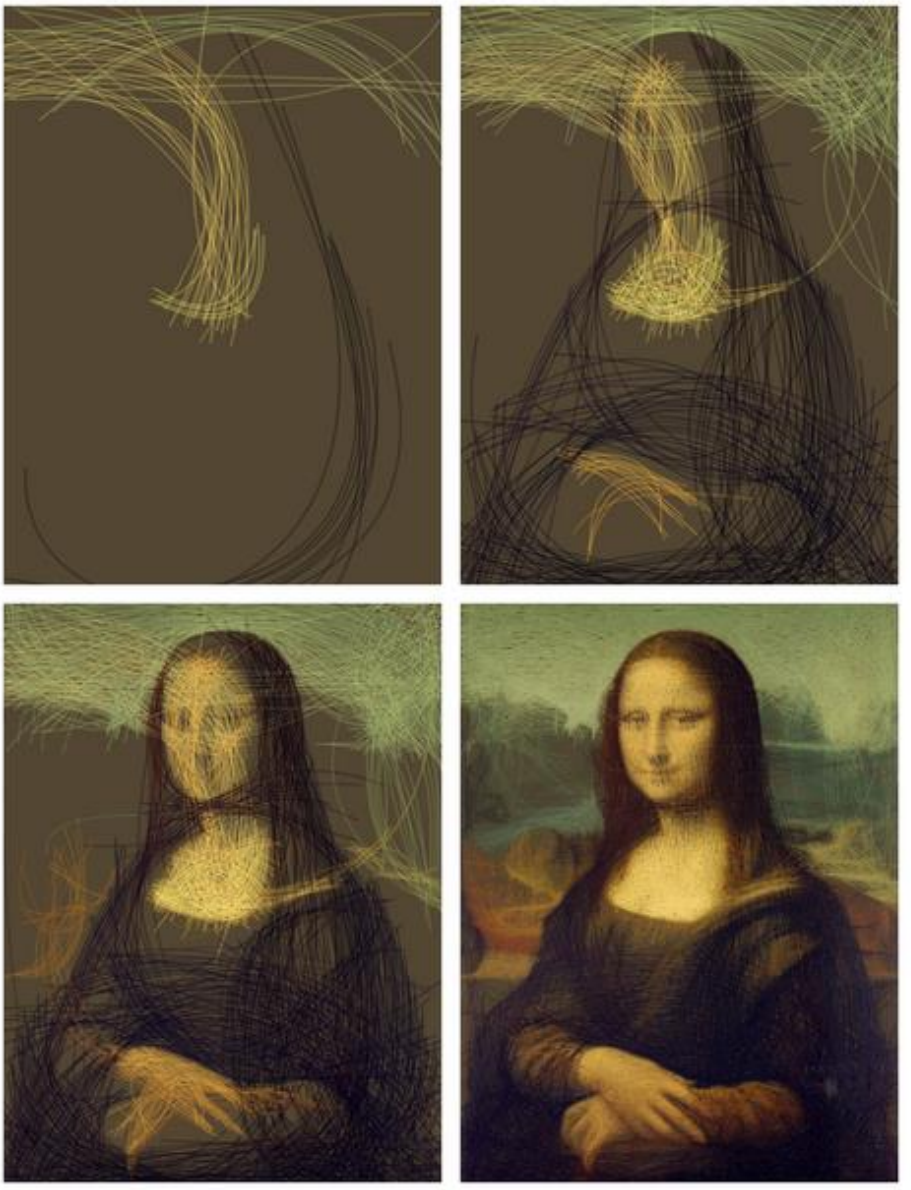


THIS TIME IT'S PERSONAL

The Digital Shift in the Public Sector

Teknologirådet

THIS TIME IT'S PERSONAL: THE DIGITAL SHIFT IN THE PUBLIC SECTOR

ISBN 978-82-92447-84-0 (print edition)
ISBN 978-82-92447-85-7 (electronic edition)

Published: Oslo, May 2017
Printer: Litografia
Illustrations on pages 6, 11, 22, 33 and 43: Anders Hoff, Inconvergent.net
Cover page: The Norwegian Board of Technology with the Primitive programme (Copyright (C) 2016 Michael Fogleman)
Published electronically on: www.teknologiradet.no

FOREWORD

Transformation is high on the political agenda, and the public sector is not exempt from this. In the next few years, the ageing population will seriously begin to hit home, with more people chronically ill and relatively fewer in work. At the same time, contributions from oil and gas to the treasury will decline. It is therefore necessary to consider how we can do things in new ways in order to maintain a sustainable welfare state.

New technology, and especially digital technology, is changing some important assumptions regarding what we can do and how we are organised. Smartphones and tablets lower the threshold for what we are able to contribute ourselves, while the amount of data enables personalisation and predictive services. The digital shift in the public sector described in this report is not theoretical or pulled out of thin air – we have used examples from areas where the shift is already under way.

