



THE RESPONSIVE CITY

It's rush hour in the city. People make their way home after a hard day's work. Driverless cars pass by as cyclists stream along purpose-built lanes, safe from motorised traffic and unpredictable pedestrians.

As the city unwinds into the evening, indoor sensors adjust the ambient temperature and turn lights on; televisions, radios and even baths are operated with a gesture from an armchair.

Outside, sensors monitor atmospheric irritants, ready to alert those at risk should dangerous levels be reached. A computer planning the city's waste collection receives data about foul-smelling and full bins. Traffic systems constantly check and adjust, ensuring jams and accidents are a thing of the past. Unbeknown to its citizens, every function of the city is silently optimised to make life simple and efficient.

These kinds of futuristic vision are now common place, in-part thanks to Hollywood blockbusters, such as 2002's *Minority Report*. In that film, Tom Cruise lives in a world created by Alex McDowell, an award-winning Hollywood production designer. It was McDowell's job to take what was then cutting-edge scientific research and translate that into what has since become a prescient vision for the future, packed with novel computer interfaces, surveillance and driverless cars. "With the right people in the room, we can take leaps that can't be taken in the scientific community," he says.

But increasingly, planners, architects and technologists are also being forced to bring imagination to life as they wrestle with one of the great challenges of our time: how to deal with an ever expanding urban population in a sustainable and efficient manner.

By 2050, the World Health Organization predicts that 70% of the population, or 6.4 billion people, will be urbanites. Many of these will live in cities that are decades or centuries old, built for vastly smaller populations with very different needs. As these new metropolises gestate and grow, they risk becoming sprawling, inefficient sinks, wasting precious resources such as land, water and energy, and becoming harder to manage logistically.

Now a diverse range of disciplines are stepping up to help solve these challenges, aided by a suite of digital tools that allow scientists and city planners, for example, to see and explore the futures we are creating and their effects on their inhabitants and the planet as a whole. The Science of Cities, as it is known, promises to change the way we think about cities and the way we live in them forever.

Ingeborg Rocker is one of those leading this charge. The head of the GEOVIA **3DEXPERIENCE**City project at Dassault Systèmes, which aims to create holistic, virtual models of cities, believes that to build for the future we need to take a new approach to designing our cities.



Traditional planning is built on the idea that efficiency is achieved by standardising every element. Make every road, streetlight, junction and building the same and you drive down costs and make cities easier and quicker to build, expand and repair. But, much like medicine has come round to the idea that no two humans are alike and therefore need personalised care, Rocker believes that no two cities can be considered the same. Instead, she says that cities need to be viewed and planned as living entities, where every element and every citizen is part of a whole. Changes—no matter how small—cannot be made without examining their impact on the entire organism and its environment.

“Studies of the interaction between people and systems have revealed patterns that are anything but standard,” says Rocker, who is also an associate professor of architecture at Harvard University. “If we analyse the patterns and interactions between people and systems—such as transport and waste management—we can develop cities that are still robust while also being highly efficient and sustainable—but in new terms.”

This approach is at the cutting edge of architecture and could lead to a reimagining of the discipline, focused not just on the resulting structure but also the impact a building will have on the planet’s resources. New technology like Rocker’s **3DEXPERIENCECity** project allow urban planners to digitally study and test ideas, empowering them to constantly consider the impact urbanisation has not just within the invisible boundaries of their city, but also on the entire planet and its resources.

“Even the most remote regions of the Earth are affected by urban lifestyles. In the name of sustainability, we must seek new ways to limit the impact urban growth has on our entire geosphere,” says Rocker.

THE CITIZEN

Of course architecture, infrastructure and planning are important. But at the heart of all cities are communities and people. If the urban future needs to be sustainable, it needs to work much more closely with its inhabitants.

One of the proponents of this personalised approach to planning is Neil Leach, professor of architecture at the University of Southern California (USC). He believes there is a greater need to understand how our brains are affected by spaces, light and noise, for example, and apply this to architecture so that buildings can understand what inhabitants are thinking.

Although versions of responsive home technology are already on the market, such as Google’s Nest home-management system, we are merely at the cusp of breakthroughs that will

empower the everyday person to actively create and control their immediate environment.

“[Architecture is] starting to tap into how people are thinking,” says Leach. He believes that soon we will be able to control the environment and space to optimise the use of energy or even floor configurations. He sees a future where apartments have robotic walls that can be moved to create a space according to need and even robotic furniture that can be called up as required and then retracted. This will allow small spaces to have multiple functions, allowing people to reduce their living space without sacrificing living options.

Rocker has a similar perspective. As space becomes limited, she also sees the rise of personalised, hyper-dense cities, which are planned around multifunctional spaces that take into account use over 24 hours. “People will work, shop, live, relax and dream within one small area. This will make cities and the life within them more efficient and more sustainable,” she says.



In recent years increasing attention has been given to this idea of a Compact City; designing a more condensed space in order to achieve a more sustainable urban form. The idea is that more activities and public services, including education and public transport should be within closer reach of the urban community. Among the benefits would be improved air quality by having fewer cars and reduced use of energy because buildings would be more densely concentrated.

These types of considerations are key to realising sustainable urban environments and lifestyles—and are now at the core of decision-making at companies such as Dassault Systèmes. One person who will be sure to be watching developments in this area closely is McDowell. “My sense is that as soon as you imagine it, it can happen,” he says. Perhaps in years to come we will not need to look to the movie theatre for a glimpse into the future—it will be all around us.

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