PEOPLE-SMART CITIES

Words by Emma Nuttall

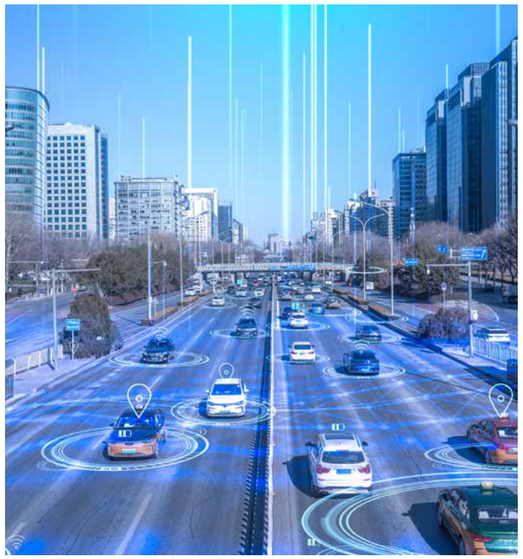
Digital technologies are evoluing rapidly, transforming the future of cities, but for urban centres to be truly liveable and sustainable, people must be at the core of the vision.

Smart devices, from wearable technologies to phones, have undergone a significant evolution over the past decade, evolving from niche tools into indispensable technologies that millions of people use daily. Initially focused on fitness tracking and communication, these devices now serve a wide variety of functions, from health monitoring to contactless payment systems and access control. They have become integral to our increasingly connected lives.

At the same time, city centres are rapidly changing in response to technological advancements and the growing demand for sustainability. As populations surge, existing infrastructure is struggling to keep up, requiring innovative approaches to city planning and design. Smart technology that shares information between urban assets, and the people who live and work in the city, is part of the solution.

More than half the world's population currently lives in urban cities and this number is projected to grow to 68 per cent over the next 30 years. Urban areas that aren't equipped to handle significant population growth may experience negative impacts such as overburdened infrastructure and environmental degradation that reduces the quality of life for the people who live and work there. The physical security, health and safety of residents also needs to be considered in line with population growth for a city, and its surrounds, to remain economically viable and liveable.

Many cities already use sensing technologies and data analytics to manage urban assets such as roads, public transport and waste systems. According to Dr Nicole Gardner, researcher, architect and author of the book *Scaling the Smart City: The Design and Ethics of Urban Technology*, sensors and Internet of Things (IoT) devices gather data about how the city functions. This data is then combined and fed into smart systems – like a digital dashboard showing how the city is performing. The data helps create insights and automate systems to improve city operations in real time. For example, sensors can help manage traffic flow, coordinate waste collection or optimise energy



Images: Getty

The sticky ethical questions these examples raise include to what extent do we, as a society, agree to the collection and sharing of our personal data if it contributes to social good?

distribution. Smart parking meters, streetlights and sometimes even rubbish bins generate data that can be used to improve efficiencies.

Technologies such as artificial intelligence (AI) and augmented reality (AR) have the capability to address challenges including mobility, crime and outdated infrastructure. AR technology adds a layer of interactivity that can enable people to engage with their surroundings in innovative ways. AR overlays can be utilised in the design phase to plan infrastructure and used operationally to inform a crisis management plan or help visitors navigate their way around the city. AI can address the challenges of limited budgets and resources by automating processes and delivering predictive insights. By analysing complex data patterns, city leaders can predict trends in such areas as traffic, events and community needs.

Smart cities of the future

More advanced cities have started to innovate further, putting data into the hands of end users – residents and businesses – to drive better decision-making. This involves leveraging technology not only to improve infrastructure but also to transform cities into fully connected ecosystems. These "smart cities" go beyond managing urban assets with sensors and data – they are designed to support the health of residents, reduce environmental impacts and actively involve businesses, residents and visitors in decision-making. By integrating technology at all levels, these cities aim to remain economically competitive, while improving the quality of life for citizens. As stated in the United Nations Development Programme's (UNDP) Handbook on Smart Urban Innovations, a city must respond to "the needs, realities and aspirations of its citizens, using technology and innovation to improve their lives and livelihoods".