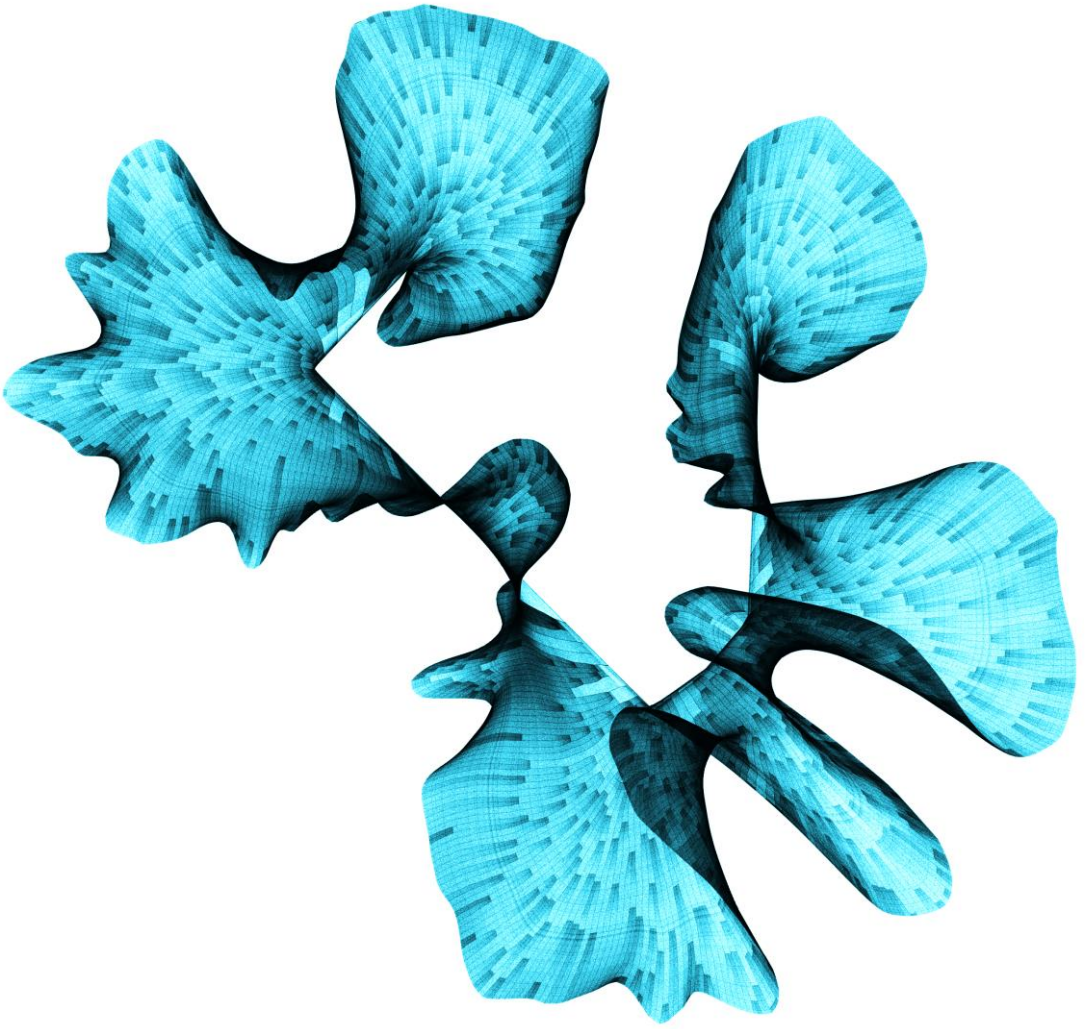
The new opportunities must be weighed against our wishes regarding how the welfare state should develop in the future. The Norwegian welfare state is a well-functioning system and enjoys a high level of trust among the general population. This means that there is long way to fall when we stand at a digital crossroads. Could it be *too* personal?

A big thank you to Siri Hatlen, Cathrine Holst and Christine Tørklep, all members of the Norwegian Board of Technology, for their comments and input along the way, and to all those we have had discussions with, both in Norway and abroad. Marianne Barland and Robindra Prabhu have acted as project leaders.

The Norwegian Board of Technology provides independent advice to the Norwegian Parliament and Government on new technology, and contributes to an open, public debate. We hope this report will contribute to an ambitious discussion of the opportunities and challenges that digitalisation presents to the public sector.

Tore Tennøe
Director, the Norwegian Board of Technology

CONTENTS



Differential Line c665ed0 (2016), Anders Hoff, inconvergent.net

THE NEED FOR CHANGE

Three trends are central to the digital shift in the commercial sector: personalisation, sharing and participation, and prediction. In this report, the Norwegian Board of Technology explores the potential of these trends for the public sector and assesses the challenges that may arise.

A number of developments are putting the public sector under pressure. Declining revenue from the petroleum sector challenges both employment and Norway's economy. An ageing population leads to fewer individuals of working age, which puts pressure on labour-intensive professions, for example within the health sector. In addition, increased welfare levels and continuous digitalisation in the private sector are also changing the expectations citizens have for public services.

The gap between the expected demand for services and the ability to pay for and deliver the services will continue to widen. According to the Productivity Commission's calculations, the household tax burden would need to increase from today's level of 37 per cent to around 65 per cent in 2060 in order to maintain today's level and organisation of welfare services in Norway.[1] The White Paper states that public spending will increase faster than government revenue from 2030, even with a limited expansion of current welfare schemes.[2] A readjustment will therefore be necessary in order for the Norwegian public sector to be

[1] Aftenposten (2016)
[2] White paper 29 (2016-2017)

able, in the future, to continue to resolve its welfare tasks and deliver quality services to the population.

THE DIGITAL SHIFT IN THE PUBLIC SECTOR

Norway ranks high in international rankings of ICT development[3], and is ranked as a technologically mature country in assessments made by the European Commission.[4] Despite this, the Productivity Commission's first report pointed out that there is significant potential for increasing efficiency through the adoption of available technology.[5]

Our neighbours, Sweden[6] and Denmark[7], are currently implementing measures to reorganise and streamline their public sectors. Great Britain[8], Australia[9] and Singapore[10] also have ambitious plans for the future.

Digitalisation of the public sector is the main priority for ICT policy, which, among other things, is evident through the "digital first choice".[11] Citizens have first and foremost seen this through a simplified, web-based contact with public administration, especially in the way that various notification and application forms can be filled out and filed online. The tax return is a good example, and the ambition with the digital first choice is that this trend should increase.[12]

One of the goals for the next few years is the development of common solutions for both state and local authority. This will help to place the needs of the users at the centre, regardless of which public body is responsible for providing the service.[13]

[3] EU's Digital Economy and Society Index and EU's Digital Agenda Scoreboard
[4] EU eGovernment Benchmark
[5] Green Paper 2015:1 Chapter 15 . 55, p. 300
[6] The Norwegian Cabinet Office (2015)
[7] The Norwegian Digitization Agency (2013)
[8] Cabinet Office (2011)
[9] Australian Govt, Dept. of Finance (2012) and (2015)
[10] Singapore Government, Infocomm Development Authority of Singapore
[11] White paper 27 (2015-2016)
[12] Norwegian Agency for Public Management and eGovernment (2014)
[13] White paper 27 (2015-2016)

Technology can simplify and streamline existing processes, but the most significant changes often come when technology is used to solve old tasks in completely new ways. This report explores these opportunities, and also discusses how they challenge the current organisation of the public sector.

