indicates number one expectation/challenge
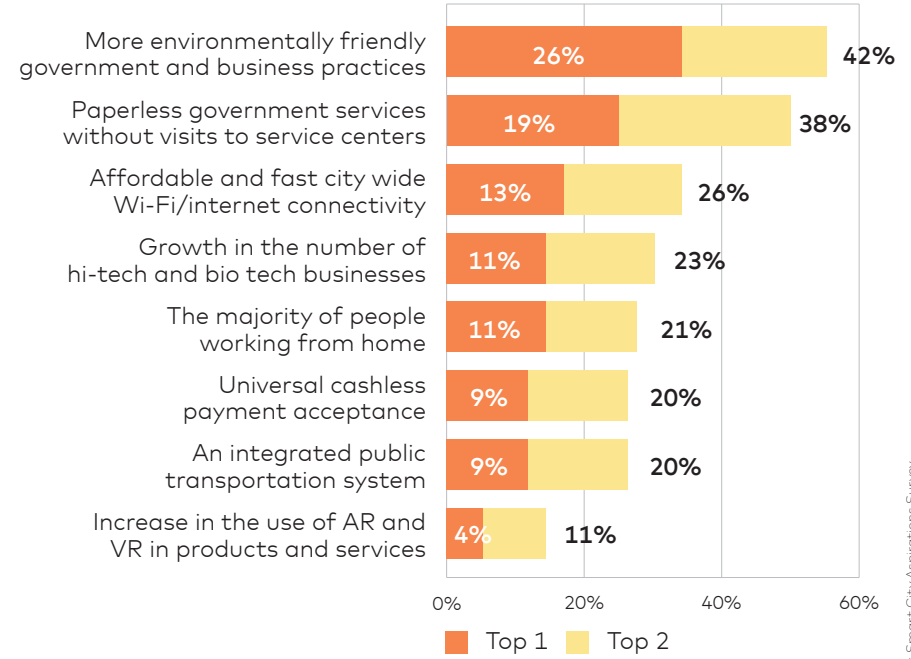Top 2 indicates if expectation/challenge is within the top 2 (either first or second choice)

Source: Smart City Aspirations Survey

1/4

respondents said a single app or platform along with privacy protection is the most important feature in daily life

More than 70% of respondents in the Middle East said they were using some form of contactless payment and 82% of UAE respondents considered contactless to be their preferred method of payment.[16]

The implementation necessitates a synergistic approach by the regulator, infrastructure developers and private sector, which can be better achieved via public-private partnerships (PPP). A case in point is the health and safety requirements during the COVID-19 pandemic.

In April 2020, the Central Bank of the UAE increased the cap on contactless payments – those not requiring a PIN to be entered – to AED 500 ($136.13) from the earlier limit of AED 300 ($81.68).[17] This enables merchants to allow consumers to simply tap their card, smartphone or wearable device to make a payment.

As part of this, Mastercard championed the increase of contactless payment limits across the Middle East and Africa region to promote safer payment choices for customers.
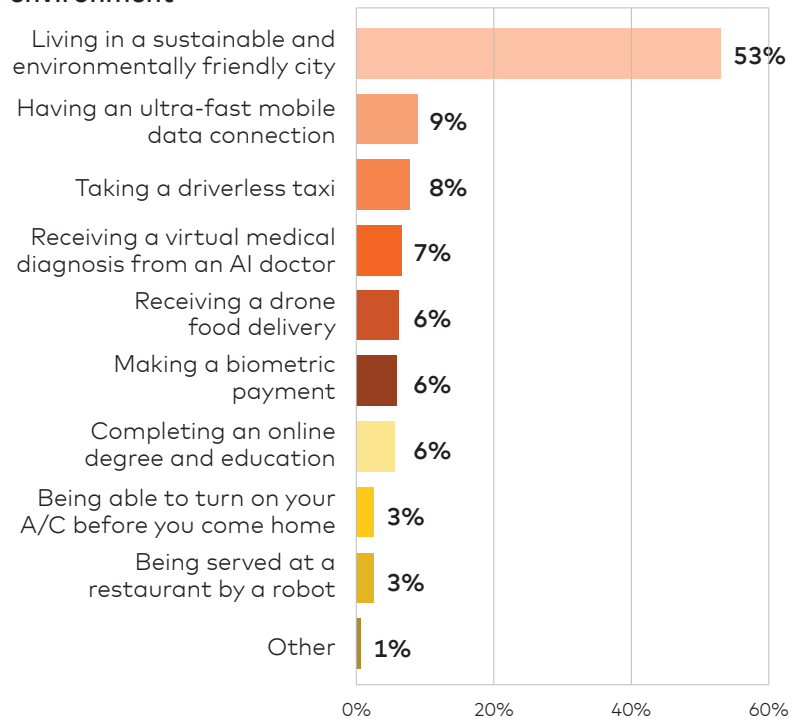
Almost one in nine Mastercard transactions at point-of-sale (POS) terminals in the Middle East and Africa (MEA) region are now contactless – a payment method that does not require the user to enter their PIN or provide a signature.[18]

The result is visible in businesses promoting smart payments as a preferred method, responding to customer demands for safer and more efficient check-out with more physical distancing.

This is a shining example of how regulators, infrastructure developers and private sector entities collaborated to achieve a higher level of cashless payments.

