Rathenau Instituut

Valuable digitalisation

How local government can play the 'technology game' in the public's interest

REPORT

VALUABLE DIGITALISATION

How local government can play the ‘technology game’ in the public’s interest

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Foreword

Rathenau Instituut

A growing number of government responsibilities in the Netherlands are being delegated to the local level. The underlying philosophy is that matters can best be decided locally, close to the public. These practices do indeed appear to be generating new energy. They are taking the debate to the people. That is already very clear in the city of Utrecht, where I live; I notice it, for example, in discussions about the energy transition initiated by my local executive councillor, and in the data initiatives undertaken by my local authority and the scrupulousness with which it is experimenting in this area.

In this report we examine the opportunities and risks of digital innovations at local government level. We discuss digital tools that enhance public engagement in politics, the role of local authorities in regional innovations, and new digital forms of municipal services. Our main message is that the power of transformation at local level goes beyond technological and economic innovation. It is, in fact, more about social embeddedness. What problems do data and digital systems solve? How is digitalisation changing the relationship between the people, local politicians and policy makers, or between different people? Is it conducive to public wellbeing?

Politicians and policy makers cannot just ignore these questions; in fact, they are on their way to becoming the true innovators. Local authorities must work together to this end and should not act alone.

They should not act alone. Together they must acquire the knowledge and skills that will enable them to use digital technologies to increase citizen participation, to achieve sustainable innovations that have public support, and to provide better services to local residents.

Governance is a fine discipline in which it is important to ask the right questions. Local authorities must dare to ask those questions. In many cases the technology is still new and its social impact unknown. Have the courage to experiment and to take a critical look at digitalisation. Stay focused on the people. Bold action is required, and I hope that this publication will be a source of inspiration.

Dr Melanie Peters
Director, Rathenau Instituut

Foreword

Association of Netherlands Municipalities (VNG)

We are delighted to present the report *Valuable Digitalisation*. Some time ago, the Services and Information Policy Committee of the Association of Netherlands Municipalities (VNG) asked the Rathenau Instituut to analyse the transition to digital government and to offer local politicians and policy makers a mode for action for dealing with it.

Digitalisation went beyond being a mere IT matter a long time ago. Today, it involves innovations such as blockchain, sensors, algorithms or robot that are no doubt familiar to you. New technology opens up new and promising possibilities. It challenges us to reach across the barriers that separate domains, and to respond to trends and concerns in society and industry. Our small-scale experiments have the potential to be scaled up to the national or even international level.

New technologies can also drive social innovation. Since the rise of Airbnb, your house has become more than a home; it is also a revenue model. Online abuse can have a huge impact on a person's life. Children suffer neck pain and eye strain from using smartphones and tablets. The self-driving car is set to change life on the streets. Digitalisation is having such a profound impact on our society that it raises questions about our values. Technology does not stop evolving, but we must always ask ourselves whether its influence is desirable in every respect.

How do we find the right balance? How do we offer stability? How do we link such abstract concepts as ‘public values’ to the specific practices of our everyday work? The ten observations listed in the final section of this essay will offer you guidance. They represent an appeal to continue to innovate, to explore options, and to be mindful of the negative aspects of the digital transition. They are also an appeal to align ourselves with what is already happening in society, but to do so by setting our own agenda and defining our own focus.

Franc Weerwind

Chairman of the Services and Information Policy Committee, Association of Netherlands Municipalities

Summary

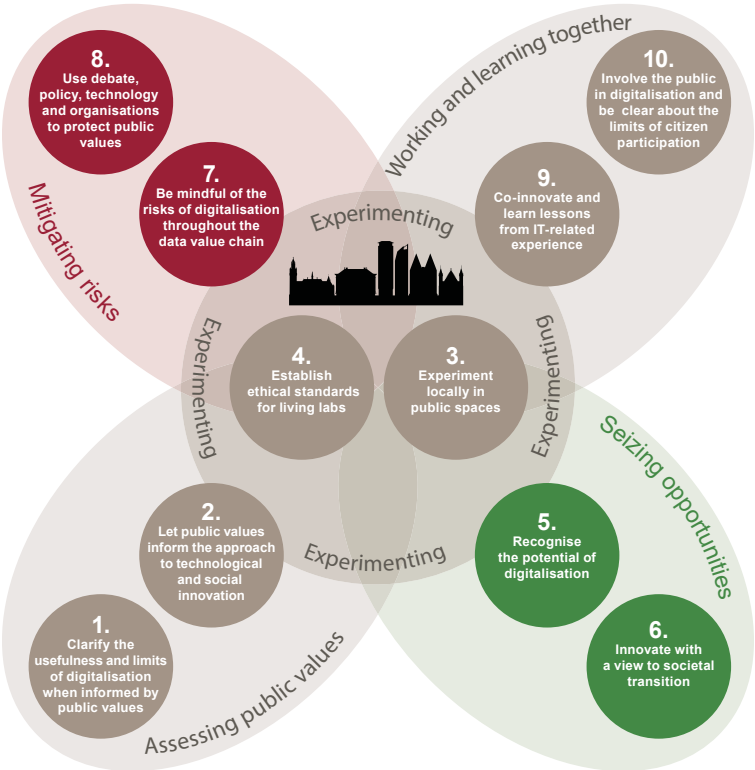
This essay looks at digitalisation in various ways from the perspective of local politicians and policy makers. We describe the need to guide technical innovation in a socially responsible manner and the role that politicians and policy makers play in this regard (Chapter 2); we discuss how digital technology can and cannot bolster local democracy (Chapter 3); we show how local authorities increasingly present themselves as a platform for innovation (Chapter 4); and we address the use of digital technology to improve municipal services (Chapter 5).

Our approach to digital innovation and the associated use of technologies has an impact on the economy, government, people's work and social lives, and the physical environment. In short, it is shaping the society of the future. At the same time, digitalisation processes are difficult to predict and to control. Politicians and policy makers, including local ones, can neither slow the pace of digitalisation nor ignore it. Its impact is simply too immense. Randomly encouraging digitalisation is also ill-advised, however. Government is there to serve the general interest and politicians and policy makers must therefore let public values (ranging from efficiency to privacy and control over technology) inform this process and transform digitalisation.

The ideas presented in this essay can be traced back to five crucial processes in what we refer to here as the 'innovative technology game':

1. assessing public values
2. experimenting
3. seizing opportunities
4. mitigating risks
5. working and learning together.

We have distilled ten perspectives, or 'sightlines', from these processes to guide the actions of local politicians and policy makers in this domain.



ASSESSING PUBLIC VALUES

1 Clarify the usefulness and limits of digitalisation when informed by public values

Digitalisation can be used to improve public services, increase citizen participation and stimulate economic innovation and knowledge-building. At the same time, it can also put pressure on fundamental public values such as privacy, autonomy, equity and equality. Politicians and policy makers must make clear in such cases why or when digitalisation is desirable, and where boundaries or constraints are required.

2 Let public values inform the approach to technological and social innovation

A naïve optimism about technology has often caused advocates to be blind to its consequences. Whereas technology is quickly hailed as the next best thing, criticism is rarely welcomed with open arms. To reap the benefits of technology, however, both are needed. In addition to new technology, innovation also requires social renewal, and politicians and policy makers play a crucial double role in this context, by letting public values inform the support and guidance that they provide. This makes it possible to seize social and economic opportunities and prevent or mitigate negative effects.

EXPERIMENTING

3 Experiment locally in public spaces

Until recently, innovation policy was aimed primarily at boosting the technology pipeline and improving the innovation ecosystem. One promising type of experiment that supports innovation in response to societal challenges is the 'living lab', where researchers, entrepreneurs, professionals, users, policymakers and/or the general public experiment and co-create solutions to difficult societal problems in a real-life experimental environment.

4 Establish ethical standards for living labs

Experiments carried out in old-fashioned laboratories take place in the confined space of a building. In the living lab, however, they are conducted in public spaces. This means that people are part of the experiment, whether consciously or not. It is therefore important to establish ethical rules for responsible experimentation in living labs. One way would be for the VNG (Association of Netherlands Municipalities) to set up an ethical review committee for research conducted in public spaces.

SEIZING OPPORTUNITIES

5 Recognise the potential of digitalisation

From biometrics, robots, artificial intelligence and persuasive technology to big data, algorithms and digital platforms, digital technologies have given us countless new technological tools. Thanks to the Internet of Things, they can greatly improve our capacity to think and to observe and act remotely. To seize the opportunities that digitalisation offers local government, it is important for politicians and policy makers to recognise the potential of technology.

6 Innovate with a view to societal transition

Digitalisation gives us new ways to address today's societal challenges. Local experiments in living labs are needed to collaborate with users on developing innovative solutions that work in everyday life and in the short term. However, to address the grand challenges that transcend municipal boundaries, such as climate change and organised crime, and their corrosive impact on society, local authorities need to join up their local experiments. Applicable knowledge will be shared more broadly in this way, and local authorities can build on their shared knowledge.

MITIGATING RISKS

7 Be mindful of the risks of digitalisation throughout the data value chain

Data value chains are the fundamental building blocks of the data economy and data society. They collect and analyse the data that is used as a basis for intervention in our living environment (increasingly in real time). As a result, digitalisation not only affects privacy and security, but also other public values and fundamental rights, such as equity and equality, human dignity, autonomy and, last but not least, control and power over technology.

8 Use debate, policy, technological and organisational tools to protect public values

A healthy data economy and an inclusive data society require transparent and honest data management. Three traditional processes play a role in the protection of public values. The first is democratic debate and political decision-making on numerous digital issues. Second, innovation can be driven by various policy instruments: regulatory measures, financial policy and communication with/participation by the public. Third, digitalisation requires technological and organisational tools that guarantee that the data and algorithms used are transparent.

WORKING AND LEARNING TOGETHER

9 Co-innovate and learn lessons from IT-related experience

Local government should have an overview of the various experiments that are taking place in its community. It is through the sum total of these experiments or living labs that the community is working on its future and revealing how it envisages that future. Coordination and cross-project learning (at local, regional, national or European level) are of crucial importance. This also applies to standardisation and the need for government expertise in IT. In infrastructure matters, for example the development of 'smart' street lighting, the national government should take the lead.

10 Involve the public in digitalisation and be clear about the limits of citizen participation

Since digitalisation is such an important factor in shaping the future, the public should be involved both at project level and in a wider debate about the digital future. Government can engage the public in traditional ways but can also do so through digital channels. It is the responsibility of public authorities to listen seriously to the views of society and to respond to those views. Government must be clear about the limits to citizen participation in the decision-making process.

Contents


Rotterdam The Hague
Airport Taxi
UBER

Getting familiar with the age of the digital transition

1

'Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world's largest accommodation provider, owns no real estate. Something interesting is happening.'

Tom Goodwin (2015)

1.1 The age of the digital transition

We live in interesting times: the age of the digital transition. Not that long ago, new IT meant gadgets to us. Today, it is commonly understood that digitalisation can fundamentally change industries, social customs and our view of the world. We have become wiser with every passing year. Digital technology long resembled the old technology. The CD, for example, was just a smaller and handier LP. It was only the advent of the internet, YouTube and online music services such as Spotify that brought about radical changes in the way we listen to music and in the music industry's revenue model. Digitalisation give us new ways of organising things, as illustrated by the above quote by Tom Goodwin.

Not only is the social and economic world changing, but digitalisation is also clearing the way for new political processes and approaches to governance. Take the AMBER Alert, a crowdsourcing system that the Dutch police force has used several times a year since 2013.

The system makes it possible for the police to distribute information about missing children to millions of people by text message, e-mail, Tweets, Facebook posts and electronic billboards and traffic signs. The police are now experimenting with a new 'Searching Together' app. As the police official who invented it explained, 'It's an entirely different approach to citizen participation. We don't ask people to help us with our investigations; instead, we help them with their searches' (Politie, 2018).

Today's technology is capable of many things and has raised even more expectations. Will we soon see the widespread introduction of the self-driving car, the delivery drone, the virtual assistant, cryptocurrency and the fully automated shop? And if so, what will it all mean for our society? Diamandis & Kotler (2012) believe that innovation will lead to a world of abundance in which nine billion people have access to clean water, food, energy, good education and healthcare. Others fear that technology is slipping out of our control. They predict a jobless future in which people spend their lives in the virtual world and every move we make is monitored by industry or the state. They envisage a future in which democracy has no control over the power of mega-platforms. Both wishful thinkers and doomsayers believe that there is a lot at stake in the digital transition.

The crucial question

The crucial question is: is technology something that befalls us or can we ourselves shape this changing world? How do we 'get familiar with the age of the digital transition'? It is a multi-layered question. First, we have to familiarise ourselves with the digital transition itself. That requires us to study technological advances and how they interact with societal processes to produce new social, economic, and political-administrative processes and relationships.

We also need to build a future in which we feel at home. Technological modernisation that focuses exclusively on efficiency but clashes with the public values of a community will meet with resistance from society. According to Sheikh (2016), we can embed technology in local culture through a creative marriage of tradition and modernisation. In addition to its importance for technology and the economy, innovation is also and more specifically a socio-cultural and governance issue in which local traits, values and ideas play a role.

Recognising opportunities and risks

This essay describes how local local politicians and policy makers can deal with technology. We show that technology is not something that simply befalls us. If we want it to have a positive effect on our lives and our living environment, then the public and local politicians and policy makers must play an active role. Franc Weerwind, mayor of Almere, is astonished at how little interest the Dutch Government has taken in digitalisation in recent years (Weerwind, 2017). Cities and regions seem to be more aware of its opportunities and risks. That is probably because local government is closer to the front lines than national government. It is the local level that feels the need for innovation first, and feels its influence most acutely.

For example, the people of Amsterdam are feeling the impact of Airbnb personally, in both the positive and the negative sense. If automation leads to job losses at insurance companies, the town of Apeldoorn – the heart of the Dutch insurance industry – will suffer. And those in need are the first to seek smart solutions. For example, the success of Brainport Eindhoven can trace its origins to the crisis that hit Philips in the 1990s. Many communities are currently experimenting with new technology. Many local authorities are trying to improve public services, mobility, quality of life, sustainability and economic vitality through innovation, all under the 'smart' banner.

The aim of this essay is to describe this phenomenon and show how local government can play this 'technology game' by observing and reflecting on the public interests involved. It describes how local politicians and policy makers can shape the digital transition intelligently and use it to improve municipal services and promote local democracy and regional innovation.

1.2 Building transformative power

'If traditions are transformed, the embedding of people no longer stands in tension with modernity, but can be grafted onto it. The elements of embedding can balance the dark side of Technopolis and create meaning and direction, this way creating a home in Technopolis.'

Haroon Sheikh (2017, p. 290)

Local politicians and policy makers can choose to ignore, slow down, support or transform the steady stream of digital innovations that are flooding into society now and will continue to do so. Ignoring them may be the sensible course of action at times, since administrators cannot be attentive to everything. But given the deep impact of digitalisation on our society, burying one' s head in the sand is ill-advised. By ignoring innovations, administrators sideline themselves. The market will then dictate the form innovation takes, raising the question of whether that form is politically and socially advisable. Slowing down innovation may postpone its potential adverse effects temporarily, but it means missing out on opportunities and taking decisions that are not sustainable. The third option is to support innovation, to open the doors wide to modernisation. It is good to welcome innovation, but it is also important to be mindful of its downside. The history of the automobile, which we will discuss in the next chapter, is a good example.

Making technology our own

In this essay we choose the option of transformation or, as we call it , 'getting familiar with technology'. The idea is to make sensible use of the energy and vitality of innovation. The challenge for local politicians and policy makers is to guide innovation in the right direction. First of all, this requires the local authority to have an overall idea of the future that it wants for its community. What do the people and politicians and policy makers think is important? What are the societal challenges that the local community is facing? What should be preserved and what could do with improvement? In addition, it also needs to understand what innovation means for society. What technologies are already available or are in the pipeline?

What opportunities does technology offer the local community, and what risks does it pose? Who are the possible winners and losers? What public values are at stake? What can a public authority organise locally and when is it better to team up with other local authorities or tiers of government?