Human-centred design

In the report *Forces of Change: Smart Cities* from the Deloitte Centre for Government Insights, authors William Eggers and John Skowron explain that the next iteration of smart cities will focus on the 3Ds: data, digital and human-centred design. These cities will harness the knowledge, experience and participation of the people who live and work there to make cities more sustainable and liveable. Instead of relying solely on data and technology or top-down decision-making, this approach encourages collaboration between governments, businesses and residents.

To solve real problems in ways that are meaningful to residents, advantageous to business and encourage lasting changes in behaviour takes a collaborative approach. Eggers and Skowron describe this dynamic as "tapping into the collective intelligence of the city", and it involves collecting data from citizens who live and work in the city, regarding how they use public spaces and interact with city services.

Wearable technology and smart devices

Wearable devices such as smartwatches and fitness trackers serve a purpose in a smart city vision because they integrate user-centred, real-time data with the broader smart city network. These technologies include GPS, accelerometers and environmental monitoring apps that gather data about location, mobility patterns, air quality and even noise levels. When personal data that is tied to specific times and places is combined with data from other sources, this information can reveal trends and patterns about how people interact with their environments, helping cities make improvements. By downloading an app, residents and city workers can effectively turn their smartphones or digital devices into sensors.

"Significantly, wearables collect user-centred data at a more granular level, for example health statistics including heart rates, skin temperature and motion and mobility detection such as gait and steps taken," explains Gardner. This data is valuable because it is inherently user- or person-centred but also tied to geographic locations and environments where activities occur. "For example, a smart watch collects and processes data that can be used to create a metric for how many steps a person takes over time, but this data also relates to where and in what specific time period those activities occur," Gardner adds.

The value of wearable tech and the performance of smart city systems relies on network effects. That is, when more people and things become networked and more data is generated, this can improve the efficiency, accuracy and reliability of smart city systems. For example, devices tracking pedestrian movement can optimise traffic flow and inform infrastructure improvements, while health monitors may contribute to identifying public health trends.

Health, safety, mobility

A key application of wearable tech is in the areas of urban mobility and public health and safety. According to Gardner, there is already a transition towards creating "smart" public health systems and this is occurring in a range of ways. "At an individual level, wearable tech for fitness tracking has enabled automated and convenient ways to track movement, glucose levels and other health indicators. Creating systems that make this kind of personalised health data accessible has contributed to raising an individual's awareness of their health status and catalysed more proactive approaches to staying healthy," she explains.

When it comes to the large amount of data these devices record, Gardner references Goodhart's Law: "When a measure becomes a target, it ceases to be a good measure."

Image: Getty

At an infrastructural level, the integration of wearable medical technologies (MedTech) into public healthcare has provided new ways to monitor certain health-related conditions remotely. Remote-care monitoring technology has provided early intervention that can reduce hospital presentations and support people to continue to live well and safely in their own homes. During the COVID-19 pandemic, MedTech supported public healthcare initiatives such as virtual hospitals, helping relieve pressure on overstretched systems.

MedTech wearables are a potential avenue to collect health data across a population, providing valuable insights. Gardener cites AttentivU glasses as an example. Prototypes of these wearable smart glasses are being developed in the MIT Media Lab to address safety and wellbeing for various tasks and scenarios. "The AttentivU glasses integrate electroencephalography (EEG) electrodes to detect brain activity and electrooculography (EOG) electrodes to detect eye movement in order to measure cognitive performance and prevent fatigue, for example, while driving," Gardner explains.

Privacy and security concerns

According to Gardner, the success of networked systems depends on how many devices are connected and how much data is shared, which often hinges on user consent and product-specific terms and conditions. Citizens, often unknowingly, transform their smart devices into sensors simply by carrying them. This introduces challenges, particularly concerning privacy and ethics.

Gardner notes that wearable IoT devices, while empowering individuals with personalised insights, create data pipelines that are vulnerable to breaches. "The same smartwatch that tracks your child's walk to school can also produce data that others may hack," she warns. While some sensor-based systems, like motion detectors, produce relatively impersonal data, others, such as smart glasses with cameras, collect highly personal and potentially identifying information. Even seemingly anonymous data can become identifying when combined with other datasets.