MOST EXCITING INNOVATIONS: The positive impact on the environment

Innovation	%
Living in a sustainable and environmentally friendly city	53%
Having an ultra-fast mobile data connection	9%
Taking a driverless taxi	8%
Receiving a virtual medical diagnosis from an AI doctor	7%
Receiving a drone food delivery	6%
Making a biometric payment	6%
Completing an online degree and education	6%
Being able to turn on your A/C before you come home	3%
Being served at a restaurant by a robot	3%
Other	1%

82%

of UAE respondents chose contactless as their preferred mode of payment, according to a Mastercard poll in 19 countries conducted in April 2020

The primary expectation is sustainability

Respondents expect environment-friendly innovations in the smart city of the future, in the form of 'greener' government and business practices. Paperless government services without visits to service centers emerge among the top 2 expectations, with connectivity closing out the top 3.

The most important feature of daily life was higher efficiency and a single app or platform, followed by better privacy and security of personal data. Job security and staying active are the biggest challenges, followed by the fear of becoming over-reliant on technology. 'Living in a sustainable and environmentally friendly city' also emerged as the most exciting innovation by far, with 53% of respondents choosing that option, followed by ultra-fast mobile connectivity coming in at 9%.

Addressing the accelerating impact of climate change requires an urgent mobilization of global efforts across both private and public sectors. According to the UN's Intergovernmental Panel on Climate Change (IPCC), limiting the rise in average temperature to the critical target of 1.5C by 2030 requires immediate, coordinated, and unified action to reduce emissions and implement nature-based solutions to mitigate CO_2 emissions.

In January 2020, Mastercard launched its Priceless Planet Coalition to unite the efforts of consumers, financial institutions, merchants and cities to fight climate change through the restoration of 100 million trees over five years – together with climate science and forest restoration experts Conservation International (CI) and World Resources Institute (WRI).

In October 2020, Expo 2020 Dubai joined the Priceless Planet Coalition as a strategic partner. Mastercard further strengthened its Expo 2020 partnership by welcoming the mega-event's Official Banking Partner and regional sustainability champion, Emirates NBD, to the Coalition.

Together with other partners, such as regional payments leader Network International, who share a common commitment to doing well by doing good, the Priceless Planet Coalition will also launch regional campaigns to empower consumers to take action for the environment and support these reforestation efforts.

With sustainability as a shared value, Expo 2020 Dubai has joined the Priceless Planet Coalition as a strategic partner

Challenges by generation

A closer look at age-wise responses can help inform the technology adoption curve, providing decision-enabling information for entities that are at the forefront of the smart city evolution.

Across all age groups, while the number one expectation from a smart city/government is sustainability, there are significant differences by age group. Of respondents 45 years and older, 47% say a sustainable city is their primary expectation, compared to 32% of those in the 18-24 group.

The biggest future challenges as perceived by respondents, also vary depending on the generation. Loss of jobs is a top concern, picked by 40% of all respondents. However, this is a top concern for 50% of those aged 18 to 24 years, whereas only 28% of respondents aged 45 years and above perceive this as an issue.

While automation is expected to change the way we work, the UAE has remained largely proactive in efforts towards creating a future-ready workforce. With a young population demographic, policy focus on enhancing the country's business environment and its potential to become a futuristic country has been geared toward this.[19]

"Our vision is to build an inclusive, holistic and citizen-centric smart city"

What are the emerging trends in the development of smart cities worldwide that you believe will be relevant to Dubai's unique requirements?

Dubai is a pioneer in attracting and developing emerging trends in the area of smart cities, through agile adaption of regulation to accelerate technology adoption, and ensuring the evolution of the education system to prepare youth for the future of work.

Examples include the development of the Dubai Virtual Commercial Zone where entrepreneurs are empowered to implement initiatives such as Smart Crowd, which enables people to invest in fractions of properties, and blockchain-supported peer-to-peer energy trading, which enables people to exchange excess renewable energy. This is possible using holistic data ecosystems that cater to governments, private sector and individuals alike, while ensuring security and privacy.

What strategies are you deploying to make Dubai the happiest city on the planet?

At Smart Dubai, we don't believe in the use of technology for the sake of technology. Our vision is to build an inclusive, holistic and citizen-centric smart city by leveraging the power of technology to redesign everyday city experiences, leading to higher levels of happiness amongst residents and visitors.

In May 2016, we launched a scientific framework called the Dubai Happiness Agenda, which studies the needs of people in the city, establishes a cultural baseline, and helps us develop policies and implement strategies to address some of the biggest everyday concerns of the average residents and visitors of Dubai.

What part does a frictionless government experience play in the evolution of a smart city?

A frictionless government experience is an integral part of any smart city. The Dubai Paperless Strategy 2021 aims to have a paperless government by December 2021, by eliminating paper requirements from both internal operations within governments, and transactions with stakeholders.

We developed the DubaiNow app to be the complementary G2C [Government to Citizen] arm of the Paperless Strategy 2021.

By combining the most used city services in one app, DubaiNow becomes the one-stop-shop for all government services, right from the palm of your hand, with almost zero visits to customer service centers.

Along with laws that protect privacy, how is data being optimized for best use?

Dubai Pulse, the digital backbone of the city, makes open data from Dubai Government entities available and points to more sensitive data that can be shared under certain conditions, in accordance with the Dubai Data Law.