Aims and dimensions of innovation

The reasons for wanting to innovate are diverse. Van der Steen & van Twist (2010, p. 28) argue that change is sometimes driven 'by an internal desire to do better, sometimes by external pressure to do things differently'. Digitalisation can play a role in many different ways (Bunders, 2017). For one thing, it represents a new economic impetus that may boost one local economy while threatening another. Social pressure can also induce local authorities to intervene in the event of adverse effects. In addition, new digital technologies raise all sorts of new expectations. People expect government to update its services. They also have enormous confidence in the power of digitalisation to help address various societal issues, for example sustainability, security, health, energy, mobility and social equality. Lastly, digitalisation has the potential to boost local democracy by making information more readily available online and by using a range of e-participation tools to engage the public more, and more effectively, in decision-making.

Social innovation is needed to safeguard and promote our public values. That is an important task and an inspiring challenge for local politicians and policy makers. This essay combines findings from earlier studies, supplemented where necessary with up-to-date information. We have divided these findings into three dimensions that overlap but can nevertheless be seen as separate. We distinguish between a democratic participatory dimension, an economically innovative dimension and a public dimension linked to municipal services. This allows us to cover a wide range of digital advances and view them from different angles. The various sections therefore also emphasise different matters: the section on digital democratisation focuses on governance aspects; the section on innovating for societal goals is more economic in emphasis; and the section on local digitalisation informed by public values has a sociological accent.

1.3 Digitalisation informed by public values

One of the underlying themes of our essay is that public values should inform the way that digital innovation is guided and shaped. Where local politicians and policy makers are successful in that regard, we can say that they contribute to valuable digitalisation. Figure 1 shows the various values that may play a role in digital innovation. The figure divides public values into two groups. First of all, local authorities can use digital tools to actively pursue public values. We can refer to these as target values, targets or simply innovation aims. There are also numerous significant human values that may be threatened by digitalisation. Safeguarding such values is a prerequisite for the proper embedding of digital technology in society and is thus an important government task.

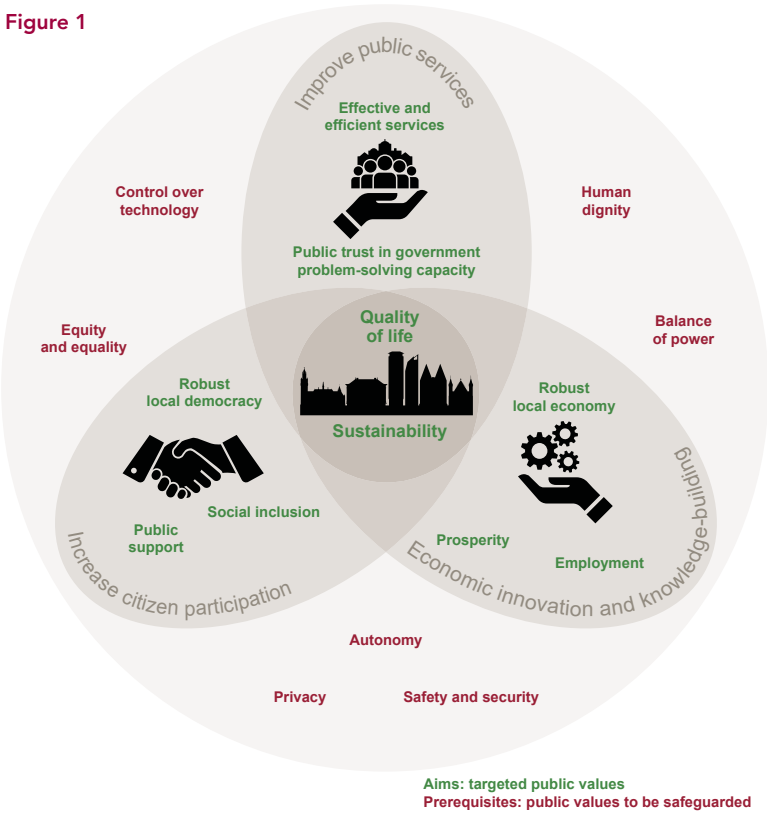
Quality of life as a key public value

The overarching public value at the heart of innovation in local government is 'quality of life'. All the other values illustrated in Figure 1 are connected to this value. The use of technology can help to improve the quality of life in a local community. It can do so, for example, by promoting citizen participation, by innovating the economy and building knowledge, or by improving government services (see the three 'propeller blades' in Figure 1).

Innovation aims

Each of these dimensions has distinct target values or targets. For example, the dimension 'economic innovation and knowledge-building' is linked to the target values 'prosperity, employment, and a robust local economy'. The 'improve government services' dimension is linked to effective and efficient services and the public's trust in government's ability to solve problems. Promoting citizen participation is linked to such values as a robust local democracy, public support, and social inclusion. The final public value, sustainability, is critical to maintaining quality of life in the long term.

Figure 1



Linking innovation and public values

Using digitalisation to pursue various municipal goals can also exert pressure on certain public values in a manner that downgrades quality of life. Digital innovations concern such public values as privacy, security and safety, autonomy, control over technology, human dignity, equity and equality, and the balance of power (Kool et al., 2017). How can municipal authorities achieve societal targets while safeguarding these public values? That is the challenge of 'valuable digitalisation' – one for which this essay offers a mode of action.

1.4 Reader's guide

This essay examines the complex relationship between digitalisation and municipal government in terms of the three dimensions and perspectives outlined above. We describe how digitalisation affects a specific domain in a general sense, how politicians and policy makers can respond to the new situation, and how they can then actively use digitalisation to encourage citizen participation and economic innovation and to improve public services. We also present four case histories that examine everyday digitalisation practices and the various challenges faced at municipal and higher government levels.

Core argument

Chapters 2, 5 and 6 set out our core argument regarding how local government can play the 'innovative technology game' in the public's interest. *'From technological dreams to societal action'* (Chapter 2) describes the challenge that digitalisation represents for society. Public authorities play a double role in this regard: on the one hand, they encourage technical innovation; on the other, they guide innovation while bearing in mind the public interest.

'Digitalisation informed by public values' (Chapter 5) shows how digitalisation touches on numerous public values. By viewing digitalisation in the public's interest, local authorities can mitigate its adverse consequences and simultaneously use digital technology to improve municipal services. This chapter also examines what digitalisation means for the physical living environment.

'Taking action' (Chapter 6) concludes this essay by offering ten perspectives, or sightlines, that can guide the actions of local politicians and policy makers in the Netherlands.

In-depth study

Chapters 3 and 4 explore our themes in greater depth. *'Digital engagement'* (Chapter 3) shows that there are many ways in which IT can promote communication between the municipal authority and local residents regarding governance and decision-making, provided that the tools are used with due care. *'Innovating for societal goals'* (Chapter 4) focuses on a new way of think-

ing about innovation. What is referred to as ‘transformative innovation policy’ aims to facilitate solutions and transition paths addressing the grand societal challenges of our time. Municipal authorities and ‘living labs’ play a pivotal role in this emerging innovation policy.

From technological dreams to societal action

2

'Technology is all the stuff that doesn't work yet.'

Inventor Danny Hillis (quoted in *Newsweek*, 1997)

Many scientists, entrepreneurs and policymakers believe in the 'technological dream'. It goes like this. Technology dictates how our society evolves. The technology is unstoppable and unmanageable, but that is not a problem because it improves on what people were able to do with the old technology. That is why progress in technology leads automatically to progress in society. Scientists and enterprises drive technological advances. Government bodies must encourage technical innovation and mitigate any adverse effects of technology on society. In short, technology should be and is beneficial.

There are countless reasons for the popularity of this dream. First of all, it is a narrative that is constantly being espoused by scientists, industry and politicians. After all, it earns them tons of funding, status and freedom. Many people go along with this narrative because they have little understanding of technology and innovation, but also because it is a story of hope: 'new research will lead to the eradication of cancer within ten years' or 'new sustainable technology will solve the problem of climate change'. In addition, technology is both practical and 'magical' –just think of antibiotics, the LED, or the Google search engine. Finally, the indirect effects are often much more difficult to determine and only manifest themselves at a much later date.

This chapter shows that the reality of technology is more volatile. In the real world, technology represents both opportunities and risks and produces winners and losers. These two faces of technology call on governments to play a double role in innovation. In addition to encouraging innovation, they should also let public values inform the guidance that they provide. That is why this chapter also discusses how digitalisation expands our human capacities – to observe, think and act – in many ways, and how this has a bearing on all sorts of important public values.

2.1 Reality for politicians and policy makers

2.1.1 Technology and society

In the 'real' world, technology and society develop in tandem. People use technology to give shape to their lives and their environment. Social customs make some innovations possible while limiting others. As early as the eighteenth century, the founding father of capitalism, Adam Smith, suggested that the division of labour spurred innovation. He gave the example of the pin factory. Dividing up the process of pin-making into eighteen simple steps had greatly improved labour productivity. Eventually, that same division of labour made it possible to mechanise each of these simple operations. In this particular case, social innovation – the restructuring of the labour process – had stimulated technological innovation.

Innovation holds out the promise of improvement

Technological and social innovation are not simply gifts from heaven. They require enormous effort and, most of all, learning from earlier mistakes. The history of the clap skate shows that it takes time to perfect a technology; in addition, because the clap skate required a different skating technique, skaters had to learn to move on the ice in a new way. In the sixteenth century, surgery was revolutionised when the butcher's knife was replaced by the scalpel, but it took three generations of surgeons to figure out the best way to hold and make incisions with it (Sennett 2017, p. 425). New technology holds out the promise of improvement. The introduction of the clap skate led to a flood of new world records in speed skating. Innovation, however, requires the

technology to be perfected, new knowledge and skills to be developed, and, in most cases, embedment in society and the law.

As we argued above, technology has a direct and visible impact. In theory, an automobile will get you from A to B faster than a bicycle. But if the roads are clogged with traffic, you may well get to B faster by cycling. This once again illustrates the interaction between technology and the social environment. Technology can also influence social customs, cultural patterns and even global trends. The automobile only gained mass popularity after Ford perfected the assembly line, laying the basis for mass production and the consumer society of the twentieth century. Political philosophy often plays an important role in advancing technology. For example, Dutch politician Joop Den Uyl – a progressive social democrat who sought to redistribute power, knowledge and wealth – said in 1967 that 'Every person is entitled to a car'. That 'aspiration' has more or less come true.

2.1.2 Blind to consequences

'The invention of the ship was also the invention of the shipwreck.'

Philosopher Paul Virilio

As we have seen, the effects of technology are diverse, far-reaching and difficult to predict. This applies in the most literal sense to the earthquakes caused by gas production in the Dutch Province of Groningen. After more than fifty years of gas extraction, it is now patently obvious that our gas consumption is having an adverse impact on the living environment and emotional wellbeing of the people who live there. They had to fight long and hard to get the earthquakes on the political agenda and to force the government to address the damage caused by the tremors. We see here that technology's glittering opportunities often come paired with risks. The way in which government manages the risks of technology and deals with those affected reveals its true face. What is at stake is trust between the people and government. A resident of the town of Bierum, in Groningen, put it this way: 'Beyond all the cracks in the walls and the urgent issue of safety, a gaping divide is opening up. Many of us here in Groningen no longer dare to rely on government. Deceit has caused the bottom to drop out of our civic lives' (Marie de Kler, 2018).

A naive optimism in technology has regularly caused advocates to be blind to its consequences. Society paid very little attention to the 1,500 traffic fatalities that occurred in the Netherlands in 1955. Referring to the catastrophic floods of 1953, which claimed the lives of 1,836 people, Queen Wilhelmina said, 'When a disaster takes place in some other domain, it rekindles our solidarity as a nation. How very different is the mindset on our streets and roads. It is as if human life has less value there' (*Andere Tijden*, 2018). For a long time, the public and politicians accepted the terrible consequences of driving as if they were a natural phenomenon. That led to a tragic nadir in 1972, when 3,264 people died on the roads. Today, thanks to a broad package of measures addressing automobile safety, infrastructure and driving behaviour – better cars, compulsory seatbelts, airbags, compulsory general periodic inspections, better asphalt, traffic lights, cycle paths, speed limits, drink-driving campaigns and alcohol testing – the number of traffic fatalities has fallen sharply. In 2015, there were 621 road fatalities.

Everyone was against everything

The above measures were not welcomed with open arms, however. Pieter van Vollenhoven, who chaired the Dutch Transport Safety Board after it was established in 1977, had this to say: 'Everyone was absolutely against everything. A compulsory seatbelt was regarded as a violation of human rights' (*Andere Tijden*, 2018). The movement to improve traffic safety forced a battle to be waged in political circles and in society. People who had lost loved ones in traffic accidents played a key role in this regard. The automobile illustrates that social and political battles are not easy. However necessary and justified criticism may be, it is often perceived as irritating. History shows that this is a recipe for disaster. Progress is ultimately made through argument and rejoinder laying out both the advantages and disadvantages. The notion of progress is also tied to a specific time and place. In the 1970s, for example, it was imperative for the built environment to be car-friendly; in the 1990s, after a long political battle, the pedestrianised city centre regained its popularity. 'Everyone is entitled to an automobile' was anything but an innocent assertion. It sparked an enormous improvement in personal mobility, but it also led to many deaths, injuries and suffering among surviving family members, to air pollution and the degradation of the natural environment, and to traffic congestion and noise pollution.

2.1.3 Politicians and policy makers are the true innovators

True innovation, it turns out, requires both technological and social innovation. We cannot extend the reach of technology without changing social, economic and political practices. It is a process of trial and error and has its winners and losers, and the losers do not automatically have an audience, even in the worst of circumstances. For their voices to be heard, the losers must first wage a societal and political battle. Government must always answer for both the beautiful and the ugly aspects of technology, and look after the winners and the losers (Teisman et al., 2016). In the marketplace, the losing companies go broke and the winners are rewarded with higher profits. To put it bluntly: the number of traffic deaths did not make a dent in the profits of the automobile industry. Society, however, was deeply affected by the adverse effects. Public authorities cannot abandon the losers to their fate.

Political wisdom and prudent policy

Public authorities have played a pivotal role in shaping our mobility system. The first automobile – then called 'a horseless carriage' – arrived in the Netherlands in 1896. Today we have more than eight million of them on our roads, the result of more than a century of social and technological innovation in motorised mobility. The authorities encourage technical innovation in automobiles and in infrastructure (roads, bridges, etc.). They also oversee how technology is used. They use various forms of social innovation – in legislation, institutions, culture, driving behaviour and the way we talk and think about mobility – to guide the use of the automobile in the right direction. Because conflicting public interests often play a role here, their efforts call for political wisdom and prudent policy.

2.2 Digitalisation as the extension of our nervous system

The contemporary automobile is a typical example of an invention dating from the First Machine Age (Brynjolfsson & McAfee, 2014). The Industrial Revolution gave birth to machines that delivered mechanised muscle power and extended human physical capacity. The automobile extended our capacity to go from one place to another.

Since the early twentieth century, this potential has unleashed a complex set of changes that have had a profound impact on our way of life, on our living environment, and on consumption and production. The 'innovation game' related to the car is far from over. The icon of future mobility is now the self-driving car – 'a driverless carriage' – that people must trust to make the right decisions in traffic.

The self-driving or robot car is a good example of a machine dating from our own era, the Second Machine Age. It revolves around digital devices that deliver brainpower, such as computers, the internet, smartphones, artificial intelligence (AI), blockchain and robots. Just as mankind has changed our world utilising the machines of the First Machine Age, we will turn our world upside down with our smart devices.

In this essay, we consider how local government can use and respond to the technological and societal challenges of the Second Machine Age. To understand the relevance of this question, we first look at the instrumental side of smart devices. We want to show how smart devices can enhance people's physical and mental capacities.

2.2.1 Technology as an extension of the human body

'My biological body meshes with the city; the city itself has become not only the domain of my networked cognitive system, but also – and crucially – the spatial and material embodiment of that system'.

William J. Mitchell (2004, p. 19) in *Me++*

William J. Mitchell, an architect who coined the term 'smart city', sees technology as an extension of the human body (Mitchell, 2004). In his vision, we have arranged our homes and surroundings in such a way that they extend and enhance our physical and mental capacities in countless ways. For example, Mitchell regards the water supply, the faucet, the toilet and the sewage system as extensions of our digestive tract. The bicycle and all cycle

tracks are extensions of our legs and feet. While the machines of the First Machine Age mainly expand our physical capacities, the smart devices of the Second Machine Age enhance our cognitive capacities. Our current living environment first arose during the Industrial Revolution. It can be seen as an array of machinery: a collection of large technological systems (drinking water and sewage systems, transport systems, electricity grids and communication networks) and devices, ranging from trains and automobiles to boilers. According to Mitchell, our bodies are thus connected to an extensive, external network of pipelines, pumps and land transport routes that supply us with food and water and remove and process waste.

