Local government
How cities score

Better use of data could make cities more efficient—and more democratic

MARTIN WALSH, THE mayor of Boston, keeps on top of what is going on in his city. His office is dominated by a dashboard, a large screen packed with constantly changing snippets of text, numbers and charts (pictured, next page). One section shows the current traffic to the city's call centre and the percentage that has been answered within 30 seconds. Next to it is a chart tracking the number of potholes filled every day, which makes way for a map of Boston's neighbourhoods coloured according to how often Mr Walsh has visited them.

But the central piece of information is the "CityScore", a single number to indicate Boston's overall health. It combines 24 different metrics, from crime to Wi-Fi availability, energy consumption and grants for the arts. A value above 1 means that things are going better than planned; anything below this, and the mayor is likely to pick up the phone. "Everybody knows that he is looking at this," says Daniel Koh, Mr Walsh's chief of staff, who came up with the idea for the index. Bostonians can check it online.

CityScore, launched last October, reflects a growing trend among city governments in America. Led by Boston, Chicago and New York, they have started to use the ever-increasing amounts of data they collect to improve planning, offer better services and engage citizens. To speed up the process, the White House recently launched a new "smart-city" initiative.

Here we go again, you might say: it was only a few years ago that big makers of computing and communications gear made an effort to persuade city halls to buy more of their machines. But this time the push is coming more from the city governments and even the citizens themselves. Cities are becoming aware that data, and the infrastructure to analyse them, will eventually become as important to their citizens' welfare as the power grid and the transport system.

What most mayors have yet to realise, however, is how much their administrations will have to change to be able to get the best out of these data—and use them to make their cities more democratic. More and better data could help governments ensure that services in poor neighbourhoods are as good as those in rich ones. Given a city-wide system of sensors, the lead-contaminated water that poisoned poor citizens of Flint, Michigan, in 2014-15 would probably have been spotted much earlier.

Pinpointing potholes

In some ways Boston has been a digital pioneer. In 2006 the previous mayor, Tom Menino, hired the city's first cabinet-level chief information officer. He was behind the launch of an app called "Citizen Connect" which made it easy for people to report problems, for instance by taking a picture of graffiti. Another first was the creation of an internal innovation team, perhaps best known for another app, Street Bump. This collects vibration data from moving cars to pinpoint potholes that need to be filled.

Now the city is putting more effort into learning from such data. About one-third of its rubbish bins are equipped with solar panels and sensors that signal when a bin is full, making rubbish collection more efficient. The city's data scientists have also analysed online classified ads to identify landlords who cram too many tenants into their flats. And they are running experiments ▶▶

course. They also employ armies of "trolls" to fight on their behalf in Western comment sections and Twitter feeds.

China's political weathermen are even more sophisticated. Researchers at Harvard University who studied millions of Chinese social-media posts found that censors mostly blocked content designed to spur collective action but tended to tolerate comments critical of the Chinese leadership.

The longer-term worry is that the internet and related technologies could strengthen authoritarian governments and may make it harder for the countries concerned to move towards democracy. In a recent report the World Bank pointed out that among non-democratic countries, the most autocratic have invested most in e-government services (see chart, previous page). They do this, says the bank, to strengthen control and solve what it calls the "dictator's dilemma": the invidious choice between restricting the internet, which would hurt economic development, and leaving it unfettered, which could undermine the government's power.

Similarly, in a recent paper Espen Geelmuyden Rod and Nils Weidmann, both of the University of Konstanz, find that the internet tends to grow faster in countries in which regimes are more concerned about the flow of information. They also argue that there is no evidence to date "that democracy advances in autocracies that expand the internet".

At least in democratic countries, though, there are some encouraging signs that at the local level the internet has improved participation in decision-making from the bottom up. ■

known as "A/B-tests" that have already become routine online. So far they have tried prioritising buses at traffic lights and increasing fines for blocking an intersection, and then used data from Waze, a popular navigation app owned by Google, to see how this affects congestion, a big problem in Boston.