We have also ensured that all AI applications developed in Dubai are built ethically. In January 2019, we launched the Ethical AI Toolkit with principles and guidelines and a self-assessment tool, which allows anyone implementing AI to assess their performance against certain criteria.

We believe we are the first city to set out this voluntary approach that will help businesses and governments create fair, interpretable, explainable, accountable and ultimately trusted AI systems that balance innovation potential and societal values.

In 2020, we extended our city data infrastructure by creating Dubai Registers, which will act as a 'single source of truth' showcases as interconnected, secure and private databases for key elements of the city government, economy, land and society.

Resident-centric technologies meet heightened customer experience in the digital era

Digitalization powers not just smart but also sustainable cities. Many sectors are being disrupted positively by the development and commercial deployment of emerging technologies. City administrators support this through a planned evolution of laws and regulations.

A. Smart infrastructure is the foundation

While smart consumers are opting for devices enabled by the internet of things (IoT), it is but natural to expect its use in public architecture and infrastructure. This is only possible on a bedrock of future-ready infrastructure. 5G networks give people, cars, mobile phones and smart devices the potential to be connected – one to one and many to many – at all times. It also powers virtual and augmented reality systems, and propels artificial intelligence (AI) technologies. For instance, architecture and technology have been meshed at the Expo 2020 Dubai site, with more than 130 buildings on the site being interconnected using IoT technology.[20]

In October 2019, the Dubai Multi Commodities Center (DMCC) free zone's Jumeirah Lakes Towers (JLT) district in Dubai partnered with Etisalat Digital to use physical and digital technologies to develop the first 5G-powered smart district.[21]

However, 6G, dubbed the Network of the Future, which will potentially be the "sixth sense experience for humans and machines",[22] is already being explored. Its transformative potential includes "nowcasting" instead of forecasting and making possible rapidly changing collaborations on vast scales between intelligent agents solving intricate challenges in real time and negotiating solutions to complex problems. One of its foreseeable applications is in self-driving vehicles, which face formidable computational challenges.[23]

B. Smart payments innovation is the enabler

Payments or transactions form one of the foundational components of smart cities, since they feature in a majority of service offerings to inhabitants and visitors. These include citizen to government (C2G) payments for utilities such as tolls, parking, taxis, education, tourist destinations, social services, healthcare, penalties and public conveniences; government to citizen (G2C) payments such as benefits, subsidies and scholarships: as well as B2B and B2C payments. Anonymized payments data is a key tool for decision-making.

Apart from Smart Dubai initiatives with entities such as the Roads and Transport Authority (RTA), which enables parking and renting of cars digitally via apps, Expo 2020 Dubai is also emerging as a pioneering adopter of smart solutions.

Mastercard is one of the prime enablers of a smart city. It is a key partner of the Dubai Government in implementing payments innovation to facilitate seamless experiences with the Mastercard Payment Gateway Services (MPGS) platform. This platform is integrated across all of Expo's online payment channels for consumers, businesses and schools, as well as the Expo 2020 Dubai app.[24]

Mastercard's Empay is a secure single platform that delivers a seamless, contactless payment experience for Dubai residents and supports the UAE's vision to transform into a cashless society. Mastercard is also the official technology partner that powers klip, the Emirates Digital Wallet's digital cash platform, via its Digital Wallet Ecosystem. klip is designed to seamlessly enable digital payments between consumers, merchants and businesses to create opportunities for the UAE's 1.3 million unbanked residents to enter the financial system and drive inclusion for SMEs.[24]

C. 4IR delivers smarter, resident-friendly cities

4IR technologies, which are already being tested commercially, play a vital role in creating smarter cities that fulfil the expectations of their inhabitants. Smart city development is the hub for growth drivers in several key areas in Information and Communications Technology (ICT), including: AI, IoT, connected devices, wireless broadband, cloud computing, big data and analytics. Together, these can power 'Digital Super-Users'.
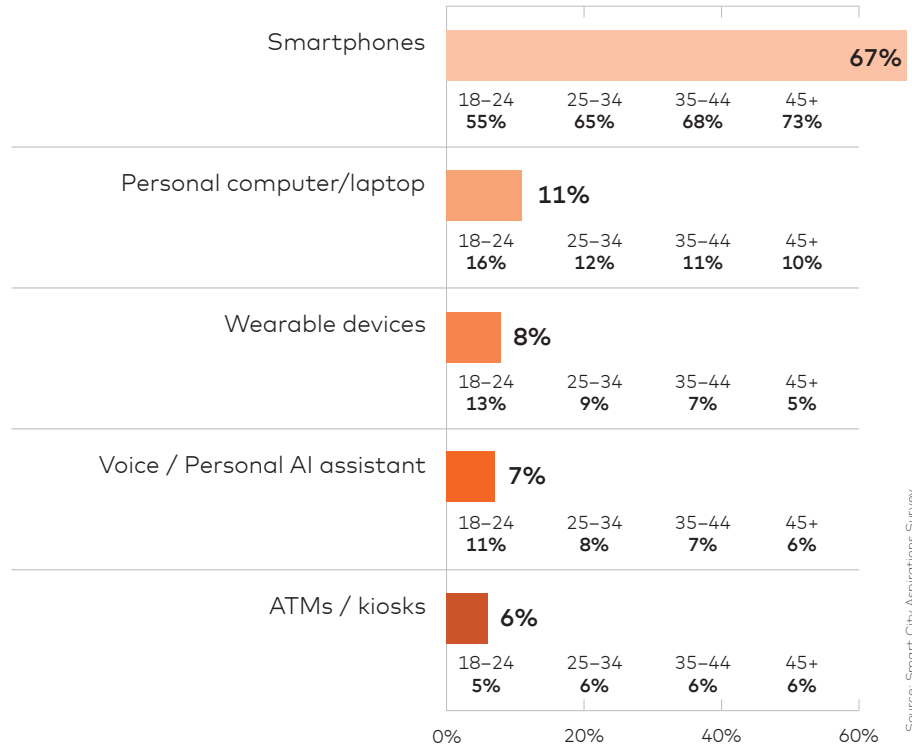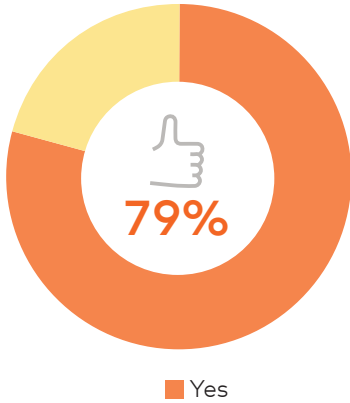
50%