Extended human nervous system

We now live in the age of intelligent devices that function as appendages to the human nervous system, as it were. Our nervous system absorbs sensory stimuli, engages in cognitive processes and controls our muscles. Supported by the internet, smart devices are extending these three functions dramatically.

- First, we can use sensors to increase our sensory perception and thus our awareness of our surroundings. In Rotterdam, for example, operators at a single control centre track criminal behaviour through more than 450 security cameras.
- Second, we use algorithms and AI to improve our analytical skills. The Netherlands will be the first country in the world to use predictive policing nationwide.
- Finally, we can use IT of all sorts to control the mechanical systems of the First Machine Age. Examples include using a smartphone to control a smart thermostat when you're not at home. And as of 2020, Amsterdam's water management provider, Waternet, will be operating sixty different bridges and locks in Amsterdam from a single control centre.

Global robot network

The machine park of the Second Machine Age has come to be referred to as the 'Internet of Things' (IoT). They form a global network in which both people and devices are online and communicate with each other. The IoT is in fact a global robot network –for what is a robot but a machine that can sense, think and act? That is precisely what the IoT does. And thanks to the IoT, we are becoming more and more connected all the time, through our smartphones.

Shortly after you order a product from Amazon, a robot picks up a package at a distribution centre just across the border in Germany. We are, in effect, being fitted out with a kind of global robot suit that we can use to control a network of smart devices. Our living environment has become a gigantic robotic exoskeleton. This makes it possible for operators in Nevada to control military drones in Afghanistan and allows 'us' to believe in a golden future for the self-driving car robot.

2.3 How digitalisation challenges society

The digital technologies of the Second Machine Age therefore make much more possible than ever before. If we believe in the technological dream, then they should immediately make the world a better place. But we have learned the hard way that we have to work hard at creating a better world and that we need social innovation alongside technological innovation. That is because technology also influences social processes. Digitalisation affects the way we live, how we communicate, how our democracy operates, how we work, and how the economy performs. Online shopping is changing the streetscape in city centres (fewer travel agencies, banks and CD shops, more restaurants and pick-up points) and increasing the volume of goods transport (Weltevreden, 2007). Dating apps are automating flirting to some extent, and digital platforms are the new economic organisational model of the twenty-first century.

Who's paying? Who's responsible?

It's obvious why the robot car won't happen overnight –the technology needs to be improved. Opinions differ as to how long it will take to develop a reliable self-driving automobile. The technological battle has begun, in any event, and billions are being invested. The Dutch government has already amended the Road Transport Act so that experiments with autonomous automobiles can be carried out on public roads. Since robot cars must be able to communicate with one another and require continuous map updates – is that bridge up ahead open to traffic or not? – they depend on smart infrastructure. The next milestone will be the roll-out of the 5G network, capable of processing vast amounts of data in a very short time. Important points of contention are: who's paying, and who's responsible?

The following anecdote is telling in that regard (Sage, 2016). During a major auto show in Los Angeles, a top Volvo executive wanted to show the press and the city's mayor what a smart car could do. When the car repeatedly failed to park properly, the executive snarled at the mayor, who was in the driver's seat, 'It can't find the road markings! Why don't you people paint markings on the damn roads!' The debates about how and which decisions robot cars should take, about monitoring and about safety have already begun. So we see that even the robot car requires technological and social innovation, learning-by-doing, and the ability to steer a political and administrative middle course between various public values.

The time is past when IT developers only had to worry about privacy and the security of IT systems. Our study *Urgent Upgrade* (Kool et al., 2017) examined the societal and ethical issues surrounding robotization, AI, digital platforms, big data and algorithms. The study shows that digitalisation affects public values such as equity and equality, autonomy, control over technology, human dignity and the economic balance of power (see Table 1). Recent public debates show that we have moved beyond a purely academic discourse; they have concerned emissions-cheating software that made Volkswagen diesel cars out to be cleaner than they really are, the influence of fake news in the US presidential elections, the addictive power of social media or, for example, the rising anxiety among Dutch businesses about the economic power of colossal platforms such as Google, Apple, Amazon and Alibaba.

Table 1 Societal and ethical issues related to digitalisation

Theme	Issues
Privacy	Data protection, privacy, mental privacy, spatial privacy, surveillance, function creep
Safety and security	Information security, identity fraud, physical safety
Autonomy	Freedom of choice, freedom of expression, manipulation, paternalism
Control over technology	Control and transparency of algorithms, responsibility, accountability, unpredictability
Human dignity	Dehumanisation, instrumentalization, de-skilling, desocialisation, unemployment
Equity and equality	Discrimination, exclusion, equal treatment, unfair bias, stigmatisation
Balance of power	Unfair competition, exploitation, shifting relations between consumers and businesses, government and businesses

Source: Kool et al. 2017, p. 75

With so many public values at stake in digitalisation, the question is how local politicians and policy makers can play 'the technology game' in the public's interest. The following three chapters – 'Digital engagement', 'Innovating for societal aims' and 'Digitalisation informed by public values' – examine this question in greater detail. Each chapter is preceded by a case history that analyses a specific practice or challenge relevant to politicians and policy makers.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WElly
ZZ-98-46
WWW.WEPODS.NL

Case history 1

Technology for an inclusive society

In the previous chapter, we described local politicians and policy makers as 'the true innovators' because they are obliged to consider the downsides as well as the upsides of digitalisation. What challenges does technological and societal change pose for local politicians and policy makers? We put this question to Mary-Ann Schreurs of Eindhoven, who served as the first alderperson for Innovation in the Netherlands from 2014 to 2018. In her view, 'Digitalisation is the means, not the end'.

Design and innovation

Mary-Ann Schreurs is a highly experienced alderperson. Initially, in 2004, she was responsible for design matters; innovation was added upon her re-election in 2010. She thinks the combination is logical. 'Design allows us to develop tools that are practical, transparent and manageable. For everyone. Technology was added as a binding medium. It gives us the chance to co-create, to come up with solutions together.'

What solutions is the City of Eindhoven working on? 'The challenges we are facing as a society are increasingly turning into economic challenges as well. The transition to sustainable energy is a good example, but so is the digital transformation.' Eindhoven is making more use of design and digital tools in that context. Schreurs cites the example of a local housing corporation that digitises entire houses so that people can 'control the switches themselves'. Years ago, industry and efficiency were the drivers behind municipal policy. 'That meant maximum insulation and maximum standardisation and, as a result, maximum failure to meet the needs of occupants.'

Digital houses

The municipal government wanted its new digital tool to give people control in three areas. First of all, to arrange a bathroom or kitchen renovation themselves. Second, to make changes to their home's exterior. 'Even terraced houses in existing residential areas.' Third, to opt to make their homes more energy-efficient. Older people, for example, often want to turn up the thermostat, whereas someone else would rather leave a window open. 'We wanted to let people make changes that suited the lives they wanted to lead. But it turned out that not all that many were interested.'

She explains why: 'Purely from a technocratic point of view, digitalisation makes it possible to track and do all sorts of things in a house. All that tracking produces oceans of data. But what these people really wanted to know was: how can I grow old in this house? And they weren't referring only to the interior design, but also to rent increases, for example. In each project, we now try to make their lives the central focus of concern.' Schreurs calls this critical reflection or 'countervailance'.

Part of the solution

'People who take a positive view of the potential of technology need to guard against simply adopting it without a second thought. There are different ways that we can approach digitalisation. On the other hand, we can't just talk about the dangers; we have to be part of the solution. As government, we bear some of the responsibility for developing the tools.' That is why Schreurs does not feel that the term 'data-driven' describes what is happening now. 'Data, and other forms of digital technologies, are tools that we can use to make new things possible. It's the means, not the end. Technology can support us, but it's up to us to actually choose.'

The community at the centre

Schreurs is guided by what people want in that respect. She gives the example of inviting tenders for the public lighting grid. Public spaces belong to us all, and so the data collected there should also belong to us all. That's why it is important to avoid monopolies and to be transparent about how algorithms work. 'It's up to us as government to create the proper conditions. It's about transparency and ownership. But in fact I find other questions more

interesting. How can government safeguard the public interest? Can we structure a service like Uber locally as well, so that the profits flow back into the community, for example by using it to transport people who could not afford it otherwise?' In her view, that calls for a major debate about the kind of society we want to be, and not only at local level. For example, she sees growing connections between complex societal processes. 'It's never just about mobility, sustainability, or urban space. All of these processes overlap, both within and outside government. Digitalisation is making the interdependence between such processes even stronger, but that in turn generates operational problems, such as how to align systems.'

Partnerships

The main challenge is to share, disseminate and scale up knowledge. Her solution is to search for answers in partnerships, for example by setting up an expertise centre with Eindhoven University of Technology and the Town of Helmond where the partners can share their knowledge. She has also taken the conversation about partnerships to Europe, for example in the Urban Cities Lab. 'Partnerships aren't always fun at first. I was in Taiwan a while ago, and they said "We'd like to do that too, work with the triple helix model." Well, to do that you first have to create a problem.'

European alternative: inclusive society

'There's growing awareness across Europe of the need to work on the challenges of digitalisation. The question isn't "What should we do?" but "How are we going to do it?". In the United States, people are treated like consumers by and large. Enterprises there have so much money that they can easily monopolise a market. Just look at Google, which wants to "revolutionise" cities, or Warren Buffet, who's out to redesign healthcare. China, on the other hand, sees its people as subjects who must follow the dictates of the state. Europe has the potential to create an alternative, where the focus is on inclusiveness. To do that, however, we will have to agree on conditions and standards for 5G, data collection, and the transparency of algorithms. If we arrange that in one place and then make it adaptable, government can then go forward with the roll-out at national or local level.'


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Digital engagement

3

'After all, that is the essence of democracy in the Netherlands, as it is elsewhere: to have the right to participate in policymaking and governance and to feel that you are represented. But what does that democratic right mean if not everyone joins in?'

Association of Netherlands Municipalities (2016)

IN BRIEF So far, digital tools have only brought about very small changes in our democratic system. There is the potential promise, however, that online communication will engage the public more closely in public administration. We are just beginning to tap into the potential offered by the digitalisation of interaction.

In decision-making processes, there is a delicate balance between what elected representatives decide and what is left to the discretion of the public. This is all the more so when digitalisation increases the scale of citizen engagement. In that case, it is important to clarify the latitude for participation and discussion at an early stage, and to be transparent about what is done with the public's input.

Digitalisation is not something that simply befalls us. There are many ways in which IT can promote communication between the municipal authority and local residents regarding governance and decision-making. Provided that they are used with due care in a well-structured process, digital tools are a valuable addition to the usual means of engaging the public more closely in municipal government.

Local democracy is undergoing major changes. The Dutch national government has undertaken a vast decentralisation operation in recent years and is transferring a wide range of tasks to the local level. One of the underlying ideas is that municipal authorities are better placed to carry out these tasks because they are in closer touch with people. But how close is the relationship between the municipal authority and local residents in reality?

Approximately half of those entitled to vote in municipal elections actually do so. Most people are reasonably satisfied with their local government, but barely give it a second thought (*Legitimiteitsmonitor*, 2015). Even so, when opposing views and conflicting interests are at stake, direct engagement is often the most promising way to arrive at broadly accepted solutions to thorny issues. This is often the case in spatial planning: should the local authority build houses, construct roads, clear trees, expand shopping centres, and so on. These are questions that call for a meticulous process, as it is imperative that even those inhabitants who are unhappy with the final decision should have confidence in how the authorities arrived at their decision.

People want to be heard

Support for municipal policy is based in part on the quality of the process leading up to that policy. A critical factor in this context is the direct engagement of stakeholders. People want to be heard, and they also want to *know* that they have been heard. The fact that government officials and political parties must maintain public support for their policies drives them to seek ways to invent democratic processes and to invite local residents in policymaking.

Recently, many municipal authorities have been thinking about how to enhance local democracy. Various initiatives are underway. They include the dozens of experiments that have been collected on the Democratic Challenge[1] website, and the 'Getting Started with Participation' guides on the Local Democracy[2] website. The VNG (Association of Netherlands Municipalities) (2016) drew up a Local Democracy 2017-2022 development agenda providing for more public participation and control in decision-making and more scope for grassroots initiatives. It states

[1] The Democratic Challenge is a three-year programme undertaken by the Ministry of the Interior and Kingdom Relations and VNG (2015-2017) focusing on innovation in local democracy; see http://democraticchallenge.nl/.

[2] The Local Democracy website was initiated by VNG and the Ministry of the Interior and Kingdom Relations; see https://www.lokale-democratie.nl/aan-de-slag-met/participatie.

the following: 'We will ensure greater scope for public participation and control and for grassroots initiatives, both small-scale (playgrounds, rubbish containers) and large-scale (the arts and culture, safety). To reach out to those people who have withdrawn because they are dissatisfied or who do not (yet) feel a sense of engagement, we will look for new approaches, new ways to get them to participate.'

'Twitter democracy'

The above evolution in the way local democracy functions is happening against the backdrop of the digitalisation of communication. We are increasingly living our lives on the internet, including democratic interaction and social debate. There are different aspects to be considered here. The digitalisation of information makes governance much more transparent. Today, anyone with an internet connection can gain direct access to local government documents and budgets online (Edwards & De Kool, 2015). The internet also makes it possible for local residents to communicate about and organise themselves around particular policy issues – and can also lead to 'Twitter democracy'. Local authorities can take advantage of this (government participation), but they can also use digital tools themselves to engage the public more closely in decision-making (citizen participation).

Many local authorities have experimented with various forms of citizen participation (top-down) and government participation (bottom-up) in recent years, but these have usually used 'analogue' tools: paper, discussions and meetings. Digital tools are now being added, in the form of e-participation (and this can mean engaging the public in municipal initiatives, but also getting local government to adopt citizen initiatives). A European study (Korthagen et al., 2018) has found that, in terms of the impact on political decision-making or agenda-setting, it did not necessarily matter whether an e-participation project was initiated by local government (citizen participation) or by the people themselves (government participation). What have these experiments taught us, and what lessons can we learn from them? That is the subject of this chapter.

3.1 Technological trends and expectations

Since the 1960s, futurologists and scientists have been describing how new information and communication technology would transform existing practices of citizen-government communication about policy (Aichholzer et al., 2018, p.18, 20). These expectations were inspired by the way in which technology had changed one-way communication into two-way communication and thus enabled genuine interaction between the public on the one hand and local politicians and policy makers and civil servants on the other. Two-way communication, it was thought, had the potential to change democracies worldwide by fostering a new type of contact between voters and elected representatives and new forms of participation. Would that pave the way for direct democracy?

'Twitter revolution'

Such expectations were revived by the rise of the internet and, more recently, social media. After all, social media potentially offer everyone, public authorities and other stakeholders, the opportunity to make themselves heard, to communicate on a mass scale, and to mobilise like-minded people. That optimism led to a major role being attributed to the internet and mobile phones during the Orange Revolution in Ukraine (Goldstein, 2007) and to the popular uprisings in Moldova (Morozov, 2009) and later in Iran (Sullivan, 2009) and other countries being seen as a 'Twitter revolution'.

We have been living in the internet age for more than two decades now and we know that all kinds of changes have indeed taken place. The workings of public administration have become more transparent, there are many ways of addressing elected representatives online, and various instruments have been developed at home and abroad to engage people in politics and policy.

In the meantime, however, the world has become more complex and local government has expanded considerably. As a result, the gap that people feel between themselves and their local government has not diminished, despite the availability of digital means of communication.[3]

[3] See Sociaal en Cultureel Planbureau 2016, p. 225-229, on the negative correlation between the size of a municipality and citizen participation. There have been various publications in recent years addressing the gap between the people and government, including by the VNG Committee on Forward-looking Governance (2016), the Scientific Council for Government Policy (WRR) (2012) and the Council for Public Administration (ROB) (2012).