Designing privacy-preserving systems is crucial, but there's an inherent trade-off between individualised insights and potential compromises to personal data security. Where data is collected in legal and ethically responsible ways, it can be aggregated to generate rich insights about disease patterns and their relationship to events and environments. "The sticky ethical questions these examples raise include to what extent do we, as a society, agree to the collection and sharing of our personal data if it contributes to social good?" says Gardner.

Developers must grapple with trade-offs between offering valuable, personalised data insights and managing the compromises to privacy and security that come with increased data collection. While regulation plays a vital role in managing these risks and ensuring devices are fit for purpose, the rapid growth of wearable technologies and apps creates challenges for regulatory bodies. These agencies face the dual task of safeguarding both the security and functionality of wearable devices, a task that grows increasingly difficult as the market expands. To address these challenges, critical issues like data storage, ownership, security and visibility must be tackled proactively. Legislation must evolve swiftly to keep pace with technological advancements.

Negative health impacts

Gardner agrees that in addition to privacy harm, there are other potential harms and unintended consequences associated with wearable tech. These include potential physical harms, such as devices emitting radiation (EMFs), devices malfunctioning and overheating, or device materials causing skin irritations or injuries. Additionally, the datafication of daily life has psychological and behavioural implications. For example, access to precise, real-time data about one's health can empower individuals to take control of their wellbeing, but may also lead to anxiety, stress, restrictive or addictive behaviours or over-reliance on specific metrics.

It's important to be mindful of these potential risks. In regard to concerns with EMFs, using wearables with lower emissions or taking regular breaks from wearing them, especially overnight, can help reduce prolonged exposure. Additionally, maintaining good sleep hygiene, such as creating a calming bedtime routine, and using wearables in moderation can ensure these devices enhance, rather than interfere, with sleep quality and overall health and wellbeing.

When it comes to the large amount of data these devices record, Gardner references Goodhart's Law: "When a measure becomes a target, it ceases to be a good measure." Striking the right balance between providing actionable insights and avoiding unintended consequences is an ongoing challenge.

Concerns with a technology-first approach

In 2020, the city of Toronto abandoned plans to build a smart city waterfront neighbourhood led by Sidewalk Labs, a Google-backed company. The vision was for a neighbourhood featuring sustainable architecture, sensor-based surveillance, autonomous vehicles and responsive, data-driven services. Residents and stakeholders objected due to significant privacy concerns, lack of a data governance framework and fears about "surveillance capitalism". This concept refers to corporations monetising personal data at the expense of individual rights and safety. Key criticisms centred on how data collection would be handled, including the lack of transparency around how the personal data that was collected would be used. The collapse of the project was primarily due to resistance from the community and experts who feared that prioritising technology