would increase their use of government digital services if government used AI to make services more courteous, efficient and quick

Would living in a smart city make you happy?

79%

■ Yes

PRIMARY CHANNELS: The smartphone is the primary channel of choice, with higher channel diversity among youngsters.

	18–24	25–34	35–44	45+
Smartphones — 67%	55%	65%	68%	73%
Personal computer/laptop — 11%	16%	12%	11%	10%
Wearable devices — 8%	13%	9%	7%	5%
Voice / Personal AI assistant — 7%	11%	8%	7%	6%
ATMs / kiosks — 6%	5%	6%	6%	6%

0%   20%   40%   60%

6G

the 'Network of the Future' will potentially function as the sixth sense for humans and machines

4IR enables the fundamental change in the way we live, work and relate to one another. It is a new chapter in human development, enabled by extraordinary technology advances that are merging the physical, digital and biological worlds to shape a future of unfathomable opportunities. As trillions of bytes of sensor data are gathered from thousands of devices city-wide, this revolution is empowering administrators to rethink how cities develop, how businesses can create more value and policymakers can harness converging technologies to create an inclusive, human-centric future.

D. Smart urban mobility

Urban mobility that works for its residents is a key priority for cities. Autonomous vehicles cover the range of urban mobility, including public transportation systems, car rental and sharing systems, vehicle leasing and ownership, industrial transportation, and automotive insurance practices and systems. The vehicles may be measured from 0 (fully human operated) to 5 (fully automated system), with autopilot systems combined with some level of human control or intervention capability forming the middle grades.

Use cases in business are already visible. Self-driving cabs, or 'robo taxis', are being tested, while fleet management is being disrupted by technologies including sensors, AI, cognitive computing, geo-fencing, GIS/mapping and more.[25]
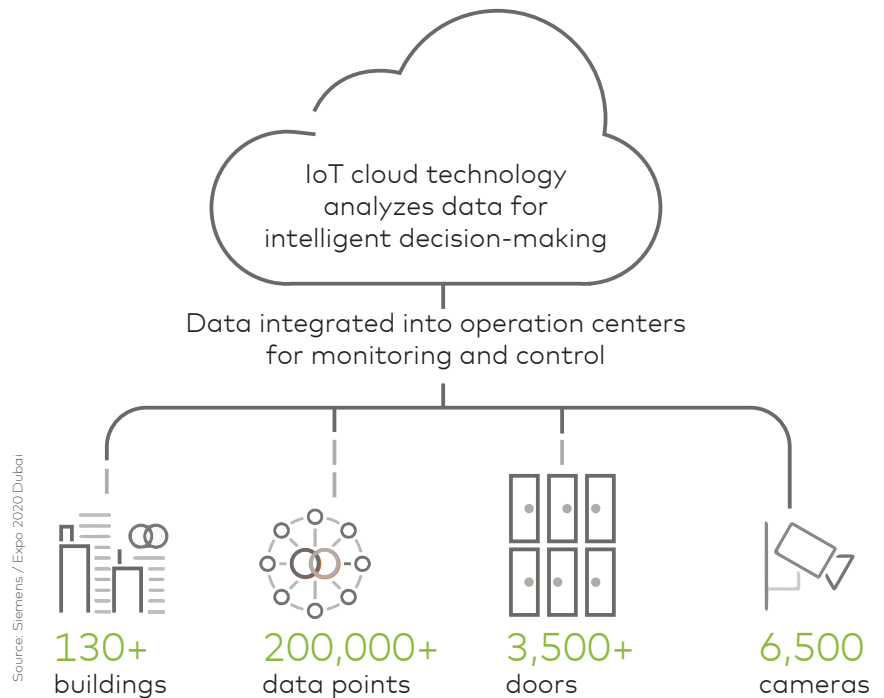
The global autonomous vehicle market is estimated to reach $172.3 billion by 2024. Smart transportation is emerging as the top smart cities market application area through 2023 with solutions in freight, traffic, parking and passenger management.[25]