MIT's Senseable City Lab in Cambridge across the Charles River gives a taste of how much more cities could do with data. Researchers there are working on a cheap package of sensors to be put on top of street lights, which if widely deployed would make it possible to measure noise and pollution levels almost house by house in real time. A project called "Underworlds" envisages small robots crawling through sewers, collecting samples and perhaps one day analysing them on the spot. This could reveal things such as what people eat and how many have the flu. "Imagine how many data get flushed down the toilet," says Erin Baumgartner, one of the lab's directors. The project is supported by the government of Kuwait, which is looking for ways to measure its people's excessive intake of salt.

However, this sort of thing is not going to make much difference if the bureaucratic structure of city governments remains the same. Most are collections of departmental silos that do not communicate much with each other, held together by complex hierarchies and rules. That may have worked when information was scarce and moved slowly, but now it has become an obstacle. City governments have to become more of a coherent whole—a "platform", as geeks put it.

This often starts with getting the technology right. City governments' computer systems tend to reflect their fragmented nature. Information is typically kept in separate databases. Making these work together is crucially important, but the task is often underestimated, explains Jascha Franklin-Hodge, Boston's chief information officer. The city still has more work to do, but most of its digital information now sits in a "data warehouse", a big computer system where it can be easily accessed and analysed.

The next thing is better integration of a city's administration. To be able to improve existing services and develop new ones, departments have to work together more closely, says Ste-

phen Goldsmith of Harvard University and co-author of "The Responsive City", a new book about urban government. City employees also have to be able to act more independently and be judged by their results, not have to follow rules slavishly.

Regulation, too, has to be rethought. When information about businesses was hard to come by, it made sense to impose all kinds of rules and regularly check for compliance. But now that analytics can point to likely violators, and business practices can be tracked in real time, such regulation may amount to overkill. In Chicago inspectors were sent mainly to restaurants which an algorithm had identified as potential problems.

Yet the biggest change will be of another order: cities need to play a more active role as broker of urban data. This means more than just sharing reams of their own administrative information, as many cities around the world already do, says Anthony Townsend, a researcher at New York University and author of a book on smart cities. Municipal governments should become the guardians of the local data ecosystem, creating a framework that encourages others to share data and offer services to citizens. They could act, for instance, as a portal for information from util-

> *A project called "Underworlds" envisages small robots crawling through sewers, collecting samples and perhaps one day analysing them on the spot*

ities and online firms, while also protecting privacy and ensuring that the algorithms used do not discriminate against particular groups of people.

Some cities are beginning to take on this role. An early example is Boston's data-sharing partnership with Waze on reducing traffic congestion. In return for some of the service's data, the city is giving it early warning of any planned road closures. Chicago, meanwhile, has launched OpenGrid, a website which allows citizens and businesses easily to visualise public urban data using online maps.

In New York the Centre for Urban Science and Progress (CUSP) has launched a project called "Quantified Communities" to work out how people could use data generated by increasing numbers of sensors in their neighbourhoods. One idea is to measure air quality in different areas and compare it with hospitalisation rates for asthma. Constantine Kontokosta, who heads the project at CUSP, explains that "we want to define the problem before we decide on the technology—not the other way around."

Seattle, for its part, has discovered that citizens will insist on stringent protection of privacy. A few years ago it began using a wireless police network that could track smartphones, along with automatic licence-plate readers. The programme was implemented without much public discussion or thought about how the data would be managed. That led to a backlash from residents and a hasty about-turn. The city has since adopted detailed privacy principles and has just appointed a data-protection officer—a standard requirement in European cities but a first in America.

It is less clear what cities can and will do to prevent algorithms from becoming "Weapons of Math Destruction", the title of a forthcoming book by Cathy O'Neil, a blogger and former quantitative analyst on Wall Street. Critics allege that local police forces in America are the worst offenders. Their "predictive policing", which uses algorithms, crime statistics and other data to pinpoint "hotspots" where further crimes are likely to be committed, has sometimes proved quite accurate. But it can also lead to unnecessary questioning, excessive stopping and searching and racial profiling in such hotspots.