Opportunities for authorities

Politicians who are on Twitter mainly broadcast; they hardly ever engage in real conversations with voters. Even when government does organise (online) citizen participation, its efforts do not always have the desired effect. People do not feel that they are really being heard and the number joining political participation projects is often disappointing. And those 'Twitter revolutions'? While social media helped to increase the visibility of the uprisings in mainstream (foreign) media, it would be going too far to credit Twitter and Facebook with the revolutions themselves. What mobilised people was the cumulative pressure of political dissatisfaction, according to many commentators who would like to abandon the term 'Twitter revolution' altogether (see for example Van der Lubben, 2011). To some extent this is because social media can also be exploited by those in power, for propaganda purposes, oppression or detection (Gibson, 2011).[4] The absence of radical transformation does not alter the fact that the advances in IT have brought about fundamental and relevant changes in (local) democracy and will continue to do so.

Digital campaigning

First of all, it is clear that various interest groups are now well-versed in the art of 'digital campaigning'. People are taking advantage of the increase in transparency and have no trouble finding their political representatives online when an issue arises that concerns them directly. All sorts of people make effective use of the technology to immerse themselves into the political decision-making process. High school students across the Netherlands mobilised online in their battle against new rules on the number of lesson hours they were required to complete every year (Edwards & De Kool, 2015). A small group of Dutch university students launched an online campaign to collect enough signatures to force an advisory referendum on a new Intelligence and Security Services Act.[5] At local level, the 'Groninger Bodem Beweging' – a community organisation set up to 'defend the interests of people who suffer (financially and/or emotionally) [from] the causes (direct or indirect) of natural gas extraction in Groningen, Netherlands' – has used its website to publish up-to-date data on extraction-induced earthquakes, to inform people about the decision-making process, and to mobilise them to take action.[6]

[4] See also the reports about the role of social media in the violence perpetrated against the Rohingya in Myanmar (https://af.reuters.com/article/worldNews/idAFKCN1GO2PF) and the Philippine government's use of Facebook: 'What Happens When the Government Uses Facebook as a Weapon?' (https://www.bloomberg.com/news/features/2017-12-07/how-rodrigo-duterte-turned-facebook-into-a-weapon-with-a-little-help-from-facebook).

[5] Https://www.ad.nl/binnenland/dankzij-vijf-studenten-krijgt-nederland-weer-een-referendum~ac88813b/.

Another example is the online petition launched by residents of the town of Zutphen that revealed a critical lack of support for Loek Hermans – a former high profile politician – as interim mayor. Local representatives subsequently withdrew their support for this candidate.

We also see that past and future changes brought about by IT create new opportunities for local authorities. Several local governments have themselves been proactive about using digital tools to engage people more closely in political and policy matters, for example by involving citizens in municipal budgeting or in developing a strategic agenda for their town or city as a whole. They consult local residents online about new plans, or offer them the chance to come up with their own citizen initiatives. A few municipal authorities in the Netherlands are also experimenting with digital democracy.[7] A recent study (Korthagen et al., 2018), also looked at what can be learned from examples from abroad.

3.2 The people themselves get down to work

Opportunities for digital interaction and for following politics and policy news online are multiplying. According to Van Dijk (2012), digitalisation's most important contribution to democracy so far is that it has improved access to and facilitated the sharing of political information. But digitalisation is creating other possibilities as well. People are now used to arranging all sorts of personal matters digitally and to speaking their minds online. They expect managing elected representatives and government officials to respond to that. People make their point in petitions, on their own websites, or on Twitter and use these means to try to influence politics. Sometimes they are successful; oftentimes, they are not. What do these new channels signify for public administration? We give a few examples below by way of illustration.

3.2.1 Following politics online

There are all sorts of online tools that help make government decision-making more transparent. For example, it is possible to livestream local council meetings and read relevant documents on municipal websites. Municipal councillors also report on their work on their personal websites, Facebook pages and Twitter accounts. Local government and political actors are largely

[7] For examples of e-democracy initiatives, see http://democraticchallenge.nl/ e-democratie/ and https://depilotstarter.vng.nl/projecten?thema=22.

in control of their communication by means of these channels. There are also websites that monitor politics, make documents available and in some cases make it possible to ask questions.

Dutch initiatives

2008 saw the launch of the website Watstemtmijnraad.nl, set up at the initiative of Dutch Ministry of the Interior and Kingdom Relations, which made it possible to track municipal councillors' votes. The website did not survive, however. It saw too little traffic, especially among its real target group: ordinary citizens. The website provided raw data on voting patterns in municipal councils, for example, but that meant users had to analyse the data themselves to answer such questions as 'Is my representative consistent in what he says and how he votes?' and 'Is my party keeping its campaign promises in the way it votes on issues?' (Edwards & De Kool, 2015). Since 2015, the Open State Foundation, VNG, KING and the Ministry of the Interior have once more been working with various local authorities to make reports, proposals, voting results and motions by municipal councils available online and to standardise this information (see the site: https://www.openraadsinformatie.nl/). The aim is to give councillors, journalists, researchers, interest groups and local residents better tools for monitoring municipal councils and their activities.

Germany and the United Kingdom

Websites in other countries go even further and have added interactivity. One example is Germany's *Abgeordnetenwatch* (Parliament Watch), which allows German citizens to question political representatives. The website is a civic initiative that is meant to improve political transparency. The questions submitted are scanned by a team of moderators, who see to it that they are forwarded to the right politicians and who monitor whether they have been answered. The website has proved popular; in 2014, Germans submitted 174,000 questions (with a response rate of 80%). A similar civic initiative was undertaken in the United Kingdom (see www.theyworkforyou.com and www.writetothem.com).

3.2.2 Online mobilisation

While transparency is increasing steadily online, mobilisation via social media is more abrupt in nature. The speed, scale and relative invisibility of internet and social media mobilisation can take politicians by surprise, more so than the demonstrations of the past (Edwards & De Kool, 2015, p. 81).

One Dutch online channel that facilitates mobilisation is petities.nl, which welcomes no less than two million visitors a month. People collect signatures on this website on general issues ('Stop unnecessary plastic packaging in the supermarket') or local concerns ('Give us back the train connection between Grou-Jirnsum, Akkrum and Wolvega'). The website is organised bottom up and not embedded in any official political channels. Signing a petition is an easy way to voice an opinion. Those who do are sometimes referred to as 'pyjama activists' (Rodenburg, 2017). Activists who initiate petitions generally seek contact with the responsible politicians in due course and hand over the petition. But they seldom succeed in influencing politics. Merely submitting a long list of signatures is generally not enough. While politicians may politely accept the petition, they are not always willing or able to take action on it.

The factory outlet that never happened

Another example is when the City of Zoetermeer wanted to involve local residents in the decision-making process for the 'Holland Outlet Mall' (HOM), a factory outlet centre to be constructed in the city centre. Citizen engagement did not go as planned, however. It was unclear what the local authority was asking its citizens: the desirability of an outlet centre, or the conditions under which the mall would be built? The questions local people were asking were more specific than the local authority had envisaged answering in such an early stage of the project. The public consultation process had no predefined purpose; as a result, certain groups did not feel that they had been heard, leading to dissatisfaction not only with the project but the process as well (Bakker et al., 2017). Dissatisfied residents mobilised themselves, began lobbying, and publicised their grievances far and wide, including on websites and social media.[8] The combination of online and offline communication and mobilisation strategies empowered the resistance. In the end, the property developer gave up and the local council voted to call a halt to the project.

[8] See for example: http://www.homzoetermeer.nl/ en http://www.doenietzomall.nl/.

3.2.3 Success factors

As these examples show, the availability of digital tools and their use in communication between residents and local authorities (municipal councillors, mayors and alderpersons, civil servants) raises a series of questions.

- First of all, how can public authorities make citizen engagement a positive experience for local residents? The point is to show them that their input is valuable, even when it does not have an immediate, concrete impact. When interaction is poorly planned, there is a risk that it will lead to less trust from citizens in the public authorities.
- Second, how can public authorities define the parameters for dialogue with residents about decision-making without trivialising citizen engagement? On the one hand, elected representatives must be in a position to shoulder their responsibilities; on the other, stakeholders should be heard and be taken seriously.
- Third, how do you ensure that elected representatives weigh up options objectively and take decisions autonomously, as the officials responsible, when public input and consultation processes (possibly also involving civil servants) have already led to consensus about what should happen? It can be difficult for municipal and alderpersons to oppose proposals stemming from interaction between the local residents involved, even though they often represent specific interests and are not representative of the entire population.

These three issues are not only relevant when communication between local residents and local government goes through digital channels but also when it only predominantly occurs offline. Online tools make these questions more pressing, however, because they have the potential to broaden and intensify interaction between residents and government.

A well-designed digital participation process can address these issues to some extent. In the next section we explain what kind of digital tools are available and what lessons we can learn from real-world situations in which they have been applied.

3.3 Digital democracy in practice

Some local authorities are themselves taking steps to encourage digital citizen engagement in politics and policymaking by attempting to collect local residents' digital 'stories' (proposals, votes, opinions and so on). Although we do not have a complete overview of such efforts, there do not appear to be very many in the Netherlands.[9] In our international study, however, we observed a wide range of digital tools that make it possible to engage people in decision-making in different ways and at different times. Many different tools have now been developed in support of e-participation, and they are being deployed in varying political contexts. Although e-participation is uncharted territory for many Dutch municipalities, there is no need for them to reinvent the wheel. In fact, they can learn from others who have already tested these tools and draw on their experience to organise better e-participation processes (De Zeeuw & Pieterse, 2017).

PRACTICAL APPROACH

Tools for digital democracy are available in every shape and size. Below are a number that we have observed being used in the Netherlands and abroad.

- First of all, there are digital citizen initiatives. In Finland, members of the public have the right to submit bills to the Finnish Parliament. If they collect 50,000 signatures in support of the bill, Parliament treats it like any other piece of draft legislation.
- Another example concerns online public consultations, such as the *internetconsultatie* used in the Netherlands. Individuals and organisations can retrieve information about draft legislation in this way and make suggestions on how to improve the quality and practical feasibility of the legislation.

[8] Examples can be found in the Dutch towns of Ede, where residents are involved in the redesign of the market square (https://www.doe-ede.nl/); in Losser, where the public has had input into the policy on dogs and litter (https://www.civocracy.org/discussions/67/ learn and https://www.civocracy.org/discussions/74/learn); and in Zoetermeer, where residents are regularly asked to contribute ideas about various projects and initiatives (https://doemee.zoetermeer.nl/default.aspx). Many municipal authorities use their websites to invite residents to submit ideas and participate in decision-making more generally, including The Hague (https://www.denhaag.nl/nl/in-de-stad/denk-mee.htm) and Leiden (https://gemeente.leiden.nl/bestuur/denk-mee/).

- The third example involves inviting the public to help write policy documents online through a wiki-based website. The City of Melbourne organised a participation process aimed at developing a shared strategic planning agenda. Local residents and other stakeholders were able to work on the municipal strategic planning document online. They could also discuss their ideas at meetings with policymakers, who added them to the online document later.
- The final example is participatory budgeting. In this case, the public is asked to share their thoughts on how to spend part of the government budget. The Netherlands is certainly not in the lead in this regard (Hofman, 2011), but a few local authorities are experimenting with participatory budgeting online, for example the City of Breda and the Town of Oss. Rotterdam used to have a basic version in which local residents were asked to vote (online) on a series of initiatives, with the city's new skating rink being one of the winning proposals. Much more progress has been made in online participatory budgeting in other countries, including Brazil, Germany and France.

There are also experiments under way with online elections or online opinion-formation and opinion polls (for example through Argu, https://argu.co/). It is important to examine needs and requirements and phase of decision-making when choosing a digital tool to ensure the best match.

No quick-fix solution

It is far from easy to use digital tools to engage local residents in policymaking and political debate. Digital tools are certainly no 'quick fix' solution to all the issues we raised earlier. There are many examples of government-led digital engagement that ultimately had very little influence on decision-making. For example, policymakers or politicians may find it difficult to actually take action on the outcomes because they are too general in nature and/or too far removed from the actual policy agenda. As a result, people often become disillusioned. In addition, the people who participate usually do not represents all the various interests at stake, and politicians are understandably hesitant to simply adopt their input. The crux of digital democracy lies in embedding digital participation properly in formal decision-making. Below, we share lessons learned based on our international study (Korthagen et al., 2018).

3.4 Lessons

A systematic comparison of 22 cases shows that six factors can help ensure that e-participation will have a substantial impact on policy or politics (Korthagen et al., 2018). These factors help e-participation make a genuine difference in decision-making and therefore add value for politicians, policymakers and the public alike. As the lessons in this section reveal, success depends on more than the technology being used; the bottom line is the interaction between the digital tool and offline decision-making process.

1 Link e-participation to a specific agenda or decision

The impact of e-participation depends on linking the participation process to a policy or political agenda or decision. Interactions between participants and policymakers can reinforce this link (whether online or offline). The wiki-based participation process concerning the future of Melbourne (see the 'Practical approach' box above) created that link by putting the city's strategic planning agenda in the public domain. Local residents and stakeholders worked on the official document online or discussed their ideas during meetings with policymakers. The latter would then amend the official document in accordance with this input. The interactions between policymaker and participants strengthened the link between the participation process and the formal policymaking process.

2 Be clear about the process and the aim

It should be clear right from the start how people can participate, for what purpose, how they can contribute to decision-making, and who is responsible for what. That way everyone knows what to expect. One approach would be to issue a set of clearly worded, low-threshold infographics or FAQs. The City of Paris uses these on its website to explain how and when people can get involved in distributing part of the municipal budget, for example by submitting proposals and voting on them, and by working with civil servants to make their plans more feasible.[11]

3 Give feedback

Let participants know what is being done with their input. Feedback is an indicator of a well-organised, transparent process and an important form of accountability. That is especially true when the final decision deviates

[11] Https://budgetparticipatif.paris.fr/bp/.

from the outcome of the participation process. It is very easy to build in digital feedback mechanisms. The Berlin-Lichtenberg district reports decisions on budget proposals by giving a brief explanation in the form of a simple 'traffic light' system: green= accepted, orange = under consideration, red = rejected.[12] In Reykjavik, participants can track decision-making on a website; they also receive e-mails with relevant updates.[13]

4 Do more than collect signatures

Online tools are an easy way for people to express – and monitor – the level of support for a particular cause. However, digital signatures send out a less powerful signal than voting for or prioritising proposals, for example in participatory budgeting. That is in part because of the specific nature of the plans themselves and how participation is linked to the formal decision-making process. There is also some interest in combining online deliberation and voting. Deliberation can help participants reach informed opinions, and votes indicate support for their propositions.

5 Customise mobilisation, online and offline

Awareness of a digital tool is crucial to reaching the largest and most representative group possible. An effective communication and mobilisation strategy consists of several tools that are customised to reach different target groups. Many participation processes are unsuccessful in this regard, or the tool's reach is left unmeasured. Digital participation need not be limited to existing media such as Facebook or Twitter, each of which has its own features and limited user base. Combining online and offline participatory options is one way to customise mobilisation. Berlin-Lichtenberg publicised participatory budgeting on social media, in leaflets and letters, and at community centres. The organisers say that each channel generated a different set of participants.

6 Repeat and improve

Digital participation is a learning process. A repeat participation process is more likely to have an impact than a one-off. It is easier to make processes and digital tools more user-friendly and to embed them more firmly in existing decision-making when they are used repeatedly.

[12] Https://www.buergerhaushalt-lichtenberg.de/.
[13] Https://betrireykjavik.is/domain/1.

It is also a good idea to measure the level of satisfaction with the tools and outcomes. That was a notable deficiency in the projects that we studied, but one exception is the European Commission's Futurium public consultation website,[14] which is being improved based on input shared by participants and stakeholders during workshops. Another exception is the process of participatory budgeting in Paris. The process itself has been amended time and again to meet the requirements of the public and the municipal authorities. At first the authorities themselves came up with proposals, but it soon became clear that Parisians wanted to submit their own plans. They were given the opportunity to do so the following year, but their plans did not always line up with the municipal agenda (in some cases, the City was already working on a similar project) or were not professional enough to be useful. Thereafter, the process was broken down into three phases:

1. the public and organisations draw up their own project proposals;
2. participants and civil servants then work together to improve the technical and legal aspects of the proposals and to bring them into line with the municipal agenda ('co-creation');
3. the proposals are put to the vote (online and offline).