Expo 2020 Dubai to create a blueprint for future cities

IoT cloud technology analyzes data for intelligent decision-making

Data integrated into operation centers for monitoring and control

Source: Siemens / Expo 2020 Dubai

130+
buildings

200,000+
data points

3,500+
doors

6,500
cameras

4IR

The Fourth Industrial Revolution empowers administrators to rethink how cities develop, how businesses can create more value, and policymakers can harness converging technologies to create an inclusive, human-centric future

Dubai is an early adopter. The city's Autonomous Transportation Strategy, published in April 2016, is considered amongst the most comprehensive AV plans in the world. It forecasts the slashing of transportation costs by 44%, reducing accidents by 12%, and saving 396 million person-hours from reduced congestion.[26]

E. Blockchain contracts deliver ease of business

Consumer-facing processes benefit from innovations such as distributed ledger technology (DLT) or blockchain. Blockchain has proven valuable in contracts and record-keeping with its capabilities of mathematically linking database entries, increasing the integrity of transactions, eliminating centralized management, and reducing the risk of cyberthreats.

Dubai is an early adopter here too, with Smart Dubai and the Dubai Future Foundation launching the Dubai Blockchain Strategy in 2016. Its use in processing payments by constituents for government services has made it possible for payment reconciliation and settlement in real-time instead of the traditional period of 45 days.[27] As of 2020, government and the private sector entities are working on 24 blockchain use cases, spanning eight sectors: finance, education, real estate, tourism, commerce, health, transportation and security.[28]

One of the initiatives is the UAE KYC Blockchain Platform, which is planned as a nationwide ecosystem for exchange of verified customer data. In July 2020, Dubai Economy and Emirates NBD bank announced they were now live on the platform.[29]

Pandemic strengthens smart city narrative

New trends and technologies mandated by the realities of "stay home", "work from home", social distancing, and contactless living in the wake of the COVID-19 pandemic have strengthened the smart city narrative, which has emerged as a force for good in the fight against the pandemic's impact.

In the Smart City Aspirations Survey, 54% of respondents said that the impact of the COVID-19 pandemic will accelerate the development of smart cities. They also agreed that working more frequently from home and cashless payments are mostly likely to stay. Most chosen among the top three options was that people will use less cash and favor the use of card, contactless and electronic payments.

While decreased tax revenues and reduced workforces have impacted global economies, technology is being deployed at all levels of government to help combat the impact of the pandemic. This has resulted in large increases in technology investment, firstly to help mitigate the impact of COVID-19 and secondly to reignite economic growth.[30]

Singapore announced a 30% increase in information technology investments in June 2020 to accelerate digitalization and support businesses. The increased spending of $3.5 billion (instead of $2.7 billion) in 2020 will help the government accelerate digitalization as technology becomes increasingly vital in enabling the city to resume normal activities and businesses to reopen safely.[31]

Elsewhere, municipalities have zeroed in on data-driven decisions as the core of effective solutions. Data visualization and analysis has emerged as a crucial tool during the pandemic both for residents and decision-makers. Data dashboards have made information flow possible, informing local policies for social distancing and healthcare at both government and resident levels.

In Dubai, smart infrastructure helped develop an effective response to the pandemic. Two decades of investment in technology and digital transformation of the city have played a crucial role in its survival and recovery during this pandemic, enabling government services to function at 100%.

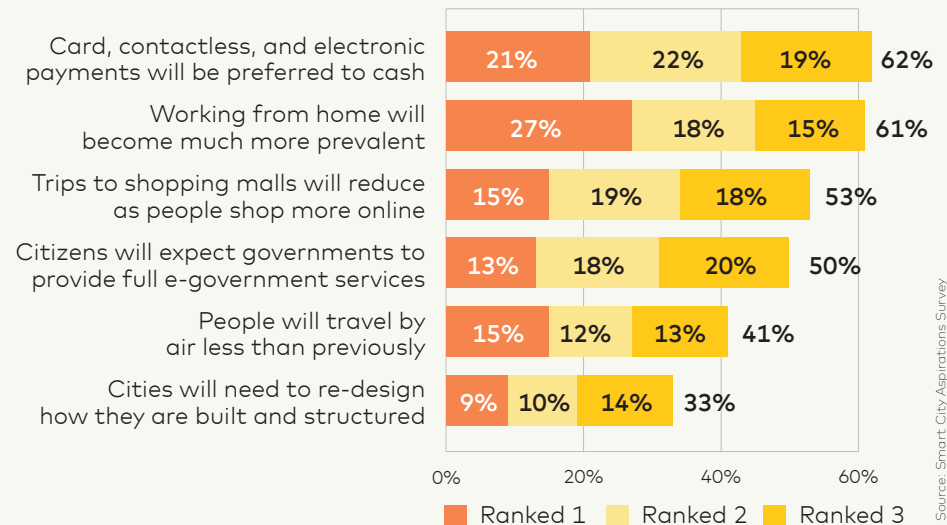## Perception of COVID-19 impact on smart city development

54%
Accelerate

35%
Halt

12%
No impact

Source: Smart City Aspirations Survey

Which habit change due to COVID-19 will become permanent?