What the mayor saw

Even apparently neutral apps such as Street Bump may have unintended consequences: the service could give priority to wealthier neighbourhoods where people can afford smartphones, leaving potholes in poor areas unfilled. To avoid such an outcome, Boston first released the app to its road inspectors, who drive all over the city. It has also negotiated a deal with Uber, the taxi-hailing service, to get trip data so that its transport department can monitor, for instance, how long passengers in poor neighbourhoods have to wait for a car.

The big political question is whether data will simply make city government more efficient—which in itself is a worthwhile goal—or whether they will also empower citizens. Susan Crawford of Harvard University, co-author of "The Responsive City", argues that having access to data will not only show people what their tax money can achieve, but give them the tools to get involved in their city's affairs.

Others are not so sure. Technology rarely fixes the underlying problem but mostly replicates it, says Benjamin Barber, an American political theorist with an interest in local government. "Above all we need smart mayors and smart citizens, not smart cities." The dashboard in the mayor's office suggests that in Boston, for now at least, efficiency and control win out. ■

Living with technology
The data republic

To safeguard democracy, the use of data should be made as transparent as possible

"TECHNOLOGY IS NEITHER good nor bad; nor is it neutral," said the late Melvin Kranzberg, one of the most influential historians of machinery. The same is true for the internet and the use of data in politics: it is neither a blessing, nor is it evil, yet it has an effect. But which effect? And what, if anything, needs to be done about it?

Jürgen Habermas, the German philosopher who thought up the concept of the "public sphere", has always been in two minds about the internet. Digital communication, he wrote a few years ago, has unequivocal democratic merits only in authoritarian countries, where it undermines the government's information monopoly. Yet in liberal regimes, online media, with their millions of forums for debate on a vast range of topics, could lead to a "fragmentation of the public" and a "liquefaction of politics", which would be harmful to democracy.

The ups and downs of the presidential campaign in America and the political turbulences elsewhere seem to support Mr

Piles of digital information and the algorithms to analyse them tend to be good for those in power

Habermas's view. Indeed, it is tempting to ask whether all this online activism is not wasted political energy that could be put to better use in other ways. Indeed, the meteoric rise of many online movements appears to explain their equally rapid demise: many never had time to build robust organisations.

But online activism cannot be dismissed. Some movements have had real impact, either by putting an issue on the political agenda or by taking over an existing organisation. Without the Occupy movement, the debate about income inequality in America would be much less prominent. The same goes for the Black Lives Matter campaign and violence against African-Americans. In Britain, Jeremy Corbyn and his supporters managed to commandeer the Labour Party. In America, Donald Trump seems about to do the same with the Republican Party (though whether he can do it to the whole country remains to be seen).

No going back

Only the most extreme critics want to go back to a time when the flow of information was controlled mostly by governments and mass media. And the current political turbulences may lead to the creation of services that calm them down. Earlier this year, for instance, Change.org, a petition site with nearly 140m members, launched Change Politics, which lets any user, including media companies and other organisations, post endorsements. The idea is that voters will be able to draw on recommendations by people they trust, rather than being manipulated by political commercials and tweets.

The effect of vast quantities of data is both easier and harder to gauge. As this special report has shown, piles of digital information and the algorithms to analyse them tend to be good for those in power. Political parties with plenty of money can use them both to target voters and to discipline recalcitrant candidates by cutting off access. Autocratic governments that were blindsided when the internet took off in the mid-1990s have regained their vision. Data can make cities more efficient, but also more centralised and controlling.

All this suggests that data and analytics risk slowing down and perhaps even undoing the welcome redistribution of power to ordinary people that the internet seemed to be able to offer. They create "points of control" in what used to be largely an "open system", as Yochai Benkler of Harvard University puts it in a recent article in *Daedalus*, an American journal. The design of the original internet, he writes, was biased towards decentralisation of power and the freedom to act. Along with other developments such as smartphones and cloud computing, he now sees data as a force for recentralisation that allows "the accumulation of power by a relatively small set of influential state and non-state actors".

Does this matter? Another law of technology, particularly the digital kind, is that it is never in equilibrium. Data can empower both empires and rebels. David Karpf, of George Washington University, expects a rise in what he calls "analytic activism", the title of a forthcoming book of his. One example is MoveOn.org, a left-wing advocacy group in America with a voracious appetite for data of which even many of its 8m members are unaware. Among many other things, it closely tracks whether people have read the many messages it sends out.