TECHNOLOGICAL DRIVERS

Over the last decade, we have witnessed the fact that ICT and data analysis have fundamentally changed many data intensive businesses. Online banking has replaced the bank branch, physical travel agencies have disappeared and turned into self-service websites, and stockbrokers have been replaced by algorithmic systems. There are good reasons to assume that this process will increase in scope and strength in the years to come:

- **Technology is with us all the time.** Through the internet, smartphones and the Internet of Things, the population is more closely intertwined digitally, while the boundaries between the digital and physical world are being eliminated. We are online all the time and communicate with each other in new ways through the exchange of different types of data.
- **Data provides more in-depth knowledge of the user.** Increasing amounts of data are produced every day, both by citizens and by public and private enterprises. Data can be used to better understand the enterprise as well as the behaviour of the user, thereby allowing more personalised services to be provided.
- Artificial intelligence and learning machines: Computer systems get more powerful with less expensive computing power and storage capabilities. Additionally, access to to digital data sets opens the door to the computer systems developing learning capabilities. Computers are getting better at managing new types of data and solving increasingly complex tasks, such as understanding natural language.

This development has already affected the development of services in the private sector. The internet economy is largely data driven, and some of the world's fastest growing companies, such as Uber and Airbnb, are challenging established business models by directly coordinating supply and demand between

individuals. This interactivity reduces the need for traditional institutions as intermediaries. These coinciding technology trends also have the potential to change the design and execution of public services.

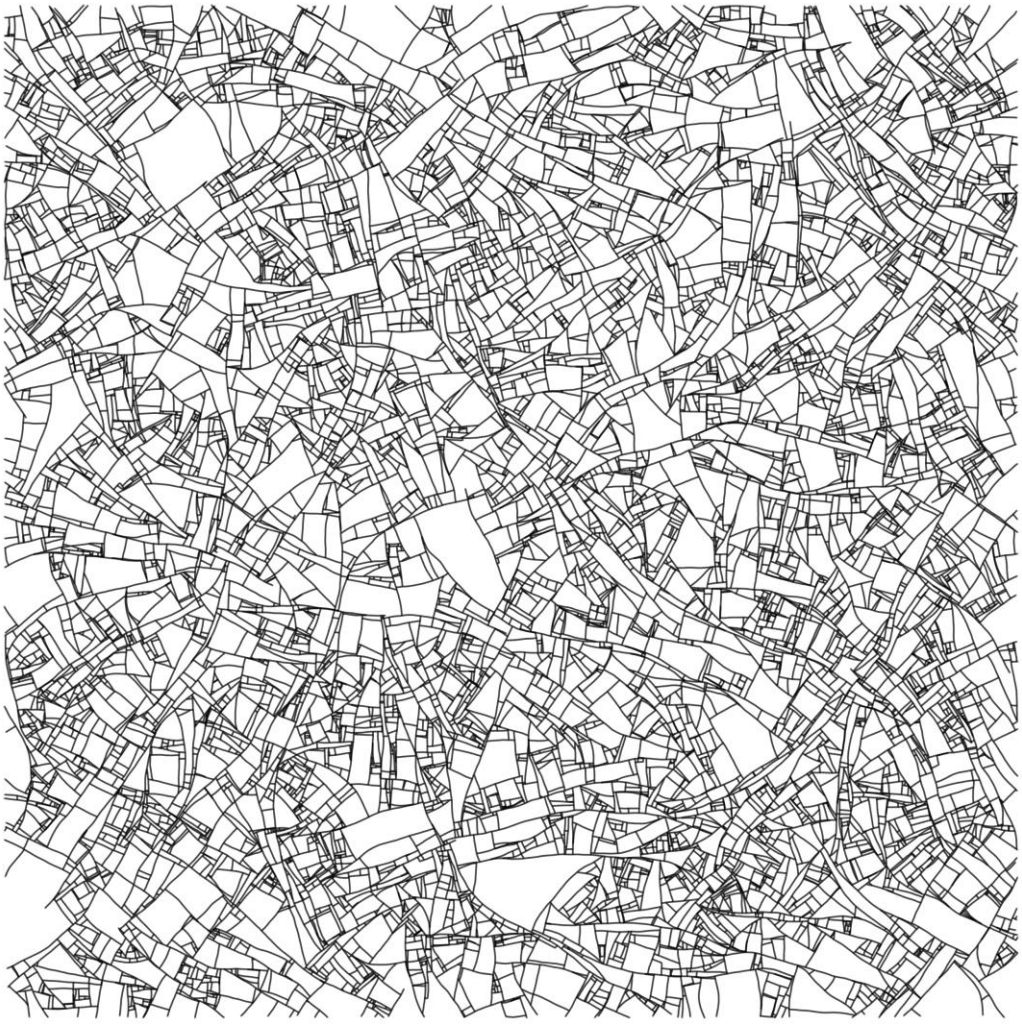
THREE POSSIBLE CHANGES IN PUBLIC SERVICES

In this report, we outline how technological development can help change public services in three fundamental ways:

- **Participating citizens:** Interactive technologies such as the smartphone and the Internet of Things not only enable citizens to use public services, but also allow them to become active participants in their design and delivery. For example, individuals with chronic illnesses can take measurements themselves, and thus get a better service while relieving the burden on health services.
- **Personalised services:** New public data provide more in-depth knowledge of each citizen, opening the way for public service delivery tailored to the specific needs of the individual citizen. For example, smart teaching materials in schools can provide each pupil with customised teaching and closer monitoring.
- **Predictive institutions:** More extensive use of data analysis in public institutions turns public services towards prevention, and away from reaction and remedial action. For example, the Norwegian Tax Administration can carry out targeted checks by using predictive models that identify tax issues with high probability of errors.

Digitalisation and data-driven services also raise some important questions: If citizens are to provide the services themselves, will they be willing to pay as much tax? Are algorithms used to offer support and possible choices, or do they help stigmatise individuals or groups within society? What can we leave to the judgement of machines?