Habit	Ranked 1	Ranked 2	Ranked 3	Total
Card, contactless, and electronic payments will be preferred to cash	21%	22%	19%	62%
Working from home will become much more prevalent	27%	18%	15%	61%
Trips to shopping malls will reduce as people shop more online	15%	19%	18%	53%
Citizens will expect governments to provide full e-government services	13%	18%	20%	50%
People will travel by air less than previously	15%	12%	13%	41%
Cities will need to re-design how they are built and structured	9%	10%	14%	33%

Ranked 1   Ranked 2   Ranked 3

"Collectively, we have the chance to respond to how our world has changed"

How has Expo 2020 Dubai's purpose evolved in response to the current global health crisis and emerging landscape of the future to elevate event?

The year 2020 has become synonymous with what humanity can define as 'unprecedented'. It is also the year when humanity was challenged to endure a pandemic that baffled the world.

Today more than ever, people are looking for an optimistic vision of international cooperation that improves lives. With our theme 'Connecting Minds, Creating the Future' more relevant than ever before, Expo 2020 Dubai is an exceptional opportunity to bring the world together with a shared purpose, inspiring and facilitating discussions, connections, and actions that address some of humanity's most pressing challenges.

Simply because of its timing and the emergence of new global realities, we recognize that we need to deliver better than what was planned before because collectively, we have the chance to respond to how our world has changed.

From health and wellness and urban development to climate change, innovation is the fulcrum of Expo 2020 Dubai's conversation with global stakeholders. Some of the world's brightest minds will convene to contribute expertise, content and best practice to encourage international cooperation on a range of issues that will define the next era of human advancement.

How do you plan to deploy smart city technologies to make for a seamless visitor experience during Expo 2020 Dubai?

We have prepared for Expo 2020 Dubai to be a one-of-a-kind smart city. With the postponement of the Expo to 2021, and the rapid transformation and adoption of technology in a post pandemic era, it is necessary to assess what we have delivered so far to ensure our work remains relevant and compelling. This is something that is being accomplished in close collaboration with partners such as Mastercard.

Over the last few months, we have witnessed a phenomenal digital acceleration and embrace. Technology's promise is no longer limited to a seamless physical experience. Technology has exponentially provided a virtual or digital front to be explored within the visitor experience realm.

While we continue to develop our physical visitor experience through technologies such as smart-ticketing, chatbots, or autonomous robots, we are also leveraging these current technologies to design and enhance the digital visitor experience in what we call a Digital Expo.

In line with Expo 2020 Dubai's theme of "Connecting Minds, Creating the Future", it is essential that these initiatives bring value and meaning and, most importantly, impact. We are determined to reach millions of physical and virtual visitors. The manner in which we engage with the virtual visitor, and the length of time that we hold their attention, will define the success of this mission.

We are currently exploring a Digital Expo platform that is to be made accessible to anyone with an internet connection. Our aim is to have it act as a hub for dialogue, updates, storytelling and events across the site including within the pavilions. Our vision is to allow audiences to engage with Expo 2020 Dubai content through technology made available to us today, whether it's through podcasts, webinars, or 360-degree videos of participant exhibits, streaming live or pre-recorded. Our objective is to amplify the visitor experience virtually and make Expo 2020 Dubai accessible anytime, anywhere.

What role have World Expos played in shaping the cities of the future?

World Expos have influenced the development of their host cities for nearly two centuries through iconic structures and advancements in technology and engineering.

As the first mega-event to take place since the pandemic began, Expo 2020 Dubai is best positioned to set an example, thereby re-defining and leading the way forward in terms of shaping the cities of the future. As World Expos have done in the past, Expo 2020 Dubai will influence and play that instrumental role in implicitly structuring future smart cities through its many activations, be it environmental, technological, or economical, during the event.

Looking at our technology masterplan, we have implemented more than a hundred projects spanning different verticals of technology, including IoT, robotics and artificial intelligence. However, our lasting legacy is not only the technologies, but the people who implemented, tested and applied them smartly and effectively, bringing the Expo 2020 Dubai experience to life. Moreover, specifically within the UAE, Expo 2020 Dubai serves as their pilot for advanced and innovative technologies further accelerating their technological adoption rate beyond 2021, alongside our skilled manpower that will continue to play an impactful role in their post-event organizations.

Digitalization is transforming urban experiences

With livability as a key criterion, the concept of making cities smarter with the use of digital payments, global positioning systems, and other technologies to transform government services, transit, traffic management, parking and building access is interconnected with the development of payments technology and regulation.

There are many ways in which payments intersect with and enable smarter cities. For example, visualizing transportation as a service necessitates the development of a consumer solution to include pricing, routing, booking and payment through a single platform. Research on how smart city technologies 'give back' time to inhabitants features cashless payments as a primary instrument.

Even simple initiatives such as cashless retail payments are a positive addition. A study has also focused on cashless payments on transport systems. Research has found that, on average, inhabitants have the potential to save an average of 25 seconds per transaction using cashless mechanisms.[32]

UAE consumers turn to contactless payments for everyday purchases

82%

consider contactless to be their preferred method of payment

73%

moved contactless cards to top of wallet

84%

view contactless as the cleaner way to pay

83%

say they will continue to use contactless payment post-pandemic

Mastercard global contactless payment study

10x

increase in speed of contactless payments compared to in-person payment methods

When viewed in the context of about 360 billion journeys per year, the time saved globally adds up to more than 285,388 calendar years.[32]

With smart city technologies at the heart of its transformation, Dubai has been quick to adapt to increased contactless transactions in 2020. According to the Mastercard Global Consumer Sentiment Survey, perceptions of safety and convenience have spurred a preference for contactless payments and reminded consumers of the convenience of 'tap to pay' on a global scale.