Equally important, digital technology has a "capacity to surprise", says Helen Margetts of the Oxford Internet Institute (OII). The database politicking within America's parties has created room for non-partisan offerings. One is NationBuilder, a startup based in Los Angeles. Its clients get access to a basic national voter file to which they can add their own data and share it with other campaigns if they wish. "Unlike an organisation which keeps a big central database, we don't have to make a decision on who can use it," says Jim Gilliam, the startup's chief executive.

And then there is the blockchain. This technology, a version ▶▶
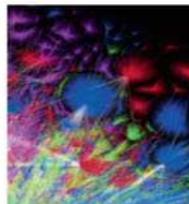
of which powers bitcoin, a cryptocurrency, could prove to be a big democratic reset button. It is essentially a new type of database that is owned and maintained not by a single actor but by its users, who collectively agree to any changes. Such "distributed ledgers", as they are known, could one day become alternatives to big centralised databases. Venture-capital firms have made their first bets on such undertakings, including OpenBazaar, a peer-to-peer marketplace. Perhaps one day voter files will be kept in blockchain-like distributed ledgers, which allow citizens to reveal their data only to the candidates they like.

Taming the beast

It would be foolish, however, to base public policy solely on the hope that some new service or technology will come along to solve existing problems. So what safeguards might be introduced to limit the power conferred by data? The most radical proposal comes from Evgeny Morozov, a technology critic. He thinks that big companies such as Facebook and Google should be barred from owning certain types of data, such as the keywords users search for, and whether those users have voted in the past. Instead, this information should belong to the individuals concerned and shared only if they so choose. Yet the political will to implement such a policy is lacking in much of the world, says Mr Morozov.

A more practical idea comes from Gavin Starks, the executive director of London's Open Data Institute. He argues that certain types of data may need to be kept available to all: address files and geospatial information, for instance, are akin to roads and other public infrastructure and need to be treated in the same way. "We need to discuss who owns our data infrastructure, what roles the public and private sectors should have, and what role we as citizens play," he recently wrote in a blog post.

Others think that more transparency would help. Zeynep Tufekci of the University of North Carolina wants campaigners to be required to publish all the messages they pitch to voters—in the same way as they are obliged, at least in America, to show in detail how they have spent their campaign money. And Eitan Hersh of Yale University recommends that voters should be given the chance to check the information held about them in campaign databases.

Transparency over the use of algorithms has its limits. Opening them up for inspection, as some have proposed, can make them lose their value because it will allow them to be gamed. Others are so complex that even their authors do not fully understand how they operate. One possibility is to develop algorithms that check on algorithms. Researchers at Columbia University have built a software tool called Sunlight to reveal why, say, users of online services are presented with certain ads.

Luciano Floridi, also of the OII, calls for an ethical framework for the use of data, much like that currently being developed for reproductive technologies. Some companies have already started to move in this direction. Google has set up an ethics committee for artificial intelligence. And the British parliament's science and technology committee recently proposed the creation of a national data-ethics council.

The debate about data and politics has only just begun and these proposals need time to mature. But getting the rules for managing digital information right is critically important. Societies will have to decide how they want data to be used, in politics as well as in other spheres. As Alec Ross, a former State Department official who now works as an adviser on technology politics for Hillary Clinton's campaign, puts it in his new book "The Industries of the Future": "The choices we make about how we manage data will be as important as the decisions about managing land during the agricultural age and managing industry during the industrial age."

Data and politics are likely to become ever more intertwined, as science-fiction writers have long forecast. They may have got the details wrong, but some of their ideas are nevertheless worth considering. Isaac Asimov, who died a quarter of a century ago, before the internet took off, invented a prophetic universe ruled by a group of "psychohistorians" who forecast humanity's future, using a set of complicated equations. To prevent people from interfering with the predictions, they had to keep them secret, but that in turn created untold complications. The story, like this special report, suggests that technology is morally neutral. Data are neither good nor bad for democracy. It all depends on how people use them. ∎

Future special reports

The internet, but not as you know it