We will discuss the challenges for the digital shift in the public sector at the end of each chapter.



Fractures b3902a0 (2016), Anders Hoff, inconvergent.net

PARTICIPATING CITIZENS

Citizens can use the internet and smartphones to provide part of the service themselves.

TECHNOLOGY IS DEMOCRATISED

89 per cent of Norway's population has a smartphone.[14] This means that most people carry a powerful computer that is connected to the net and which has sensors such as a camera, GPS and a motion sensor. The major mobile operators' platforms, such as App Store and Google Play, have made it possible for almost anyone to develop apps and services that can make use of smartphone technology.

This development contributes to the technology becoming increasingly cheaper and smaller. Together with the use of cloud services, this has resulted in most people now having access to technology and data that were previously only available to professionals. This provides great opportunities for reorganising the way in which public services are performed.

[14] MedieNorge (the figure applies to people aged from 9 to 79 years old)

EVERYONE CAN WORK FOR THE PUBLIC

The economist William J. Baumol describes how rapid productivity growth has led to a division of the economy into progressive and stagnant sectors.[15] In stagnating sectors, costs rise quickly because quality largely depends on a human factor that is not easily replaced by machines. A number of the welfare state's most important services such as education, health and social care and policing are suffering from this so-called cost burden.

Baumol's central argument is that productivity growth in progressive sectors such as industry and transport makes it possible for society to finance stagnant sectors. But he also points to another important development to reduce the gap – namely, to transfer some of the work from the provider to the user. For certain services, this could also provide an improved service for the citizen, as things will happen quicker and easier.

A good example of this type of task transfer is provided by IKEA, where the customers themselves find the goods in the warehouse, bring them to the till, carry the flatpacks home and, finally, assemble the furniture. Prices are kept low because customers do part of the job themselves. Internet banking is another example of introducing a service that involves task transfer. Instead of spending time physically travelling to an office where the bank clerk performs tasks, the internet and new technology have enabled customers to do most of the tasks from home themselves.

Public services can be considered as a transaction in which the citizen receives services in return for taxes and fees. In this model, the citizen is a more or less passive recipient of fully developed services that are performed and provided by public service institutions.

Digital technology now enables another approach to be taken, namely that the citizen becomes an active participant in both the design and execution of the public services that she uses. The spread of the Internet and PCs enabled the online encyclopaedia Wikipedia to erase the distinction between contributor and consumer. Similarly, the spread of smartphones, tablets and other digital tools enables citizens to become co-producers of public services.

---

[15] Baumol, W. (2012)

HEALTH: MOBILE HEALTH TECHNOLOGY

Norway has a population where more people are living longer and many live with chronic diseases. By the year 2060, if we keep today's organisation, we will need to almost double the number of full-time equivalents in health and social care.[16] This makes it necessary to rethink the organisation of health services in Norway, and how the resources in the health sector can be best utilised.

In parallel with the development of the smartphone, a wide range of sensors and instruments are being developed that measure parameters such as blood pressure, blood sugar or ECG. Such equipment has become far less expensive, more accessible and easier to use than before.

Mobile health solutions provide the opportunity to transfer certain types of tasks to citizens. First, self-testing can replace routine measurements which are currently taken at a GP's surgery.[17] Self-testing is not new; diabetics provide an example of a patient group who have been doing this for many years. But with new technology, self-testing can be performed by many more individuals and for a number of different types of conditions such as heart disease and chronic obstructive pulmonary disease (COPD).[18]

Individuals with chronic illnesses who perform self-testing following agreement with their doctor can be monitored by a network of healthcare professionals as part of the overall treatment plan. This will strengthen the ability to cope with disease and the perception of safety in everyday life, as well as reduce waiting and travel time. Healthcare professionals can follow up on the patient by giving motivational reports, or arrange a consultation in event of a negative development. Depending on the situation, the consultation would take place by telephone, chat, video link or physical attendance.

Secondly, diagnostic self-testing can save citizens' time and relieve the health service by reducing unnecessary enquiries. A digital first-line in the health care

[16] Holmøy, E. and Kjelvik J. (2013)
[17] Norwegian Board of Technology (2016)
[18]Norwegian Board of Technology (2015) and https://teknologiradet.no/velferd-skole-og-helse/20-mobile-helselosninger-du-kan-ta-i-bruk-na/

sector will mean that citizens initially use an app that receives self-tested data and provides recommendations for follow-up.

One example is the Babylon Health mobile app, which has 250,000 users in Great Britain and Ireland.[19] The app asks questions about symptoms and the user's self-tested health information. If it detects a risk of disease, the user is offered a digital consultation with a doctor, and possibly more home tests, in order to arrive at the final diagnosis.[20] The app is also now being tested at two GP's surgeries outside London.

In other words, mobile health technology can streamline the organisation of health and social care services in the following ways:[21]

- **Users relieve the pressure on public services.** According to the Norwegian Prescription Database, approximately 1 million Norwegians were treated for cardiovascular disease in Norway in 2016, and these individuals usually meet their doctor 3–4 times a year for checks on blood pressure, weight and heart rate. Self-testing performed by the patient can in itself provide major savings for the health service, simply by the fact that the number of GP visits is greatly reduced. Reduced travel and waiting time and an increased feeling of coping can also give the patients a better quality of life.

- **Fewer and shorter admissions.** Frequent measurements made over a period of time and in a home environment provide a more complete picture of health status than one-off measurements taken at the GP's surgery. Patient groups who take measurements themselves experience both fewer admissions to hospital and shorter stays when an admission is first required.[22]

- **Task transfer within health and social care services.** Follow-up of ongoing self-testing can be performed by persons other than the patient's

[19] http://www.babylonhealth.com/
[20] Forbes (2015)
[21] For further reasoning why mobile technology is the most promising platform for innovation within health services, see Jonathan Skinner, *The Costly Paradox of Health-Care Technology*, MIT Technology Review, September 2013
[22] Martin-Lesende, I. (2013)

GP, thereby freeing GP resources for other tasks. Employees at pharmacies, hospitals, GP surgeries and in local authority nursing and social care services will have important roles to play. This type of task transfer is also in line with the “Samhandlingreformen’s”[23] ambition to move the services closer to where people live.