[14] Https://ec.europa.eu/futurium/en.

Case history 2

Innovation: living labs

The City of Delft is experimenting with innovation policy. Executive Councillor Ferrie Förster (2014-2018) told us about Delft's living labs policy, the role that the municipal government plays in this domain, and what these experiments are producing. 'We help generate ideas about how to make an invention possible.' In the next chapter, we look more closely at the societal challenges of innovation. This case history illustrates how relevant local practices are changing.

Delft is famous for its university of technology and has a high concentration of innovative enterprises. 'That doesn't just happen by itself', says the executive councillor responsible for the economy, culture and spatial planning, Ferrie Förster. 'The municipal authority tries to promote the city's investment climate and that's why it invests in knowledge and innovation.' One element of this is its 'living labs policy'.

How it works

People who have project initiatives can get in touch with the municipal government if they want to test their idea in the real world. 'There are a lot of new inventions coming out of Delft,' says Förster. 'They have to be put through practical testing before they can be scaled up. We want to give companies and students the opportunity to test new ideas in "their" city.'

The local authority's approach has already led to various living labs. Smart street lighting guides cyclists along quieter routes through the city centre. And the digital surgical assistant Dora – a kind of Big Brother machine – was put to the test in the city's teaching hospital. Dora films the surgery (the patient remains anonymous), keeps track of the instruments used and maintains an remains aof the equipment. It is an efficient way to check that everything is in the right place and avoid errors.

Policy under development

The City of Delft had been cooperating in the odd experiment for quite some time. Two years ago, Förster decided to cluster them and call them 'living labs'. 'It gives us a better overview. We suggest suitable locations, link new parties to existing ones where possible, and let local residents know about the experiments taking place in their neighbourhood.'

The team sometimes also suggests ways to improve the content of the projects, but the local government does not decide which challenges developers should be addressing, mainly because it does not itself finance the projects. Förster does not rule out that it will do so in the future, but there are no specific plans as yet.

For now, the City is focusing on facilitating living labs. 'We highlight certain issues on our dedicated website [www.proeftuinendelft.nl/en/home] – mobility, governance, economy, environment, living and people. But basically, it doesn't matter whether the innovation addresses sustainability, mobility or sensors and data-gathering. In terms of content, everything's possible.'

Role of the municipal government

Because the living labs differ so much from one another, the municipal government takes a case-by-case approach. In one instance it helps parties get the necessary permits or points them to regulation-free zones, in another it takes charge of the project itself. In each case, however, it is no longer a passive participant, but actively involved. Many of these experiments transcend the boundaries of existing policy or legislation. 'We ask ourselves how we can make the invention possible. So instead of saying "No, unless…" we think in terms of "Yes, provided that…".'

The municipal authority is always in charge, however. It examines whether the living lab falls within the existing legislative and regulatory frameworks, or what would need to happen to make that possible. It also sets a number of additional requirements. For example, the idea must be innovative and should not be undergoing testing elsewhere. It should also work outside the living lab.

After all, the point is to take successful innovations further and to a larger scale. For example, a smart street lighting grid tested in a Delft car park is now being rolled out internationally. 'The concept is really very straightforward,' says Förster. 'The street lights dim when there aren't any people or cyclists passing by. That saves energy. Why should those lights always be on anyway?'

Added value for the economy

Delft has chosen controlled experimentation for various reasons. First of all, the City is eager to improve the investment climate. It accomplishes that in the living labs by offering companies more freedom. One example is The Green Village, an innovation campus. Local government, in consultation with the provincial and national authorities, introduced more flexibility into the zoning plan. Parties can get to work sooner without permits, accelerating the innovation process. Students at Delft University built a prototype on the campus for a hyperloop pod. The hyperloop is a high-speed transport system in which people and cargo will travel in pressurised pods through near-vacuum tubes. Their design won the Hyperloop Pod Competition organised by Elon Musk's company SpaceX. Working with construction firm BAM, they built the prototype in just a few weeks. 'Normally, that process would have taken months or even years,' says Förster.

Solutions for society

The living labs also help to achieve a further goal: to develop technologies addressing societal challenges. 'Testing reveals whether an innovation will actually work down on the ground,' says Förster. He gives the example of the Mudtrap, a specially designed underwater container installed in a ditch to collect sludge. The idea was that there would be less need for dredging, but in the end the concept did not work as well as expected. 'At least you know that then. The developers have two options in that case: go back to the drawing board or give up.'

Sometimes an innovation does work but has another lesson for the local authority to learn. For example, a team of students designed a 'duckbot', a robot that consumes duckweed in Delft's canals. Duckweed is a major problem in the summer. The robot did its job perfectly, but did not address the real causes of infestation. 'We haven't solved the real problem: nutrient-rich water resulting from all the fertiliser that local farmers use,' explains Förster. 'So we've now decided to tackle the problem at the source.'

Public support

The third outcome of the living labs is that they shine a spotlight on technology – and its added value – in the city, making it visible to both local residents and tourists. And that brings the entire process full circle, 'because visibility generates more support for our economic policy of promoting technology and innovation,' says the executive councillor.

Such support is not always obvious. Local residents also have questions or doubts about experiments, for instance regarding their privacy. The executive councillor gives the example of Sensorcity, a system of sensors that keep track of the temperature and humidity but also the number of people in the city centre. This data is then linked to other data, for example retail revenue. 'We explained what we were testing, why, and what the benefits would be. Because it was a temporary experiment, people agreed to it despite their misgivings.' Based on the sensor data, the City will decide what it can do to attract more people to the city centre, for example on rainy days. The results persuaded local residents and retailers to make the Sensorcity experiment permanent.

Policy in transition

Delft's living labs policy shows that local innovation policy is changing. Economic factors are often important drivers for closer cooperation with businesses or local residents. Will there come a time when societal challenges are a bigger motivator?

Amsterdam elektrisch
Oplaadpunt

Innovating for societal aims

4

'Addressing Grand Challenges is a challenge in its own right, for policy as well as for science, technology, and innovation actors.'

Stefan Kuhlmann & Arie Rip (2018)

IN BRIEF In this chapter, we draw attention to a new generation of transformative innovation policy, one that aims to support transition paths and solutions addressing the major societal challenges of our time. As local organisers who often see and feel such problems most directly, municipal authorities can play an important role in this context by supporting promising innovations. But they cannot do this on their own.

They need to cooperate with local companies, knowledge institutions, professionals, users, citizen initiatives, residents and/or civil society organisations. If they mean to scale up local solutions, they also need to cooperate with other municipal authorities, with regional and national authorities, and sometimes with other European governments as well. In the previous sections, we saw that living labs show promise when it comes to implementing the new innovation policy. We also saw that municipal governments are becoming more active in this regard, in cooperation with local stakeholders.

We conclude with six lessons for the new of generation local innovation policy in which living labs can play a major role.

4.1 Innovation policy for societal challenges

The grand challenges facing society – climate change, sustainable transport and mobility, renewable energy, food security and an ageing population – have become the predominant force driving knowledge and innovation policy in recent years. The European Union was a forerunner in this respect with its Horizon 2020 Framework Programme for Research and Innovation. A significant share of that programme budget is reserved for research that seeks to find solutions for seven 'societal challenges'. Those challenges have now also permeated national and regional knowledge and innovation policies. The focus of the Northern Netherlands' smart specialisation strategy, for example, has shifted to four of these societal challenges instead of its sector-driven policy. In the Netherlands' national innovation policy, the top economic sectors have indicated, at the Government's request, how their agendas and activities are addressing societal challenges. The Government coalition agreement refers to a reorientation in the top sectors policy towards societal challenges.

The aim of innovation policy has always been to help companies or business sectors become more innovative and to ensure robust innovation ecosystems. In its new innovation policy, the Dutch government uses targeted measures to encourage innovative solutions to complex and persistent societal problems. The underlying premise of the new innovation policy is that government should actively help to find new ways to tackle the challenges of the twenty-first century (Mazzucato, 2015; 2017; Raworth, 2017). The wish to put innovation policy more firmly at the service of societal challenges has now gained broad support (AWTI, 2016; VVD, CDA, D66 and ChristenUnie, 2017).

INNOVATION POLICY We can summarise the evolution of innovation policy as follows. Until the 1980s, government focused heavily on stimulating R&D investment by offering subsidies and tax breaks and by protecting intellectual property.[15] 'Market failure' gave government policy legitimacy: companies are less inclined to invest in R&D than society would like because their competitors will also benefit from the results.

From the 1990s onwards, it became popular to think in terms of innovation systems, with government's main role being to repair 'system failures'. During this period, innovation policy was firmly geared towards connecting the actors in the innovation system and encouraging public-private partnerships (PPPs).[16]

Recently, we have seen the dawning of a third generation of 'transformative' innovation policy, the aim of which is to promote innovations that are beneficial to society. Government is now more closely involved in the content of innovation, in that it helps to find innovative solutions and transition paths addressing pressing societal challenges, such as the transition to a low-carbon or circular economy (Schot & Steinmueller, 2016). In short, innovation policy has gained legitimacy not only from market and system failure, but now also from transition failure (Frenken & Hekkert, 2017).

The importance of co-creation

Transformative innovation policy calls for new ways of thinking and working, both in policymaking itself and in the way research and innovation are managed and organised. One factor is that technological innovations alone will never be enough. Social innovation in existing corporate, professional and user practices is often much more important. Hence the need to involve behavioural scientists, companies, users, public initiatives, interest groups and others in the search for new solutions.

[15] The Research and Development tax credit (WBSO) scheme, which the Ministry of Economic Affairs is using to encourage innovation by Dutch firms, is an example.

[16] Examples include the PPP allowance (part of the top sectors policy) and initiatives setting up regional clusters and 'triple helix' alliances.

Innovation policy addressing societal challenges must be implemented using new policy tools based on the 'co-creation' of innovation. In this case, co-creation means that end users, professionals, members of the public and/or civil society parties play an active role alongside researchers and technology developers in setting the agenda for and developing innovative solutions that actually work in the real world. In societal transition processes, practical or experiential knowledge is often just as important as scientific and technological knowledge and skills. Government is there to facilitate, coordinate, incentivise and/or orchestrate collaboration.

Another aspect of transformative innovation policy is that in the long run, major societal challenges must be turned into tangible missions and programmes in which existing and potential solutions can be explored and tested. An experimental approach is necessary because transition paths cannot be designed in advance. The challenge is to organise a joint quest to identify advisable and feasible transition paths.

Beckoning local scale

Local and regional authorities play an important role in this new innovation policy. That is first and foremost because societal problems are felt most acutely in cities and villages and because local authorities have a responsibility to address them. Their responsibility has grown heavier in recent years as the national government has undertaken various decentralisation operations. Second, that is because the grand societal challenges can be broken down into 'bite-sized' elements at local level. There, it is possible to undertake experiments to identify promising solutions and transition paths. For example, experimenting locally with new solutions obviates the need to immediately change national policy frameworks and existing structures. Moreover, co-creation is most effective when organised around a local initiative or experiment; it is often easier to build mutual trust and share personal knowledge at the local level.

City Deals: multi-level cooperation

But local government cannot do it on their own. To ensure that local initiatives contribute to societal transitions on a larger scale,

it has to cooperate with other municipal, provincial and national authorities, water boards and sometimes even the European Commission. The aim of a challenge-driven innovation policy is to arrive at a 'multilevel' division of labour in which each tier of government contributes to finding solutions and transition paths addressing societal challenges by virtue of its own competencies and responsibilities. One example would be the 'City Deals' that the national government is concluding with local authorities.

Below, we first address the role of local government in tackling societal challenges. We then explain the 'living lab' phenomenon as a promising tool for transformative innovation policy. In theory, living labs offer a real-life environment in which multiple parties can join forces to experiment and work on innovations that address societal challenges; this makes them an interesting tool for local transformative innovation policy. In reality, however, the living lab label covers a wide variety of different initiatives, each with its own features. We attempt to create some order out of this chaos with our typology of living labs in Section 4.3. Section 4.4 explains how local authorities can ensure that living labs make an effective contribution to finding innovative solutions and practical transition paths for the grand challenges. Section 4.5 concludes by listing six lessons for the new generation of transformative innovation policy.

4.2 Role of the local authority

The municipal authority is an important tier of government when it comes to tackling societal challenges. The need to do something to address the issues of climate change, environmental pollution, public health, poverty, accessibility and other matters is particularly pressing in urban areas. In addition, with their local networks of businesses, knowledge institutions and public initiatives, municipalities offer an appropriate arena in which to work on solutions. Local networks and initiatives bring local parties together and allow them to join forces.

Copenhagen sets an example

Global challenges, for example carbon reduction, seem too overwhelming to break down into bite-sized components at local level. Even so, there is no question that local governments can work to address these types of societal challenges. Copenhagen has shown us how. As far back as 2005, the municipal

government set itself the aim of making the city carbon-neutral by 2025. That gave it and local businesses and civil society organisations twenty years to take action.

The grand societal challenges must be worded in terms of local missions and policy objectives that can count on public support. The next move is to develop a portfolio of initiatives that can help meet the objectives that have been set (Mazzucato, 2017; 2018). Societal challenges are so complex that it will take a series of (successive) initiatives to find innovative solutions that truly do support the desired societal changes. This calls on government to show leadership and develop the right expertise as the guardian of the public interest. It must show leadership by charting a course, monitoring progress and making changes where necessary, even when disputes arise and there is resistance from society. And it must develop the right expertise so that it can join stakeholders in civil society in determining which initiatives do and do not contribute to attaining the objectives of the mission. For each initiative or project, the local authorities must find a balance between managing, encouraging, facilitating and letting go.

Arnhem and Amsterdam as drivers

A local authority can take action itself in domains for which it is responsible. Copenhagen invested in hybrid buses that reduced carbon emissions by 75 percent. But government can also force others to adopt climate-neutral practices, as recently happened in Arnhem when the municipal authority established the strictest environmental zone in the Netherlands. A local authority can also encourage and facilitate bottom-up initiatives. One example is Amsterdam's policy supporting residents in Amsterdam-North who want to turn their district into a circular economy; the local authority is dealing flexibly with regulations and drawing lessons from this sustainability initiative that will be useful in other parts of the city.

The complexity of societal problems makes experimentation and living labs worthwhile. Such initiatives can be launched by local government itself, or undertaken by other parties, with local government simply extending the necessary permissions or going a step further by offering encouragement or outright support.

4.3 Living labs as an innovation tool

'Living labs can be defined as a physical arena as well as a collaborative approach in which different stakeholders have space to experiment, co-create and test innovation in real-life environments defined by their institutional and geographical boundaries.'

Schliwa & McCormick (2016, p. 174)

The above quote identifies two essential features of living labs: the real-life experimental environment (the laboratory space) and the collaborative approach to experimentation (co-creation).

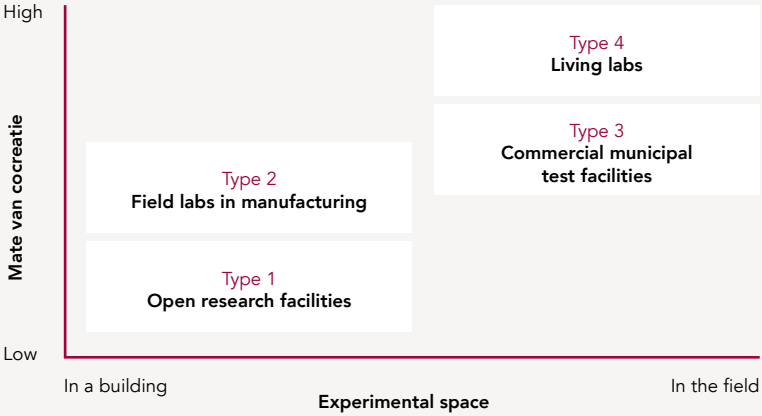
In practice, a host of different initiatives are given the 'living lab' label. We also see initiatives that promote themselves as field labs, smart labs or something similar, without it always being clear what these terms mean. To get a better idea of what these various 'lab' initiatives are, we have developed a typology based on the features identified above (Maas, Van den Broek & Deuten, 2017). Figure 2 provides an overview. We explain the dimensions below.