In the UAE, 73% of respondents said they swapped their top-of-wallet card for one that offers contactless while 82% of UAE respondents said they considered contactless to be their preferred method of payment. A total of 78% of UAE respondents said contactless payment methods have been easy to adopt. Contactless payments are up to 10 times faster than other in-person payment methods, enabling customers to get in and out of stores faster.[16]

The COVID-19 pandemic is further spurring eCommerce, with a Mastercard study showing that nearly three out of four (73%) UAE consumers are spending more money online than they did before the pandemic. According to the survey, FMCG (fast-moving consumer goods), healthcare, apparel, and banking have seen the highest surge in online activity.[33]

More than 73% of UAE consumers said they had shopped more online for groceries, 66% for clothing, and over 60% said they had purchased medicine online. And, as eCommerce increasingly becomes a part of everyday life, consumers are moving other aspects of their financial management to digital, with 70% of respondents having started banking online.[33]

Government payment ecosystems emerge as early adopters of new technologies and digital payments, making smart cities a viable point of entry for payments providers. Reduced dependance on cash is one of the strategies being employed by governments worldwide to pursue economic growth and financial inclusion. In addition, countries that prioritize digitized payment economies are better placed to mitigate the associated adverse impact of unemployment, financial exclusion, fraud, theft, cost of cash, and corruption.[34]

With its commitment to working with governments to systematically and effectively assess and capture the potential of payment digitization, Mastercard has developed a proprietary Payments Ecosystem Design and Development (PEDD) methodology.[35]

In an analysis that demonstrates the high economic cost of cash prevalence, Mastercard estimates that cost to be at 3.2% to 4.5% of global GDP. This points to an opportunity for countries to increase GDP by growing a digital payments economy to benefit from access to jobs, more robust commercial activity, streamlined business loans, and the reduced cost of operating cash.

In addition, higher card use in 70 countries, representing 90% of the world's GDP, contributes an additional $296 billion to consumption. In fact, each 1% increase in use of digital payments produces an average annual increase of $104 billion in the consumption of goods and services, representing a 0.04% increase in GDP in developed markets and a 0.02% increase in developing ones.[34]

Co-develop, deliver and scale

A collaborative approach is called for, including not just the government but also private sector entities from various industries. The global Smart Cities Council, an industry coalition to advance smart city development and innovation, for example, has had Mastercard as a member since 2013, along with other private sector companies such as Cisco, General Electric and IBM, among others.[36]

City Possible is Mastercard's partnership and co-creation framework for cities. Since launch, City Possible has facilitated a community for members to draw on the resources of all stakeholders to scale innovative solutions that address urban challenges. Mastercard is helping more than 250 cities become more sustainable and inclusive. More than 180 cities have already joined the City Possible Global network.[24]

The Dubai government's commitment to promote contactless payments is paying off. Data from the Mastercard Data Warehouse show more than 100% growth in the value and number of contactless payments in the UAE in Q1-2020, compared to Q1-2019.

>100%

growth in contactless transactions in the UAE in March 2020, according to Mastercard Data Warehouse

COVID-19 and payments innovation

The COVID-19 pandemic has seen relief initiatives and payments innovation being rolled out by private sector organizations to support public sector efforts.

Mastercard, for instance, committed up to $300 million to support response and recovery efforts and set a target of bringing one billion people into the digital economy by 2025.[24]

In addition, Mastercard committed up to $25 million in seed funding to establish the COVID-19 Therapeutics Accelerator in partnership with the Bill & Melinda Gates Foundation, Wellcome, The Chan Zuckerberg Initiative, and others.

Leveraging the power of technology, Mastercard has supported the communities it operates in by partnering with Bank Alfalah and National Bank of Pakistan (NBP) to provide a safe online payment solution through which people can donate to Prime Minister Imran Khan's COVID-19 Pandemic Relief Fund 2020.

Mastercard is supporting the Ministry of Social Solidarity in Egypt to disburse relief funds to more than 477,000 citizens using the Mastercard Payment Gateway.

It has also collaborated with Jordan's National Wallet Payment service providers to expand the issuance of Mastercard prepaid contactless cards for Jordanian citizens and support the government's initiative to disburse national aid through JoMoPay Wallets.

Anonymized payments data from digital wallets, credit or debit cards, mobile wallets and pre-paid cards can help identify usage patterns of various demographics because it is based on consumers actively opting for an activity, whether it is food, travel, fuel, entertainment or government services.

Some ideas foresee consumers as owners of their own data – which means that one could, hypothetically, choose to pay for a ride in exchange for allowing their data to be used. The benefits to the ecosystem from the economics of data ownership by the individual have been propagated for a while. Proponents say that since these enable a fair and efficient market for metadata, a payments plug-in would be needed to ensure a working market where users can get the best services and algorithms in exchange for their metadata.[37,38] That is what eventually makes data its own asset class.[39]

At Expo 2020 Dubai, for instance, visitors will enjoy the most convenient and seamless ways to pay, with cashless, contactless and express payments available on-site. Mastercard Labs is facilitating design thinking workshops with Expo 2020 Dubai and other premium partners to tap into potential opportunities to deliver seamless and cutting-edge visitor experiences at the historic event.