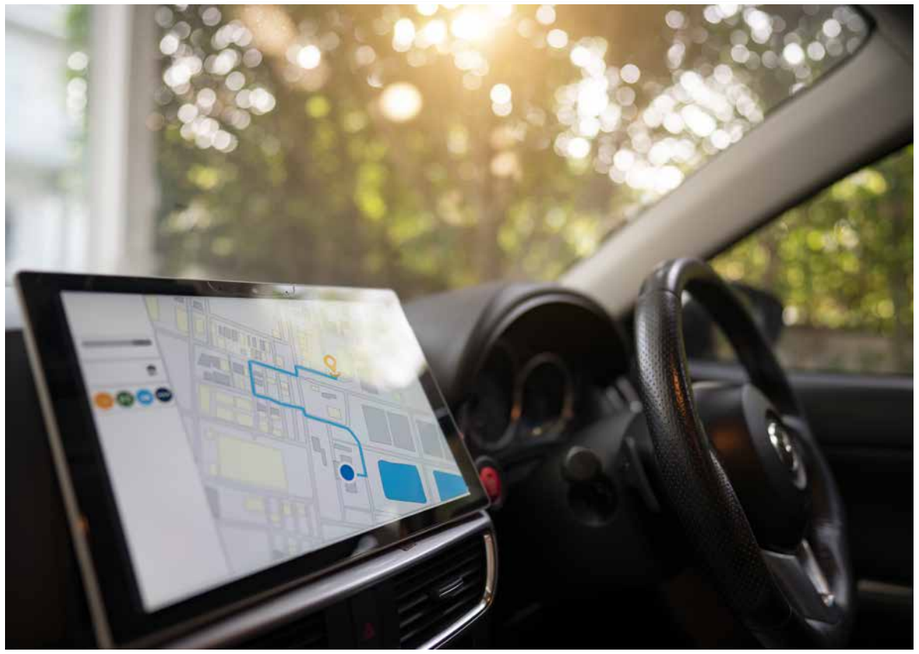


Image: Getty

To solve real problems in ways that are meaningful to residents, advantageous to business and encourage lasting changes in behaviour takes a collaborative approach.

over human needs would result in privacy harm. The project failed to prioritise the impact on citizens and was therefore incompatible with public interest.

Cities demonstrating a person-first approach to smart design

Several cities around the world are implementing smart city initiatives with citizens at the centre of their vision. Singapore has introduced several digital initiatives including contactless payment technology, MedTech monitoring devices and numerous digital projects that aim to assist the ageing population to live safely and independently in their own homes. Singapore is also planning the development of an eco-smart city located in the western region of Tengah that aims to have a low carbon footprint with plans for sustainable construction and centralised cooling. Biophilic designs that connect people more closely with nature aim to support residents' physical, social and emotional wellbeing.

Helsinki is another example of a city that has embraced a human-centred approach to urban living, while prioritising sustainability and innovation. The city uses smart technology in areas like transportation, energy and public services to improve life for residents. It also promotes collaboration and transparency by openly sharing data to improve efficiencies and create new services. Helsinki aims to become carbon neutral by 2035.

A futuristic city under development

NEOM is a global hub under development in Saudi Arabia, envisioned as a people-first and environmentally conscious city that redefines urban living. At its core is THE LINE, a zero-carbon, car-free city, powered entirely by renewable energy. Designed to span 170km in length, 200m in width and 500m in height, it aims to eventually accommodate up to 9 million residents within a 34-square-kilometre footprint.

THE LINE is planned as an example of "zero-gravity urbanism", where city functions will be layered vertically, allowing pedestrians to move freely in three dimensions: up, down or across. Public spaces, schools, homes and offices will be integrated within a five-minute walk for all residents. A high-speed transit system will replace roads, enabling end-to-end travel time of just 20 minutes.

While NEOM's vision is bold, its development has not been without significant challenges. Debates over environmental impact and cultural heritage have drawn international scrutiny. Recent reports also indicate that Saudi Arabia has scaled back its medium-term goals due to financial constraints, construction delays and logistical challenges.

Closing the digital divide

Explosive population growth will present challenges to low- and middle-income cities that don't have the funds to invest in digital technologies to ease the burden on transport and infrastructure. The United Nations (UN) emphasises the need for global support to help underdeveloped and developing countries adopt smart city initiatives and close the digital divide. The UN's Global Digital Compact is a framework that outlines strategies to improve connectivity and increase digital literacy within these populations and increase access to affordable finance. The strategies require global cooperation and encourage public-private partnerships to enable equitable access to technologies. Without such measures, these countries risk being left behind in the transition to a digital future.

As urban population growth continues, the people-first smart city model provides a solution to many of the challenges that dense population centres face, from resource management to healthcare access. Resilient cities need to consider human connection and how people want to live in, and interact with, their neighbourhoods. Quality of life for citizens can be enhanced by integrating essential services such as healthcare, education and housing into seamless, accessible systems, but for the approach to be person-centred, regulation needs to keep up with the rapid pace at which these digital technologies evolve. Importantly, citizens will need to empower themselves with an understanding of the privacy, data security and health impacts of the technologies themselves.

Emma Nuttall is a nutritionist, communications specialist and feature writer, passionate about uncovering wellness trends and translating research into lifestyle advice. Through her platform, Health Served Up, she shares accessible, evidence-based wellbeing and behaviour change tools. Visit healthservedup.com or follow @healthservedup.