Inside or outside the lab and level of co-creation

The first dimension is the type of space in which the experiments are organised. On the one hand, we see experiments being undertaken in clearly defined laboratories, in a building or part of a building that is screened off from the outside world. That makes it easy to control the test environment. On the other hand, there are experiments organised outside the laboratory, in a street, neighbourhood or on the outskirts of a town. Many of these make use of digital technologies, such as digital sensors that monitor the test environment.

The second dimension is the level of co-creation. If cooperation is limited to researchers and enterprises, then the level of co-creation is low. If professionals, policymakers, the public and/or civil society parties also play an active role in setting up and conducting the experiment, then the level of co-creation is high (Merkx, 2012).

Figure 2 Four basic types of experiments



Type 1: Open scientific research facilities

The first type is a partnership between a knowledge institution and industry in which the knowledge institution opens the doors of its facilities to industry. These experiments generally take place in a traditional laboratory setting and the level of co-creation is limited. They tend to involve research and technology and are used by universities for knowledge valorisation purposes. One example is the Dutch Optics Center, in which Delft University of Technology cooperates with the Netherlands Organisation for Applied Scientific Research (TNO) on matching new optical inventions with the needs of businesses in order to drive innovation and valorisation.

This type aligns with first- and second-generation innovation policy, which emphasises valorisation and innovation in industry but without government providing any explicit guidance. The aim is to use technology to deliver new products and services that will generate employment and revenue in industry.

Type 2: Field labs for the manufacturing industry

In the second type, a group of enterprises works with knowledge institutions to digitise and automate industrial processes. These initiatives often have support from a regional or local authority that is looking to innovate regional manufacturing and boost its competitiveness. The experiments are usually conducted in a physical building with a simulated industrial setting. The level of co-creation is limited because no end-users, members of the public or civil society parties are (or need to be) involved. The Dutch national government's Smart Industry policy has given rise to many different field labs. For example, the Sustainability Factory in Dordrecht shows employees and students how to work with new digital tools in the maritime and energy sector.

This type also aligns with first- and second-generation innovation policy. Its purpose is to boost competitiveness in manufacturing and, as a result, maintain and improve direct and indirect employment in the relevant industry.[17] It is not meant to help discover innovative solutions and practical transition paths for societal challenges.

Type 3: Commercial municipal test facilities

Both the space involved and the scope of collaboration are broader in commercial municipal test facilities. In these initiatives, an enterprise works with knowledge institutions and local politicians and policy makers to test new products or services in a real-world setting (often in the open space of a street or neighbourhood) with end-users. One good example is Flo, an 'intelligent' traffic light that is meant to get bicycle traffic flowing more smoothly and is now being tested in Utrecht and Eindhoven. Another is InnoFest, which uses music festivals in the northern part of the Netherlands as a test environment for all sorts of innovations, from temporary insurance to new types of sewage systems.[18]

[17] New technologies may breathe new life into manufacturing in the Netherlands or even lead to reshoring (bringing industry back to Europe from low-wage countries).

[18] This initiative won the European Enterprise Promotion Award in 2017.

Because this type of test facility usually takes place in public places, local authorities are involved in issuing permits and in monitoring public spaces. The local authority can also join the initiative as a partner if the innovation contributes to solving municipal problems or improves public services. This type of facility can help embed new technologies in the municipal organisation and in public spaces. One well-known risk, however, is that private corporate interests (especially those of large enterprises) may prevail over the public interest if the authorities fail to offer enough counterweight (in terms of actual content).

Type 4: Living labs

The fourth and final type is the living lab. Living labs feature broad and 'inclusive' collaboration between knowledge institutions, enterprises, professionals, civil society organisations and the public. The experiment furthermore takes place in a real-world setting (neighbourhood, urban district or city-wide). The participants in living labs seek solutions to complex societal problems. One example is the transition to a circular economy being undertaken in the Buiksloterham district of Amsterdam. One of the projects involves applying certain recycling principles to local waste water treatment by the local water management provider. After testing, the same principles can then be applied in other places around Amsterdam.

Such experiments can help local authorities define the overall shape of societal transitions at local level. They explicitly guide innovation policy in this type of experiment, and play multiple roles: they are responsible for public spaces, they serve as co-owners of the problem, they provide a portion of the funding, they generate knowledge, and so on. Whereas business interests dominate in the first two types, in this case the focus is on the societal issue and innovation is a necessary part of the transition.

4.4 Living labs: a tool for addressing societal challenges

The living lab (type 4) is a promising tool that can be used to address societal challenges in local communities and regions. Starting with a specific, local problem makes it possible to devise and test new approaches and solutions.

Not all living labs are scalable

To truly make a contribution to large-scale societal transitions, the knowledge and experience gained in local experiments cannot remain stuck at the local level. It is not easy to scale up promising results, however. Solutions that appear to work in the specific context of a local lab are often the result of customisation, adapted to local conditions, and it is not at all certain that these solutions will work well elsewhere. What works in a living lab in one town need not necessarily work across the entire town, or in another town or city. Neither does it go without saying that local participants want to invest time in transferring and sharing knowledge. Their implicit knowledge and experience must be made explicit so that it leads to insights that are also useful elsewhere. It is quite an effort to transform the knowledge and experience gained by participants in a local lab into practical knowledge that other communities can use.

For living labs to be effective at addressing societal challenges, they must form part of an integrated approach in which local authorities learn from one another, and in which the national government acts as facilitator and coordinator. Where appropriate, cooperation could also be established at European level to learn from experiments in other countries. Mutual learning means that local authorities do not have to reinvent the wheel; ideally, living labs should be part of a coordinated approach that makes clever use of their differences to produce robust, scalable solutions.

Case study: Medical Delta Living Labs

Several localities are currently experimenting with innovation coordination methods. One interesting case concerns the Medical Delta Living Labs in the Province of Zuid-Holland.

The 'Medical Delta' – a network of life sciences, health and technology organisations based in the Rhine Delta region of the Netherlands – is attempting to coordinate a network of living labs in various care institutions (university hospitals, nursing homes, rehabilitation centres and the home nursing environment). They share their knowledge and experience through the Medical Delta Living Lab Academy, providing useful information on what does and does not work in certain situations and why this is so. The Medical Delta also participates in the Smart Industry Field Labs programme and in the Health Living Labs run by the European Institute of Technology (EIT). The Field Labs programme coordinates fifteen field labs in the province with a view to connecting and encouraging mutual learning.[19] EIT shares knowledge and experience at the European level. The Medical Delta can therefore benefit from an extensive network.

Bureaucracy versus enthusiasm

One of the pitfalls of coordination is that it can lead to bureaucratisation and kill off the very enthusiasm and creative entrepreneurship at local level that helps living labs to thrive. The challenge is to combine local energy with supra-local learning. Local residents' and administrators' aims, expectations and interests are geared to their own community. Knowledge institutions and industry can help drive broader applications in response to research or commercial interests. Local residents and administrators benefit from knowledge-sharing because it gives them access to useful expertise elsewhere.

Parties prepared to learn from and about one another can connect through local platforms or forums that facilitate cooperation between local experiments. Regional and national authorities can play a role in increasing the impact of transition-minded initiatives (addressing societal challenges), but overarching organisations such as the VNG can also do their part to boost these initiatives.

Long-term, shared strategic agenda

In many cases, the innovative solutions generated by living labs are only one step along the way to maturity. In this sense, living labs are not one-off experiments, but a series of interrelated experiments that span several years.

[19] Many of these field labs are, in turn, associated with the national Smart Industry agenda.

Testing solutions in different locations can make knowledge more robust and, eventually, allow society to learn how to organise transitions. This type of approach requires:

- a multi-year, multi-party effort;
- coordination;
- a structure that supports experimentation in several locations and over a longer period of time.

4.5 Six lessons for the future

We conclude with six lessons for the new generation of local innovation policy in which living labs can play a major role.

1 Innovation policy across multiple generations

Innovation policy has evolved across three generations. In the first generation, government encouraged research and innovation in industry through direct funding and tax breaks. In the second generation, the focus was on connecting industry and knowledge institutions by encouraging cooperation in innovation systems. The purpose of the latest generation is to provide targeted support for innovations that contribute to solutions and transition paths addressing societal challenges. Innovation is not an end in itself, but a means to attain certain societal aims and to spur certain societal transitions. The three generations co-exist, but each one comes with its own policy aims and tools.

2 Each generation of innovation policy has its own policy tools

Typical first-generation innovation policy tools are funding and tax breaks for industry R&D and IPR protection, while second-generation tools encourage public-private partnerships of all kinds. Third-generation innovation policy instruments have yet to crystallise, but they appear to include living labs in which researchers, entrepreneurs, professionals, users, policymakers and/or the public co-create solutions to difficult societal problems in a real-life experimental environment.

3 Labs with differing aims, logic and added value

There is a lot of hype about living labs at the moment. All sorts of initiatives are calling themselves living labs, smart labs, field labs, and so on. From this proliferation of multifaceted labs, we can distill four basic types, each with their own aims, logic and added value. This classification can help politicians and policy makers to make the right decisions and choices in their innovation policy.

- The 'Open Scientific Research Facility' is a particularly suitable category for transferring knowledge from universities and research institutes to local industry. It fits in with a 'knowledge valorisation' policy.
- The 'Field Lab for Manufacturing Industry' category is especially appropriate for improving the innovativeness and competitiveness of enterprises by introducing them to new digital technologies. It is typical of modern industrial policy.
- The 'Commercial Municipal Test Facility' category allows entrepreneurs to test and refine prototypes of new products and services. Such facilities also help local communities promote themselves as a location or platform for innovation and serve as a tool for local economic policy.
- The 'Living Lab' category looks to be a suitable tool for learning about solutions and transition paths that address complex social problems. It fits in well with third-generation transformative innovation policy. It is, however, still too soon to tell whether living labs will live up to this promise. Much will depend on the way living labs are designed and used by local authorities.

4 Proactive guidance of innovation by government

Innovation is not something that forces itself upon local authorities from the outside and to which they are obliged to adapt. Local authorities can also join local parties in shaping innovation. Third-generation innovation policy requires a local government that actively seeks cooperation with other parties (other government agencies, industry, knowledge institutions, professionals, public initiatives, interest groups and/or civil society organisations), and that works with society to define the aims and direction of innovation. That also holds for living labs: if they are to contribute effectively to addressing societal challenges, the local authority must guide the experiments, in consultation with stakeholders.

For many public authorities, this broader, dialogue-driven approach marks a break with the recent past and with the current practice of entrusting matters to the market. Social innovation in new working methods and practices is crucial to harnessing technology for societal purposes. Living labs are ideally suited to combining social and technological innovation.

5 Living labs are more effective when municipal governments learn from one another

It is important for municipal governments to set up an active process in which they learn from one another and from other public authorities. A coordinated approach of this kind permits several different experiments to be conducted simultaneously and successively at different locations, making it possible to carry out similar experiments in different settings or different experiments in the same setting. It is a necessary step towards developing robust knowledge and solutions that can be applied in multiple locations. In short, each local living lab should make provision for cross-location learning.

6 Bear the ethical and societal aspects in mind

Experiments that are carried out in old-fashioned laboratories take place in the confined space of a building. In the living lab, however, they are conducted in public spaces. This means that people are part of the experiment, whether consciously or not. Experimentation requires openness, change and the sometimes flexible application of rules and laws. But experiments are not necessarily positive and politically neutral in nature. Which experiments are being conducted? Who is participating in the experiments? How are we learning from their results, and who are we sharing those results with? Whether people benefit from the experiments, and how, depends on how we answer such questions (May & Perry, 2016). Experimentation must not lead to exclusion, remove protections, or expose participants to unacceptable risks. It is therefore important to establish ethical rules for responsible experimentation in living labs.


Digitale
begroting

Case history 3

Blockchain in the local community: promise and practice

Can blockchain represent added value for local authorities that want to improve their public services? The Town of Zuidhorn, near Groningen, is finding out. Initiator Erwin van der Maesen de Sombreff tells us which problems the technology is solving, and the new issues that it has raised.

The Town of Zuidhorn has overhauled its allowance scheme for children in low-income households (the *Kindpakket* or 'Child Assistance Package'). Before, parents were given paper vouchers that they could redeem at three different shops. The shops were paid the relevant amount in advance, without the local authority being able to tell whether parents had actually spent the allowance there. The system was also inflexible; parents were obliged to redeem the entire voucher in one go.

Now, parents have a code on their telephones that they can present at twelve different shops. The cashier scans the code, which is anonymised and transmitted by blockchain. The local authority has programmed 'smart contracts' into the system. That means that transactions can only take place if certain requirements are met: is it the right shop, and is there enough money left to cover the purchase?

Two reasons for the overhaul

The local authority had two reasons to undertake the experiment. First of all, it wanted to 'do something with blockchain technology'. Second, the Child Assistance Package needed an upgrade.

‘It takes a sense of urgency to develop experiments and make a real change,’ explains policy officer Erwin van der Maesen de Sombreff, ‘and the Child Assistance Package was a manageable project.’ The underlying premise was that the technology had to represent genuine added value; if not, then the local authority would opt for a ‘standard’ digital alternative.

Added value for local resident or local authority?

‘Ultimately, we didn’t need the alternative,’ says Van der Maesen de Sombreff. ‘The new system was easier for local residents to use and gave them more autonomy. They no longer have to spend their entire allowance in one go; they can spend it whenever they like throughout the year. And it’s convenient for us because we can now track whether the money is being spent in the right place. For example, parents can spend the allowance at a sporting goods shop but not at an off-licence.’

In this case, the technology gives users more freedom and the developers more control. Blockchain is by no means a neutral solution in that sense; the local authority is making deliberate choices in developing it, for example by drawing up terms and conditions in the form of ‘smart contracts’. But how much control should it exercise? It was a question that Van der Maesen de Sombreff asked himself as well. ‘Since we’re talking about public finances here, we think it’s only logical to specify the shops where the allowance can be spend. In theory we could even specify the products that they can purchase, but we decided against that.’

The promise of blockchain

Blockchain can be described as a digital distributed ledger made up of a network of interconnected computers that use sophisticated algorithms to track transactions in a transparent and reliable manner. The Child Assistance Package is only one example of how this technology is being used.

‘The infrastructure is enormously promising,’ says the policy officer. ‘Imagine someone using his phone or fingerprint to log into the system, which has all his information on record, and applying for a wheelchair or an allowance just by pressing a single button.’ But there are many things that are still beyond the power of this technology. ‘A lot has to happen before a complex system like this can get off the ground. For example, everyone would first have to be assigned a complete digital identity to which events or accomplishments can be added, like a diploma or a driving licence – maybe even their electronic patient file. Also safeguards, for example concerning privacy. must be put into place.’

To live up to the promises of freedom and autonomy, choices will have to be made, for example about what data we do or do not want to add to the blockchain.

Is it the solution for everything?

The policy officer refers to the core task of the local authority in answering these questions: making Zuidhorn a better place for its people. 'It sounds very pragmatic, but it does inform our reason for digitising and changing.'
Before getting started on blockchain, he says, it's a good idea to assess certain specific matters. Does the change concern public services? Are any external parties involved? Is it about value transfer? Is change necessary? 'In the right set of circumstances, blockchain will certainly be useful. But it's important to remain critical and ask whether you really need technology to make the change. Look at the example of decision-making in the municipal executive council. Sometimes issues go back and forth ten times or more. You can streamline that process without technology as well, simply by eliminating the checks and balances. And that's what we did, by trusting people and giving them responsibility.'

The changing character of local government

In his view, technology will not by any means make the local authority superfluous, but it will change its role. 'Thanks to blockchain, we can cut down on monitoring and inspections. That gives us more breathing space and time to spend on more important public values, for example to address the causes of family debt. Technology makes it possible for us to refocus our work from administrative matters to more qualitative efforts.'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Digitalisation informed by public values

5

'Data is the new oil. We need to find it, extract it, refine it, distribute it, and monetize it.'

David Buckingham

5.1 The challenge of digitalisation

Public wellbeing has improved considerably since the Industrial Revolution – the First Machine Age. Of critical importance in this regard are adequate public services, including clean water, safe food, good transport facilities, sufficient commercial and employment opportunities, adequate housing, access to health and educational services, and police forces to ensure public safety. People expect local authorities to do the best they can when it comes to such public tasks and services. In the current Second Machine Age, digital technologies play a crucial role in developing and improving these efforts. Nowadays, brick-and-mortar offices increasingly function as an auxiliary to the services offered online.