In addition, Expo 2020 Dubai will be the first online merchant in the UAE to incorporate Mastercard's sonic brand identity on checkout. The Mastercard acceptance sound, Sonic, is a short, unique and memorable sound played when a transaction takes place, providing audio reassurance that a payment has been completed successfully.[39]

Innovation in payments technology continues to focus on the human aspects of the exchange of cash seamlessly and with minimal contact. Payments are being transformed to become more than mere transactions. Each payment is increasingly being viewed as an interaction between stakeholders.

"Invest in humanity as much as you invest in technology"

How do you foresee a typical day playing out for a resident or visitor in a smart city?

First off, we would not need to have personal cars. We can reduce the cost of transport, make the city greener, be generous with space, and enjoy more equality.

The benefits of smart technologies are also in construction, energy, vertical farming… We can solve every problem. We need to have the right government to spread the benefits. Technology is driving our progress. But values and ethics will decide what we do with it. In a more equal society, you could use smart cities to ensure smart food, smart housing, smart water…

At what stage of evolution are smart cities today and what can we expect in the future?

We are living in a world with lots of data. This helps you to do some pretty amazing things with regard to health and environment controls. The problem is that to look at people as a data source can lead to abuse or misuse, overreach and bias.

Einstein said things should be as simple as possible but not simpler. I say things should be as connected as necessary but not more.

A smart city needs to balance security and convenience with liberty. To achieve that, you need supervision and digital ethics, or the ethics of technology. This is unlikely to happen in a self-regulated way because it is the nature of commerce to expand. A smart city needs a smart government, and the wisdom of the leadership to balance the needs of industry with ethical needs.

How have you seen smart cities respond to the COVID-19 pandemic?

Technology has played a huge part in tracking, tracing, testing and having hundreds of thousands of scientists working together and sharing information. The quick response and collaboration have been the saving grace for many cities and regions. But COVID-19 has also heightened the inequalities for those who are disadvantaged.

What is the greatest impact a smart city like Dubai will have on the lives of its residents 50 years on?

That is impossible to say. In 50 years, we may live on another planet. We may have artificial humans. The only thing we know is the next 50 years will not be like the last 50 years.

We need to keep in mind that a city is simply a place that people want to be in. Where they are respected as human beings rather than by their functions. There is a cultural component to this. Culture eats technology for breakfast.

People feel good in cities that support culture. Technology only creates efficiency. Do not confuse great technology with great well-being. To design the future, ask: how would it feel for people to live there? People care about who else is there, what kind of relationships they can have, what it feels like. You cannot say a smart city will be a great city unless it fulfils cultural aspirations.

How does a smart city work towards being a happy city?

For starters, technology is not the answer to that question. Technology is not the goal; it is the path to the goal. The difference between algorithms and 'androrithms' is that algorithms are binary, yes or no. 'Androrithms' is the term for human rhythms, the human ways of doing things. Humans don't think in clear data. Our qualities are discovery, imagination, curiosity. Even if we are logical, we may not know how the logic works.

The collective benefit of smart cities or any technology isn't efficiency. That is not a human measure. That is a financial measure. Efficiency is not the higher goal. If you are a carpenter, you can use a hammer to build or break a house. There is no moral judgment in technology.

A machine won't differentiate the context of a command unless you tell it to. Face recognition, for instance, does not know where the face is, what it is doing. But face recognition can be the tool that increases the sense of human security or the quality of customer service, leading to happiness. A smart city needs androrithms – discovery, imagination, experience, intuition and creativity. Invest in humanity as much as you invest in technology.

The purpose of life is not to find new technologies. Human connections are made with engagement, relationships, feelings and quality of life. Technology can amplify the bad just like it can amplify the good – look at the way we have our food delivered, or how we continue to have work meetings in spite of social distancing, or the way our children continue their education, and how we make and receive payments.

Values and ethics will decide what we do. In a more equal society, you could use smart cities, with smart food, smart housing, and smart water, once you make the decision that these are important.

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METHODOLOGY

Mastercard commissioned IPSOS to conduct a survey in June 2020 of 1,000 UAE inhabitants between 18 and 65 years of age with a minimum monthly household income of AED 8,000. The demographic profile is as follows:

Household income
28%: AED 8,001-12,000
20%: AED 12,001-15,000
19%: AED 15,001-20,000
13%: AED 20,001-25,000
09%: AED 25,001-30,000
12%: AED 30,000+

Household composition
18%: Single
64%: Married with children under 18
17%: Married without children under 18
01%: Separated, divorced, widowed

Gender
27% Female
73% Male

Age
05%: 18-24 years
39%: 25-34 years
41%: 35-44 years
15%: 45 years and older

Nation of origin
03%: Emirati
16%: Expat from Arab country
       TOP 3: Egyptian, Lebanese, Syrian
81%: Expat from non-Arab country
       TOP 5:
       42% Indian
       14% Pakistani
       14% Filipino
       05% European
       03% African

Region
54% Dubai
25% Abu Dhabi
21% Other regions

The data from the Smart City Aspirations Survey was put into context by White Paper Media Consulting using secondary research and interviews of relevant stakeholders.

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