[23] The aim of the "Samhandlingreform" is to increase efficiency within health- and social care-services by reducing the use of resources on “passive” patients waiting for treatment or rehabilitation, and to be more proactive in the prevention of illness, curbing the increase in lifestyle diseases and promoting general public health.

Focus on welfare
Four demographically different districts in the municipality of Oslo (St. Hanshaugen, Gamle Oslo, Grünerløkka and Sagene) are participating in the "Focus on Welfare" project, funded by the National Program for the Development and Implementation of Welfare Technology in Social Care Services. The health and social care services in the four districts changed procedures and work habits from 2014 in order to help users better cope with their own lives and to free up caregivers from routine tasks.

Welfare technology such as self-testing of pulmonary function in the home, automatic pill dispensers that remind patients to take medication and security alarms is central to the project.

An evaluation of the project shows a 34% reduction in the number of visits from home services and a 59% reduction in time spent with each user.[24] In the specialist service, the number of admissions has been reduced by 19% and the number of bed-days has been reduced by 33%. Interviews with users and relatives show increased security and a better feeling of being able to cope. At the same time, the technology must be maintained and adjusted to the user's
changing needs, and integrated into a comprehensive health and social care service, in order to achieve the desired effect.

According to the district of St. Hanshaugen, 50 automatic pill dispensers, 150 e-locks and 20 spirometers replace approximately 180 hours of home services a week, which represents an annual saving of NOK 5.6 million.[25]

EMERGENCY SERVICES: NEW INTERACTION WITH THE GENERAL PUBLIC

Citizens are often the first at the scene of an accident or a criminal act. Using their smartphones, people can contribute with text, images, video and audio recordings with precise time and location. Such information can be crucial, especially in the time before the emergency services arrive. Via, for example, a video stream from the incident site, emergency services can obtain an understanding of the situation on the ground that was unthinkable just a few years ago.[26]

[24] Intro International and the Oslo School of Architecture and Design (2016)
[25] Aftenposten (2016)
[26] The Norwegian Board of Technology (2014)

The 110 and 113 emergency response centres in the county of Sør-Trøndelag are using an app that makes it easier for people to contact medical emergency phone lines. This app makes it easier, for example, for an ambulance or the fire service to locate a traffic accident without a precise address.[27] SmartHelp has been developed in collaboration with St. Olavs Hospital in Trondheim, and allows the public to provide emergency services with important additional information:

- The GPS on the phone allows the 113 operator to immediately locate the user's precise position on his map.
- The situation is explained either by speaking or using simple symbols.
- During the call, the user can automatically send important information about him or herself, such as name, allergies and medical conditions.

Facebook's "Safety Check" is another example of how the smartphone can be used in crisis and emergency situations. One of the authorities' many tasks in an emergency is to get an overview of the people who are missing or injured. "Safety Check" allows people to let their family and friends know that they are uninjured and safe, thereby relieving the authorities of this task.[28]

[27] https://www.smarthelp.no/ Also see http://teknologiradet.no/sikkerhet-og-personvern/apenhet-og-sikkerhet/en-nod-app-som-kan-redde-liv/
[28] Brookings Institution (2016)

Boston Marathon: Investigation by mobilising the community
In the wake of the bomb attacks during the Boston Marathon in April 2013, the FBI and the Boston Police Department launched an investigation process that was based in part on "crowdsourcing", where the general public contributed a large amount of digital information. The police received over 2,000 tip-offs immediately after the attack. Thousands of pictures and videos from both public and private surveillance cameras were put together with photos from the public's mobile phones. This helped the police to draw up a picture mosaic that provided an overarching and clearer picture of the incident site and surrounding areas from multiple angles. The police were of the opinion that this help was invaluable.[29]

LOCAL AUTHORITIES: COORDINATION IN THE SHARING ECONOMY

Smartphones, the internet and social media make it easy to communicate with others and to coordinate needs with available resources in society.

In addition to services where citizens can solve tasks related to their own personal needs, such as performing their own health checks, the emerging sharing economy shows that it is also possible to contribute to services that address the needs of other citizens.[30] One example is the Casserole Club in Great Britain, which connects citizens who like making food with older people who do not have the opportunity or capacity to make their own food.[31] Developments in the sharing economy in recent years show that people are both willing to offer their resources and to receive them from others.

In London, the ambulance service has included the GoodSAM (Good Smartphone Activated Medics) app in its emergency service. People with first aid expertise can register as volunteers in the app. When the emergency service receives a call for help, a message will also be sent to volunteers in the vicinity, so that they can start administering first aid before an ambulance arrives on the

[29] Conversation with the Boston Police Department
[30] The Norwegian Board of Technology (2015)
[31] https://www.casseroleclub.com

scene. Registered volunteers also receive information about any cardiac arrests in their vicinity.[32]

Time banks are another type of service platform. This is a phenomenon that has grown rapidly in recent years, as digitalisation makes it easier to organise the services.[33] TimeRepublik is one example of a time bank that coordinates the exchange of services between private individuals.[34] For example, the network can be used to connect a pensioner with a student who needs help with his maths homework. In return, the pensioner receives "time points" which she can cash in for a service from someone else in the network. In Norway, TimeRepublik has, e.g., a local time bank at Tøyen in Oslo.[35]

Experience from England and Spain shows that time banks can, in particular, be a supporting system *around* public services. By extending public services out into local communities, the citizens themselves become more active and the local communities are more robust. Examples of services may be assistance to the elderly after discharge from hospital, introduction into the local community for asylum seekers or social measures to combat loneliness.[36]

In the long term, a further development of the systems established in the sharing economy and time banks can both complement current public services and enable citizens to be more active and to participate more in their local communities. The local authority can become a digital coordinator that gives the citizen an overview of what services exist without necessarily providing all the services themselves.[37]

In February 2017, a majority of the Sharing Economy Committee proposed lifting the license obligation for the taxi industry, which would thereby open up to allow sharing economy participants such as Uber to become established in Norway.[38] This will enable those who want to offer part-time transportation services and also means that the obligation to provide a 24-hour continuous year-round service no longer applies. Such deregulation of the passenger transport market is an example of the government transferring needs testing to citizens:

---

[32] London Ambulance Service (2015)
[33] European Commission Joint Research Centre (2014)
[34] https://timerepublik.com/
[35] Dagsavisen (2016)
[36] European Commission Joint Research Centre (2014)
[37] NESTA (2016)
[38] Green Paper 2017:4

i.e. to those who want to offer the services whenever they want and when others need it.