There is a growing awareness that digitalisation is not just a means to streamline operations (Studiegroep Informatiesamenleving en Overheid, 2017). It is not only changing society, it is also changing government. Digitalisation impacts on the quality of many public services and public values, from health to good and affordable transport and a warm home. The VNG's (Association of Netherlands Municipalities) Digital Agenda for 2020 illustrates how digitalisation is generating numerous new policy practices, ranging from basic digital facilities, support for economic activity and a pleasant living environment to improvements in mobility and the use of big data in public spaces. It shows just how important data flows are to local government and the welfare of local communities.

Public innovation specialist Albert Meijer calls this a 'datapolis', a community of citizens who use data collectively to safeguard both individual and collective interests (Meijer, 2015, p. 22). How we shape digitalisation plays an important political role in this context.

This chapter outlines how public values can inform the process of digitalisation. Digitalisation increasingly colours how people perceive government, and, because of the rise of the Internet of Things, it also has a growing influence on the physical environment. After a brief explanation, we describe how digital technology is being used to improve local government services. We review a series of public values in that context, from privacy and autonomy to control over technology and the balance of power (see Table 1, Chapter 2). We show how local authorities can mitigate the downsides of a data-driven economy. We then look at how local government can retain control over technological systems that are crucial to the provision of public services. We do so by discussing the example of digital lighting grids (in which lampposts are fitted with data-generating sensors). We conclude by explaining how politicians and policy makers can allow public values to inform digital innovation.

5.2 Meta-utility

In Chapter 2, we described our living environment as an array of machinery, a set of technological systems and devices that make all sorts of public services and facilities possible. The First Machine Age gave us machines that extended our physical capacities. We are now living in the Second Machine Age, the epoch of devices that extend our capacity to observe, to think, and to control our muscles. The Internet of Things can be regarded as an extension of our nervous system. In other words, it is a type of nervous system: sensors are artificial senses, computers and AI increase our powers of cognition, and actuators make it possible to act remotely. This digital network therefore offers us the opportunity to optimise and control utilities that were first developed in the Industrial Age. The Internet of Things, in fact, a mega-utility, an IT system that impacts all other existing general amenities, tellingly illustrates the importance of digitalisation..

The data-driven economy and society

Much of the machinery of the First Machine Age required oil to operate. Data is the oil of the Second Machine Age. And like 'Big Oil', 'Big Data' must be collected and processed before it becomes useful. Some commentators refer in this connection to the 'data value chain', which consists of three parts: collecting data, analysing data, and intervening in our world on that basis. Numerous digital technologies can be used in this process: sensors for data collection, algorithms for analysis purposes, and robots that perform physical actions. This is how digitalisation gives rise to a data-driven economy and society (Kool et al., 2015).

5.3 Better municipal services

According to big data expert Alex Pentland, data can help us maintain and improve public facilities. He believes that the trick is to upgrade the systems that underpin society – healthcare, education, transport, energy supply, waste processing, food supply, recreation, and so on – by taking advantage of 'digital feedback technologies'. We can make these systems more efficient and effective by creating public data pools that respect personal privacy. Legal standards and financial incentives should encourage owners to share data, while at the same time serving the interests of both individuals and society as a whole (Pentland, 2014, p. 209)

In the city

The public authorities in various local communities work with other actors to collect all kinds of data that will help them to perform public tasks and attain social aims more efficiently (Future City, 2018). One well-known case concerns Stratumseind, an entertainment district in the city of Eindhoven. To improve safety and increase the area's appeal, it has been converted into the living lab 'Stratumseind 2.0' over the past few years, with all sorts of sensors being installed that measure noise levels and track human behaviour. One project is investigating whether street lighting can reduce or prevent undesirable behaviour. In the town of Enschede, commuters can use an app that alerts them to alternative travel routes. The app uses a bonus system to encourage people to travel by bicycle. The app is so successful that it has been

unnecessary to add more roads, saving the local authority a lot of money. And cycling may also help to improve public health.

In the countryside

The P10 (2017), a partnership of large rural districts, also wants to experiment with smart mobility, domotics (home automation) and innovative digital services in a bid to maintain the appeal of living, working and undertaking creative activity in rural areas. The island of Ameland is working on building a green energy system that will make sustainability affordable. Intelligent systems are used to even out fluctuations in supply and demand. The inhabitants of Partij, a small village in the Province of Limburg, used data from Strava, the running app, to tell the local authority about hazardous traffic situations (Future City Foundation, 2018). Improvements were made to the relevant road based on this information. The Town of Zuidhoorn in the Province of Groningen has used blockchain technology to modernise the Child Assistance Package, an allowance for children whose parents earn a minimum wage (see the previous case history, 'Blockchain in the local community').

These activities and initiatives appear to support Pentland's claim that the data-driven society can effectively meet all kinds of individual and collective needs. Reality is at odds with Pentland's technological dream, however, with conflicting interests and clashes between public values and new technology.

5.4 Action and reaction and inequity and inequality

Digitalisation is by no means a friction-free process. It can generate turmoil and social unrest that require a response from politicians and policy makers. In Amsterdam, the widespread use of Airbnb, the digital marketplace for letting and booking private overnight accommodation, resulted in illegal room rentals, inconvenience and nuisance. Increasingly, local residents objected to having noisy, partying tourists in their neighbourhoods. As a result, at the end of 2016 the City of Amsterdam placed an annual sixty-day limit on Airbnb flat rentals. It put further limits on Airbnb rentals in early 2018 by cutting the

maximum rental period to thirty days.[20] Questions have also been raised about Uber, specifically about its drivers' earnings and working conditions, and about compliance and monitoring.[21]

Digital platforms make use of infrastructures that are maintained by public funds, and so do many components of the sharing economy. Initially, sharing flats or cars was regarded as a socially beneficial form of sustainability that was also beneficial for people's wallets. By now, the huge success of Airbnb, Uber and other platforms illustrates that the sharing economy can also lead to rental or employment practices that break the law, evade social insurance contributions and cause unwelcome disruption. These adverse effects end up on the desks of local politicians and policy makers, who are expected to put a stop to the abuses. Are these practices illegal or unfair and, if so, how can they be combated? Politicians and policy makers in Amsterdam and other European cities have slammed on the brakes and introduced rules designed to better manage digital innovations in this domain.

Algorithms under fire

Big data companies regard algorithms as the foundation stones of their business, but they may conflict with the public interests and tasks for which government is responsible. A computational model that streamlines processes for one person may be disadvantageous for another because it curtails his or her autonomy or erodes human dignity. In *Weapons of Math Destruction*, Cathy O'Neil (2016) gives examples of how the use of big data promotes discrimination and social inequality. She contends that 'Models are opinions embedded in mathematics' (2016, p. 21). Predictive models can be powered by incorrect assumptions, or prejudices, leading to adverse consequences. A simple example suffices to prove our point: if employers refuse to hire someone with a criminal past because a model predicts a pattern of recidivism, that person is more likely to commit a crime, confirming and reinforcing the pattern. These are the sort of loops in the data value chain (i.e. collecting and analysing data and taking action based on that information) that can have a major impact on people's lives.

[20] *Volkskrant* 11 January 2018, 'Amsterdam legt Airbnb verder aan banden'.
[21] *Volkskrant* 12 January 2018, 'Uber legde eigen computers lam tijdens invallen inspectie'.

As a result, O'Neil (2016) asserts that algorithms are a danger to society if they are (i) not transparent, (ii) applied on a massive scale, (iii) and have harmful social consequences. Using algorithms in a socially responsible manner would thus involve: (i) making them transparent, (ii) using them on a limited scale at first so that any harmful effects can be eliminated, (iii) and continuing to track their social impact when applying them on a larger scale. These principles underpin the Algorithmic Responsibility Bill passed by New York City Council in December 2017 (Kirchner, 2017). The bill established a task force that monitors the fairness and soundness of algorithms used by city agencies.

5.5 Infrastructures: definitive decisions

One-way or circular

Technological choices can have very far-reaching consequences for society that are difficult to reverse. A case in point is the design of our sewage system during the First Machine Age (Steel, 2009, p. 249-259). In the nineteenth century, London opted to build a new underground pipe system that would transport the surfeit of faecal matter resulting from urbanisation to the sea. Human faeces had previously been collected and used as agricultural manure. The controversy about the new pipe system was settled when a heat wave hit the city in the summer of 1858, causing an immense stench known as the 'Great Stink'. Instead of a closed-loop system, politicians and policy makers opted for a one-way sewer system. Their decision led to a gigantic sewer network that rid Londoners of the stench by sending their dung into the sea. We no longer consider this an efficient solution: our toilets use clean water to flush away useful raw materials. Yesterday's technological solution is today's challenge: how do we move from one-way to more sustainable, circular communities?

In the same way that an historical preference for non-circular sewage systems still defines our approach to excrement, the choices made by today's politicians and policy makers in constructing smart infrastructures and utilities will continue to define the nature and quality of our streets and squares for a very long time to come. In this section we discuss the emergence of smart lighting grids, a billion-dollar market worldwide. Another term for smart lighting is 'connected

lighting', which makes clear that public lampposts are connected to the internet. Smart lighting grids are therefore an example of Internet of Things (IoT). The City of Eindhoven is experimenting with smart lighting in five 'living labs'. The municipal lighting innovation programme will run until 2030. Eindhoven is involving industry, research institutions and the public in the innovation process and wants digitalisation to serve public interests. The question is: how?

More than light

Public lighting has traditionally been the responsibility of local authorities, but intelligent lampposts enable commercial opportunities that have not escaped the notice of industry. Smart lighting grids create a basic infrastructure that supports many other innovations. Sensors can be fitted that will generate money-making data streams. High-mast lighting can be used to project advertisements or as a charging station for electric scooters or cars. Lampposts could also feature in the roll-out of the fifth generation (5G) mobile network, which will require numerous new GSM towers. The 5G network will make all sorts of IoT applications possible, including the robot car. Electricity, sensors and the internet converge in smart street lighting and that is why companies such as Philips, Vodafone, KPN, Siemens, Cisco, IBM and the Bouwfonds (a Rabobank investment company) are interested in this innovation. The modernisation of the municipal lighting grid thus involves economic and societal interests that far exceed the purpose of lighting itself.

The City of Eindhoven saw this development coming to some extent. With a visionary roadmap (Den Ouden & Valkenburg, 2012) as inspiration, it invited tenders for municipal lighting in 2014.[22] The aim was to continue to promote Eindhoven as the 'City of Light' and, by 2030, to develop an integrated 'Smart Lighting Grid' to support existing and new services that will improve the quality of life in the city. Philips Lighting and Heijmans Roads submitted the winning tender. Under the contract that the local authority concluded with the Philips/Heijmans consortium for a 15-year period, there is leeway for new parties that want to use the lighting grid for their own products or services.

[22] *Selectieleidraad Implementatie Visie en Roadmap stedelijke verlichting, Eindhoven 2030*, Gemeente Eindhoven, April 2014

Technological control

One important issue is who controls and exercises authority over the digital lighting grid, including lampposts, sensors, software and data. Who owns what and under which conditions, and who is responsible and liable? Eindhoven retains ownership of the high-mast lighting systems and the land beneath them. Philips/Heijmans manage the smart lighting grid. The data transmitted by smart luminaires is stored on a Philips server. However, the city can access the data at any time and is also authorised to take control of the grid when public interests are at risk. In addition, it has commissioned software and equipment for the grid that keep data transfer as open as possible.

Nevertheless, it remains to be seen how the city will in fact maintain control and continue to exercise authority over the smart grid. The open innovation platform that Eindhoven is developing must be viewed against the backdrop of a shifting global market. Eindhoven may be the birthplace of Philips, but like other large enterprises the company aspires to global market leadership. The political context also plays a role in the development of public amenities. Several decades of austerity have reduced the municipal budget of Eindhoven and other communities year on year. In addition, local governments are unwilling to lag behind economically and want to continue attracting young and creative talent. All this has led to a situation in which they are tempted by enterprises clamouring to manage crucial amenities in a bid to improve their position in the data economy. The opposite side of the coin, in the worst case, are poor, isolated, technology-unaware communities. It will be clear that this in fact implies the privatisation of the electricity grid and all associated data on public spaces.

Coordination by national government

In short, if local authorities want to retain control and exercise authority over new smart electricity grids, they will have to stand together. Since the national public interest is at stake, the national government also has an important role to play in this context. If it fails to do so, it is possible that a few high-tech giants, such as Philips and Google, will eventually also control many of these digital networks. Once they do, the focus will not be on public interests and public values but on economic interests.

5.6 Action informed by public values

This chapter shows that it is prudent to consider the merits of digital innovations on a case-by-case basis. What is the expected impact on society? Which public values are at stake? Digital technologies that can deliver a self-supporting, sustainable energy grid should thus be viewed in a different manner than an automated decision system that has implications for our personal autonomy. Public values must inform such decisions so that we can consider digital innovations in a broader social context and develop them in a socially responsible manner. The key is to strike a sound balance between private and public interests in the Second Machine Age, where data is the new oil and the digital network a meta-utility. This is all the more important given the context of the emerging Internet of Things: digitalisation will increasingly define the nature of the physical environment in public spaces and the extent to which commercial interests prevail there.

Various challenges

The Information Society and Government Study Group (2017) believes that government faces several different challenges. It must do more to organise matters in response to the public's expectations and needs. And it must identify clearly-defined frameworks and long-term objectives for digital society. Government legitimacy depends on the level of citizen's trust in public authorities, how these authorities manage and use information. Another major challenge is the scalability of successful products. Digital technologies are often impeded by the fragmented nature of public administration. The Study Group's final observation is the critical lack of digital knowledge and skills within government. That knowledge is regarded as a core competence for the performance of government's public tasks.

Table 2 Strategies for safeguarding public values in digitalisation processes[23]

Strategy	Real-life examples
Democratic debate and political decision-making	Formulating and legitimising policy objectives
	Enforcing democratic accountability and control
Policy instruments	
Financial policy instruments	Encouraging projects that use data and/or smart technology in various policy domains
	Making money available for projects that have added value for society and bear ethical issues in mind
Legislation	General Data Protection Regulation (GDPR)
	Open data principles in Amsterdam and Eindhoven
Communication and public participation	Provide information on the project and organise public (discussion) meetings
	Digital engagement (see Chapter 3)
Technological and organisational safeguards	Hiring specialists
	Privacy by design, privacy impact assessment (PIA), algorithmic impact assessment (AIA)
	Learning by experimenting

Source: Rathenau Instituut website long read: How are municipal governments protecting public values in the smart city?

In the light of our findings and the challenges described above, we outline an mode of action for politicians and policy makers that will allow them to address these challenges responsibly and effectively (see Table 2). Our proposal is based on a system of multi-level governance in which local, national and international policies (e.g. the General Data Protection Regulation) are mutually complementary and mutually reinforcing where possible. It is based on three foundations:

1. democratic debate and political decision-making
2. policy instruments
3. technological and organisational safeguards.

[23] https://www.rathenau.nl/en/digital-society/how-are-municipal-governments-protecting-public-values-smart-city.

Democratic debate and political decision-making

The municipal strategies that underpin data and smart technology projects have, theoretically, taken shape through a process of democratic debate and political decision-making. The executive councillors involved use democratic means to identify and account for the objectives that legitimise innovative projects. They also define and account for the strategies required to deal with the associated social and ethical issues. Such debate and the system of checks and balances in municipal decision-making are, in principle, meant to safeguard public interests. It is also at this level that overall reflection is needed on the relationship between the different domains of digitalisation. Innovations that have a bearing on mobility, sustainability or the design of public spaces are intertwined. Their cumulative impact and wider influence require a broader discussion (see also Case history 1 'Technology for an inclusive society').

Policy instruments

Strategies meant to safeguard public interests involve creating the right conditions to apply data and smart technology in municipal projects. Local authorities can, for example, create these conditions by issuing regulations, through their financial policy, and by communicating with or fostering the participation of city dwellers. Municipal governments can draft their own bylaws, policy rules and guidelines. They can also use their funding policy and purchasing terms and conditions to influence the accessibility of data generated partly with public funds, for example in the case of smart lighting grids –the open data principles adopted by Amsterdam and Eindhoven can serve as a guideline. They can further explain the projects, the goals and the means (technology, data, algorithms) to local residents. In doing so, they must be careful not to use veiled language, and they must be open about the various interests at stake and welcome discussion of the possible impact of a particular innovation. Even better is to actively involve local residents in projects, for example by organising participatory design sessions or by setting up panels to identify specific needs and wishes with regard to new technologies.