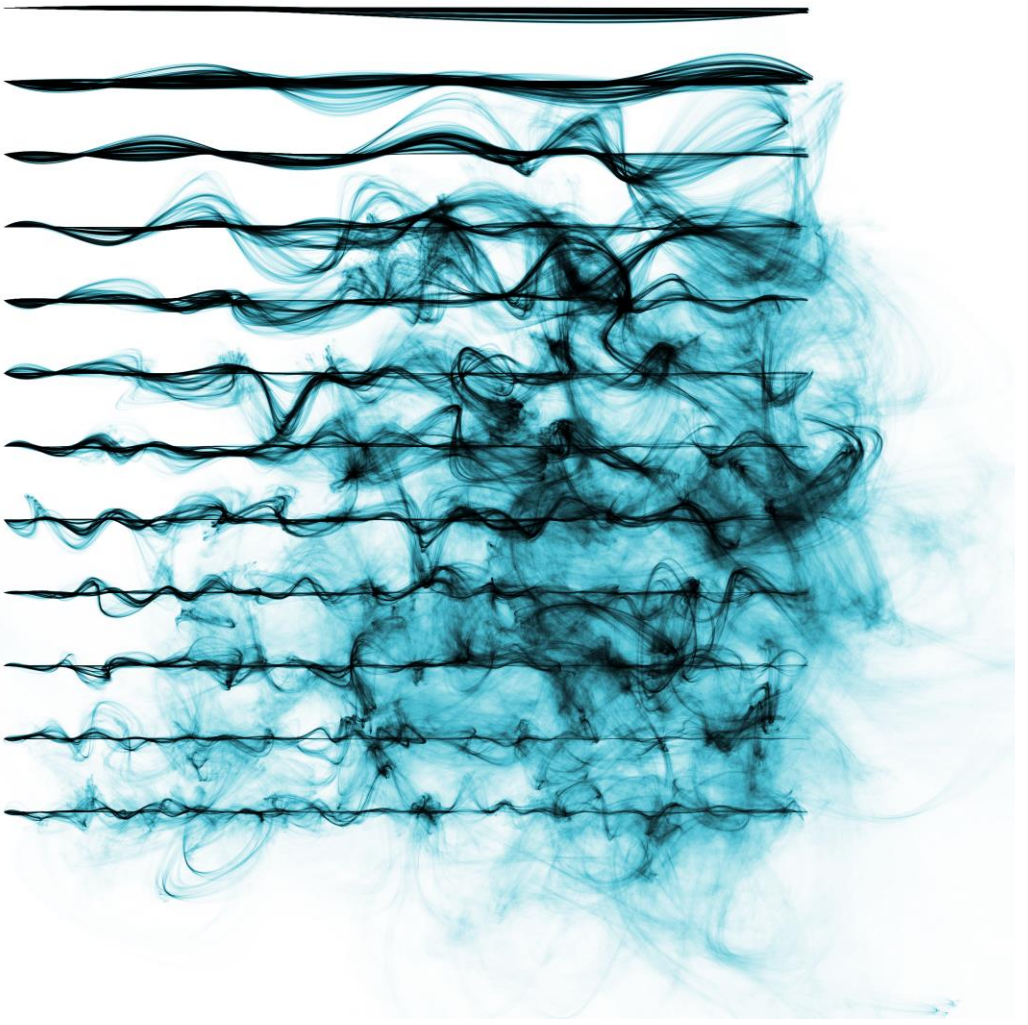
WILL PARTICIPATION LEAD TO A NEW TYPE OF INEQUALITY?

The Norwegian welfare state is based on citizens paying for universal services via their tax returns. Increasing participation in the configuration of services may challenge this principle: if citizens are to increasingly perform the services themselves, this will necessarily lead to inequality. Those who choose to perform services themselves will receive a different service than those who choose not to participate in the service.

For many, it is likely that participation will lead to an increase in quality. When taking your own health measurements you do not have to coordinate this with the GP's surgery, which costs time. Furthermore, more frequent measurements could provide a better result than single time point measurements at the doctors.

An important issue for the authorities is whether such participation should be a duty or whether it should be a voluntary arrangement for those who want it. Although groups of citizens will welcome such a scheme, not everyone will be able to or wish to actively participate in the service. Is it acceptable that the latter group receives services of a different quality than those who participate to a greater extent?

If local authorities increasingly coordinate services rather than offering them, this could also lead to geographical differences in the services on offer. For example, if the local authorities no longer provide needs-based taxis, the service on offer might be weakened in sparsely populated areas of the country – the service on offer will simply not be extensive enough to cope with the demand for the service.



Sand Spline odfd9b9 (2016), Anders Hoff, inconvergent.net

PERSONALISED SERVICES

Amazon and Netflix supply us with recommendations based on both our own and others' behavioural patterns. As public enterprises now get more and more data about us and our life situation, they are in a position to do the same.

The public sector consists of many different entities that produce ever increasing volumes of data through their work and their interaction with the general public. This means that the public sector is sitting on a large amount of data about both the services they provide and the citizens who use the services, whether in health and education or self-service solutions within Altinn.[39] With digital first choice, this trend will most likely increase in both strength and scope.

Public services are becoming digitalised. A brief glance at the major players in the internet economy gives an impression as to how the public sector can utilise user data from its citizens to tailor and customise services to the individual citizen's life situation and needs.

[39] Altinn is a web portal for electronic dialogue between the business/industry sector, citizens and government agencies.

SOMEONE WHO LOOKS LIKE YOU

The concept of personalisation can give the impression that it concerns personal or individual customisation, while in reality what really happens is an advanced sorting into groups. Traditionally, it has been common, for example within marketing, to divide target groups on the basis of gender, age or geography. As services are gradually digitalised and the amount of information about each individual increases, it becomes possible to define smaller groups based on criteria that may be perceived as more personal, related, for example, to lifestyle, cultural preferences, social networks or patterns of consumption.

With the emergence of new online digital services, the development of new technology that attempts to make each service more adapted to the individual user has gathered pace.

For example, using different algorithms, Amazon and Netflix analyse both their customers' historical purchasing patterns and data about the products they offer. The algorithms segment the products and customers into smaller subgroups. By looking at products that are similar in style and content to something that you have already purchased, or that other customers like you have previously purchased, the systems can provide you with "personalised" recommendations. Similar techniques are used by Facebook to manage and customise your news feed, and in the online advertising market to provide you with advertising based on your search and internet history.

FROM OFF THE HANGER TO TAILOR-MADE

Public services are based on all citizens having access to the same service offer. However, increased resources for the service rarely creates more efficient services, precisely because the citizens are different and have different needs and wishes. A more personalised and targeted service delivery can counteract costly over-servicing while, at the same time, ensuring that everyone gets the services they need. This should happen regardless of how well informed they are or how good they are at searching for and interpreting information.

Presumably, the development will first be expressed in the collection and delivery of digital information. Examples of this may be individually customised guidance on relevant benefit schemes for new parents, a completed form that is submitted to a new student or a person who has just received an active medical certificate.

The pre-filled tax return most Norwegians receive once a year is a good example of how the authorities use the data they already have to provide citizens with easier and better services.

Oslo municipality has outlined an ambition for such solutions in its budget for 2017. For example, the municipality wants new parents to stop applying for nursery school places. Instead, the municipality will automatically inform parents about 2-3 nursery schools with available space when their child is approaching nursery school age.[40]

SCHOOLS: INCLUSION AND CUSTOMISED EDUCATION

Developing digital skills has been a priority area in Norwegian schools for a number of years. Norway has invested heavily in infrastructure, and there is good PC coverage in schools. However, these measures on their own are insufficient to give rise to increased learning outcomes.

Frequent feedback and customised education for those students who need it are measures that will likely enhance the quality of teaching and help more pupils to complete secondary and further education. In the same way as Amazon recommends books they think the user will like, smart learning materials can provide individual pupils with tasks of an appropriate degree of difficulty.[41] Based on data collection regarding pupils' level of attainment, use of time and development, a learning pathway is created and used to take the pupil through the various parts of the curriculum.

When these data are used together with information about pupils' private lives and hobbies, they provide good opportunities for individually customised teaching and predictions about how a pupil will manage in the future. Digital teaching materials and smarter use of data can facilitate better monitoring, as well as alerting pupils who are at risk of falling behind.

[40] Digi.no (2016)
[41] Bulger (2016)

Customised mathematics education in Norway
The Norwegian-developed mathematics programme Kikora offers attainment level-differentiated tasks that provide pupils with continuous feedback and hints if they make a mistake along the way. The teacher saves time on marking and correcting and receives detailed information about what level each pupil is at, where they are stuck, how long they have spent, the number of tasks they have solved and how many suggested solutions they have looked at. The teacher thereby receives information that can be used to adapt his or her teaching to the pupils' needs. In 2014, Kikora reported that 110,000 Norwegian pupils were using the scheme.[42]

Smart digital teaching materials and personalised education will improve both the pupil's prerequisites for coping with school life and the teacher's ability to understand the individual pupil's needs:[43]

- Smart teaching materials provide the teacher with ongoing information about the attainment level and development of his or her pupils and classes. This gives the opportunity to customise teaching for each pupil, which can contribute to a higher level of attainment for each individual.
- By continuously measuring the progress of pupils, the teacher will gain easy access to information currently retrieved via evaluations and national tests. If ongoing evaluation can be done continuously via data collection and analysis, this will free up teachers to have more time to monitor their pupils in other ways.
- By following the progression of pupils in real-time, you also obtain ongoing information on which teaching methods and resources work best. This can help the teacher to design teaching in the way that best suits his or her class and its pupils.

[42] Fædrelandsvennen (2014)
[43] The Norwegian Board of Technology (2012)

Millions of data points

Arizona State University (ASU) has used the teaching tool Knewton to raise the level of mathematics attainment of its first year students. Knewton is a teaching platform that collects between five and ten million data points about each student during a single day.[44] The data points are used to customise the teaching to the students. Previously, as many as a third of the students at ASU got worse grades than C, which proved to be a clear indicator that they would drop out from the studies later in the course. With the help of adaptive teaching, the proportion of students who gained grades from 64 to 75 percent increased and the number that dropped out was halved.[45]

In Norway, the publisher Gyldendal has entered into a partnership with Knewton, and is using the latter company's technology in a teaching programme called "Smart Learning".[46]

JOBCENTRES: PERSONALISED MEASURES

In Germany, the Bundesagentur für Arbeit ("the Federal Employment Service") has developed personalised services to improve the quality of its services. The Federal Employment Service has analysed historical data about its users, their unemployment history, what measures were taken to find work for jobseekers, what results these measures gave and how long it took to get appropriate work. The objective was to provide advice, measures and a work placement that were customised to the individual jobseeker's knowledge and needs.

Together with other measures implemented over a three-year period, this analysis contributed to annual cost savings of €10 million. At the same time, jobseekers found work faster and were more satisfied with the services they received.[47]

French "Pôle emploi" (government employment centres) have entered into a partnership with the data management company Bayes Impact, which has developed a digital tool to help jobseekers find work.[48] The company has access to

[44] Education Week (2014)
[45] Mayer-Schönberger V. and Cukier K. (2014)
[46] Knewton (2014)
[47] McKinsey Global Institute (2011)
[48] https://www.bob-emploi.fr/

large public data sets that have previously been little used. This data is used to analyse the labour market and come up with personalised proposals for jobseekers. They hope that the measure will reduce unemployment by ten percent.