Technological and organisational safeguards

To safeguard public values, local authorities can also use organisational and technological instruments. A number of such instruments have been made mandatory by the European Union's General Data Protection Regulation (GDPR). According to the GDPR, the public authorities of larger communities are expected to hire specific staff, such as data protection officers, to monitor data system security and the protection of privacy. Focusing on privacy by design and providing practical tools to innovators (see the next case history, 'Rules for sensors in public spaces') makes it possible to safeguard the public values on which these legal frameworks are based. The 'privacy by design' principle involves designing IT systems in a privacy-friendly way. Our final recommendation concerns workflow management software. This software helps to document all the options and limitations of data collection, analysis and use, thereby improving transparency and accounting for how the municipal government deals with data.

'Learning by doing' is an organisational strategy. Many digitalisation projects are designed as experiments. Interim monitoring and evaluation of such experiments make it possible to assess the extent to which autonomy, trust, responsibility and other data-related issues are properly covered. A privacy impact assessment (PIA), as defined in the GDPR, can be an instructive tool in that context.

What do we want? The bigger picture

Local authorities can use these three strategies to guide innovation and 'bring technology home'. They must, however, always consider the bigger picture of society and that means examining the advisability of data-driven and smart technological systems in Dutch communities: what implications does smart technology have for how we co-exist physically, culturally and socially? In an international context, the question is to what extent Europe will follow its own digitalisation pathway, based on important values such as inclusiveness and sustainability. In the end, the political question goes far beyond mere decisions about technology and the necessary safeguards.


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Case history 4

Rules for sensors in public spaces

How can local authorities gain control of sensors in public spaces and the vast quantities of data that they collect? That's the question Geonovum is working on. The organisation drew up a set of rules in late 2017. Marc de Vries, who helped draft the guidance, explains how local authorities can use these rules and why they should.

It seems quite handy: a street light that switches on when someone walks past at night. But what if it's a street light, microphone, movement sensor and security camera all rolled into one? Where is this data stored? And who's allowed to use it?

Rules for sensors

Sensors collect information about the world around us. Their data-acquisition capacity is increasing: they can track locations, take the temperature, record sound, and recognise objects and people. But collecting, storing, sharing and combining all this data may have numerous consequences, both collective and individual. 'If you can track a person to a specific location in The Hague precisely when a radical organisation was demonstrating there, you suddenly know a lot about that person,' explains Marc de Vries of Geonovum. Geonovum makes public-sector geo-information accessible and helps government use this data.

'Local authorities have rules for billposting, fighting dog breeds and prostitution but not for sensors and the data they collect,' he says. That is why he wrote a guidance setting out rules for data acquisition in public spaces (Dutch title: *Handreiking Spelregels Data Ingewonnen in de Openbare Ruimte*).

He calls it an opening gambit to trigger public authorities thinking about their local situation and how they can gain (or regain) control over the data collected by themselves, industry and ordinary people in public places.

The guidance offers various tools for professionals who are involved in drafting or implementing policy on data collected in public spaces by third parties or by the local authority itself. One tool offers a template for the data management paragraphs that are inserted into terms and conditions of purchase and grant bylaws. Another consists of a checklist for promoting data interests when entering into alliances.

Role of the municipal authority

Municipal authorities have traditionally been responsible for managing public spaces in their community. The arrival of sensors may burden them with additional responsibilities, for example protecting the privacy of local residents and ensuring fair treatment and a level playing field for businesses. The rules referred to above can help. 'Local government manages about 95% of our public spaces,' says De Vries. 'That means that it also manages the cables, walls and other infrastructures that sensors need to operate. Local politicians and policy makers can use their position of authority to claim ownership of data that is acquired in those public spaces.

'Twenty years ago, the authorities had what amounted to a monopoly on data collection, for example for mapmaking purposes. Now commercial parties have got involved. Google Maps, for example, combines data from different sources to generate up-to-date, dynamic maps,' de Vries explains. Instead of producing data, he thinks local authorities should be focusing more on managing and monitoring it.

Local enforcement

De Vries believes that asserting control over such data will allow local government to take up other tasks too, for example the enforcement of privacy laws. 'That's currently the responsibility of the Dutch Personal Data Protection Authority, but they've got their hands full. Local government could play a role in enforcement, for example by issuing a municipal sensor bylaw, similar to a General Local Ordinance. The same goes for other data domains.

By applying certain rules, local government may be able to shoulder some of the tasks at local level that now rest with the national competition authority.'

Further reading

The rules (in Dutch) can be found at meteninhetopenbaar.locatielab.nl


Mobile
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Taking action

6

'Technology represents the how of change, but humans represent the why.'

Futurist Gerd Leonhard (2016)

6.1 Transforming digitalisation in the public's interest

This essay has looked at digitalisation in various ways from the perspective of local politicians and policy makers. Chapter 2, 'From technological dreams to societal action', described how public values should inform technical innovation and the crucial role that local politicians and policy makers play in that context. Chapter 3, 'Digital engagement', described the extent to which digital technology can enhance local democracy. Chapter 4, 'Innovating for societal aims', showed how local authorities are increasingly presenting themselves as platforms for innovation. We described how they can promote economic innovation by experimenting with solutions that address the grand societal problems. In Chapter 5, 'Digitalisation informed by public values', we showed how municipalities can mitigate the adverse effects of digitalisation and use digital technology to improve municipal services.

Based on the findings of this essay, we have identified five crucial processes in the innovative technology game – assessing public values, experimenting, seizing opportunities, mitigating risks, and working and learning together – and related them to ten perspectives, or sightlines, that can guide the actions of local politicians and policy makers.

Local politicians and policy makers are the true innovators

The need to take action is driven by the recognition that digitalisation is changing our world (and how we experience it) beyond recognition. The way in which we are using digital technology is reshaping the economy, the government, how people work and their social lives, the physical world that we inhabit – in short, the society of the future. These enormous changes are having a huge impact on our society; they are difficult to predict and equally difficult to control. In that sense, digitalisation is leading us into an 'unknown society' (see Van Gunsteren, 1994), a complex world subject to constant and unexpected changes resulting from the rise and deployment of digital tools.

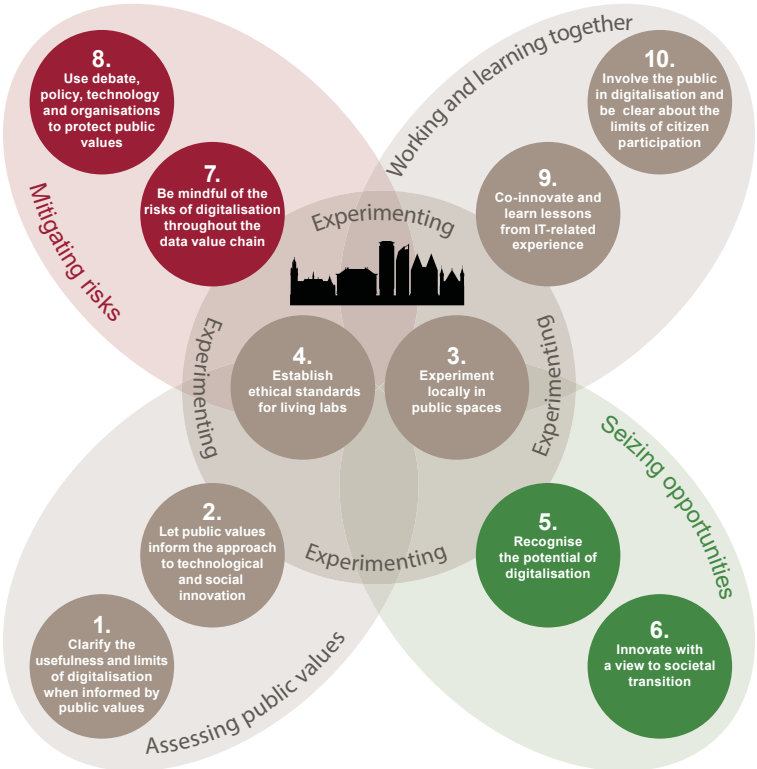
Politicians and policy makers can neither slow the pace of digitalisation nor ignore it, given its enormous impact. Randomly encouraging digitalisation is also ill-advised, however. Since government is there to serve the general interest, it must let public aims inform the way in which it shapes and transforms digitalisation. The power of transformation manifests itself in the ability to harness local objectives and public values to channel the energy and vitality of innovation. That is why in Chapter 2, we described local politicians and policy makers as the true innovators.

6.2 Mode of action for valuable innovation

Value-driven innovation depends on constructive interaction between technical and social innovation. The following five processes play a role: assessing public values, experimenting, seizing opportunities, mitigating risks, and working and learning together (see Figure 3).

'Assessing public values' involves clarifying our public values and aims. What sort of community do we want to be? How do we see the future? 'Experimenting' means making it possible to try new things in the community; innovation involves learning from earlier mistakes. Failure is just as essential to innovation as success, in other words. 'Seizing opportunities' means keeping an eye out for new uses for digital technology. It is incumbent on government to help society derive as many benefits as possible from digitalisation. 'Mitigating risks' means protecting the public as much as possible from the risks associated with digitalisation. We all share in the challenge of guiding digitalisation in the right direction.

Figure 3



It will require coordination and cooperation between different tiers of government and between government and knowledge institutions, industry and, last but not least, the public. 'Working and learning together' is therefore the fifth process and addresses how and why we can learn from digitalisation by debating and putting it into practice. Because digitalisation offers us the technological tools to shape our future, it is vital to give the public a voice in the democratic debate about our digital society going forward (see Van Est, 2016).

In the following, we elaborate on the five main innovation processes – assessing public values, experimenting, seizing opportunities, mitigating risks and working and learning together – by pointing out two 'sightlines' for each process.

6.2.1 Assessing public values

1 Clarify the usefulness and limits of digitalisation in promoting and protecting public values

Digitalisation can be used to improve public services, increase citizen participation and stimulate economic innovation and knowledge-building. These aims represent a wide range of different public values, including efficiency, sustainability and economic activity. Digitalisation can therefore serve certain public values. At the same time, it can also put pressure on such public values as privacy, autonomy, and equity and equality. Local politicians and policy makers must clarify why digitalisation is desirable – in other words, which public values it supports – and what limits or conditions must be imposed on it.

2 Let public values inform the approach to technological and social innovation

Innovation requires both technological and social innovation. It is only through social innovation – in legislation, institutions, social behaviour and the way in which we view the world – that technology can be of added value to society. Local politicians and policy makers are therefore expected to be welcome the good things that technology can bring, but to remain alert to its risks as well. They must be aware of both the winners and the losers. A naïve optimism about technology has regularly caused advocates to be blind to its consequences. Whereas technology is often quickly hailed as the next best thing, criticism is rarely welcomed with open arms. To reap the benefits of technology, however, both are required. Local politicians and policy makers play a crucial double role in innovation by letting public values inform the support and guidance that they provide. This makes it possible to seize social and economic opportunities and prevent or mitigate adverse effects.

6.2.2 Experimenting

3 Experiment locally in public spaces

The municipal tier of government plays an important role when it comes to experimenting with solutions to societal problems. That is because problems are felt most keenly there, solutions must work at local level, and because municipalities, along with local industry and community initiatives, offer an appropriate arena in which to work on solutions.

There are different types of experiments. Until recently, innovation policy was aimed primarily at boosting the technology pipeline and improving the innovation ecosystem. One promising type of experiment conducive to innovating in response to societal challenges is the 'living lab'. Starting with a specific, local or regional problem makes it possible to devise and test new problem analyses and solutions. In a living lab, researchers, entrepreneurs, professionals, users, policymakers and/or the general public experiment and co-create solutions to difficult societal problems in a real-life experimental environment.

4 Establish ethical standards for living labs

Experiments that are carried out in old-fashioned laboratories take place in the confined space of a building. In the living lab, however, they are conducted in public spaces. This means that people are part of the experiment, whether consciously or not. Experiments must not lead to exclusion, remove protections, or expose participants to risk. It is therefore important to establish ethical rules for responsible experimentation in living labs. One example would be for the VNG (Association of Netherlands Municipalities) to set up an ethical review committee for research conducted in public spaces.

6.2.3 Seizing opportunities

5 Recognise the potential of digitalisation

From biometrics, robots, artificial intelligence and persuasive technology to big data, algorithms and digital platforms, digital technologies have given us countless new technological tools. These intelligent devices can be used to improve our capacity to think and to observe and act remotely. Because they are often connected to the internet, they have given rise to the 'Internet of Things', a worldwide network that is also known as the 'Internet of Robotic Things' (IoT), with robots being all-round smart devices that can sense, think and act. To seize the opportunities that digitalisation offers local government, it is important for local politicians and policy makers to recognise the potential of technology.

6 Innovate with a view to societal transition

Digitalisation gives us new technologies to address today's societal challenges. Local experiments in living labs are needed to collaborate with users on developing innovative solutions that work in everyday life and in the short term. However, such experiments can also help to identify the innovation pathways most likely to lead to the large-scale, long-term societal transitions needed to address societal challenges that transcend municipal boundaries, such as climate change and organised crime, and their corrosive impact on society. For this to happen, local authorities need to join up their local experiments both temporally (so that they can build on shared knowledge) and spatially (because local experiments may produce findings of broader applicability). In this way, municipal government can drive local innovation but also furnish the building blocks for robust pathways to address today's grand societal challenges.

6.2.4 Mitigating risks

7 Be mindful of the risks of digitalisation throughout the data value chain

Data value chains are the fundamental building blocks of the data economy and data society. The data value chain consists of three parts: collecting data, analysing data and intervening in our world on that basis (increasingly in real time). In terms of human lives, that means: quantifying people (for example using sensors), profiling people (for example with AI) and intervening in their lives (for example by 'nudging' them). As a result, digitalisation not only affects privacy and security, but also other public values and fundamental rights, such as equity and equality, human dignity, autonomy and, last but not least, control and power over technology.

8 Use debate, policy, technology and organisations to protect public values

A healthy data economy and an inclusive data society require transparent and honest data management. Besides data collection, the analysis and use of data must also be done fair and transparent.

Three traditional processes play a role in the protection of public values. The first is democratic debate and political decision-making on numerous digital issues. Municipal councils play an important role in this context, but so does the public (see also sightline 10). Innovation can be fostered and regulated through various policy instruments: by laying down rules, pursuing a certain financial policy, and communicating and participating with the public. Digitalisation also requires the application of numerous technological and organisational instruments. Some of these are required by legislation, such as the privacy impact assessment (PIA) imposed by the EU's General Data Protection Regulation. The proliferation of algorithms in public-sector decision-making will probably fuel the demand for an algorithmic impact assessment (AIA), meant to assess transparency about data quality, whether decisions based on algorithms are explicable, and how effective algorithms are.

6.2.5 Working and learning together

9 Co-innovate and learn lessons from IT-related experience

Many different municipalities are experimenting with digitalisation. Local government should have an overview of the various experiments taking place in its municipality. It is through the sum total of these experiments or living labs that the municipality is working on its future and revealing how it envisages that future. The different experiments can also learn from one another. We therefore advise municipalities to coordinate such experiments. Supralocal coordination is crucial when the experiments have a bearing on national or international concerns. In those instances, coordination and cross-project learning (at regional, national or European level) are important. The City Deals have a role to play at national level. Recall that digitalisation is not really that new. The Dutch government has already undertaken many different IT projects and acquired the necessary experience (as demonstrated by the Parliamentary enquiry into government IT projects). History has shown the importance of standardisation and the need for government expertise in IT matters. In infrastructure matters, for example the development of 'smart' street lighting, the national government should take the lead.

10 Involve the public in digitalisation and be clear about the limits of citizen participation

Since digitalisation is such an important factor in shaping the future, the public should be involved in its development. It is important to get people involved in actual projects but also in the wider debate about our digital future. Government can engage the public in traditional ways but can also do so through digital channels. It is the responsibility of public authorities to listen seriously to the views of society and to respond to those views. Government must be clear about the limits to citizen participation in the decision-making process.

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