Personalisation will in some way be a form of needs testing of services. In many cases it will be automated and the authorities can actively offer services that are adapted to the life situation of the recipients, without the recipients having to take the initiative themselves. The example of employment procurement shows how a personalisation of the welfare state's services can work in practice, by making the service more accurate. Personalisation of benefits and transfers to social security and the like will be far more controversial in a welfare model that is largely built around wide, universal benefits.

Personalised information
The Norwegian Directorate of Immigration uses basic personalisation on its website to provide better and more accurate information about asylum, family reunification and residency permits. When entering the Directorate of Immigration's website, you are asked some specific questions that are used to sift information. The rules for obtaining a work permit in Norway are different based on which country the applicant is from. By asking questions about, for example, citizenship, one can immediately provide personalised information and the user does not have to look through large amounts of general information to find what applies to her.[49]

THE WELFARE STATE: A NUDGE FOR CHANGED BEHAVIOUR

Occasionally, small pushes or nudges can help us change habits and behaviour. Digital instruments make this easier, and the possibilities for personalisation can make this communication even more target oriented. A personal message to citizens is far more effective than a general attitude campaign.

The mammography programme in Norway shows how direct contact with citizens and simple personalisation has already been brought into use in the public sphere. After reaching the age of 50, all women are invited to a mammography examination in order to reduce breast cancer mortality. Electronic patient med-

[49] Episerver (2016)

ical records now make it possible to base such health checks on much more information than the basic demographic parameters of gender and age. For example, personalised health checks can be offered to patients at increased risk of disease based on their medical history.

In the USA, digital push messages have been deployed, e.g., to prevent drop-out from school. Students receive personalised messages, for example with a reminder about application deadlines for scholarships.[50]

Such push messages are clear and concise communications. At other times, such pushes can be more subtle.

"Nudging" is about using behavioural psychology as a means of influencing citizens to behave in a desired way. This concept gained momentum after Richard Thaler and Cass Sunstein released a book entitled "Nudge: Improving Decisions About Health, Wealth, and Happiness" in 2008. In their book, the authors claimed that the way alternatives are presented can influence our choices in a desired direction. If healthy food is placed at eye level in cafeterias, while unhealthy alternatives are less visible, it is conceivable that more people will choose healthy alternatives. No prohibitions or explicit demands such as "eat healthier!" posters are on show. People still have the full freedom to choose what they want to eat, but are rather given a small push towards healthy food.[51]

A number of countries have since attempted to add "nudge theory" to their policy apparatus. For example, in 2010 the Cameron government in Great Britain established a "Behavioural Insights Team". This unit, also known as the "Nudge Unit", is actively working to find areas where nudging can be used to increase the accuracy and efficiency of public services and measures. Authorities in Australia, Denmark, Singapore and the United States have also taken steps in the same direction.

According to the British Behavioural Insights Team, if you want to change the behaviour of citizens, you should make the choice simple, attractive, social and on time.[52] And with digitalisation the public sector gets a good opportunity to do just that.[53] That the tax return is delivered automatically if no changes are

[50] The New York Times (2015)
[51] Thaler, R. and Sundstein, C. (2008)
[52] http://www.behaviouralinsights.co.uk
[53] Policy Exchange (2015)

made is a good example of this – making it easier for citizens to perform a task at the right time.

Another approach that can motivate citizens to change behaviour derives inspiration from the world of gaming. Gamification uses various techniques to motivate people to follow a desired course of action.

Recyclebank[54] is an example of this. The company cooperates with local authorities to motivate their citizens to recycle. With the help of new technology, they record how much waste is being recycled and which households are performing the best. Citizens slowly accumulate points that provide a discount on goods and services from a number of suppliers in the local area. Likewise, it is believed that the technology can help pupils get through their school curriculum or patients get through diet, exercise or rehabilitation programmes. Another well-known trick to make people change behaviour is to compare one citizen's behaviour with that of others. For example, in Singapore the Ministry of Manpower has found that reminders regarding employers' contributions printed on pink paper, with a short statement that 96 per cent of employers pay their contributions on time, were 3-5 percent more effective than traditional reminders.[55]

Today, such comparisons are general, but new data and network analyses may make it possible to compare with smaller groups that the citizen can relate to more easily. In the same way that Amazon gives the user recommendations based on his or her actual purchasing pattern and the purchasing patterns of other similar customers, the authorities can provide citizens with personalised "nudge prompts" based on information about others who are like them.

Digital technology provides the authorities the opportunity to give us a little push and shove in a way that can influence us to make different choices than we would otherwise make, as well as change our behaviour in a desired direction. It is possible that the total of such small adjustments in everyday life could save the public large sums of money over time.

[54] https://www.recyclebank.com/
[55] Prime Minister's Office (2014)

WILL UNINTENDED DIFFERENTIAL TREATMENT ARISE?

Digital personalisation means that citizens are segregated into different statistical groups which are believed to share common features, such as "women aged 30-35 years old", "patients with disease X", "parents and guardians with reading and writing difficulties" or "second-generation immigrants from Somalia".

The technology behind personalisation can help to digitalise cultural clichés and stereotypes. Even if the analysis does not seek to discriminate on the basis of gender, ethnicity, religion etc., variables such as income or residency may inadvertently point to such categories.[56] Unacceptable discrimination can thereby become hard-wired into the analyses.[57]

Studies from the USA have shown, among other things, that web searches with typical African-American names (such as "Jermaine") more often result in the display of web adverts containing the word "arrest" than searches with names typical of the majority such as "Geoffrey".[58] According to a White House report, the example shows that "perfect personalisation" can often lead to accidental or hidden discrimination in services, offers and opportunities for citizens. Where does the boundary lie between useful personalisation and harmful differential treatment and discrimination?[59]

A NUDGE IN THE WRONG DIRECTION?

Although the public can have strong opinions about what is considered to be good, bad, healthy or unhealthy behaviour, this is not based on a single unambiguous definition. Moreover, it is not always certain that behaviour that makes public services more effective, are always, or always perceived to be, the best for the individual. The challenges in the welfare state are often large and complex, and it can be difficult to predict the consequences of choice – does nudging in one direction cause adverse reactions in a different direction? Is it reasonable to assume that bureaucrats and experts in a directorate are better equipped than the citizens themselves to assess what is the right behaviour and what is

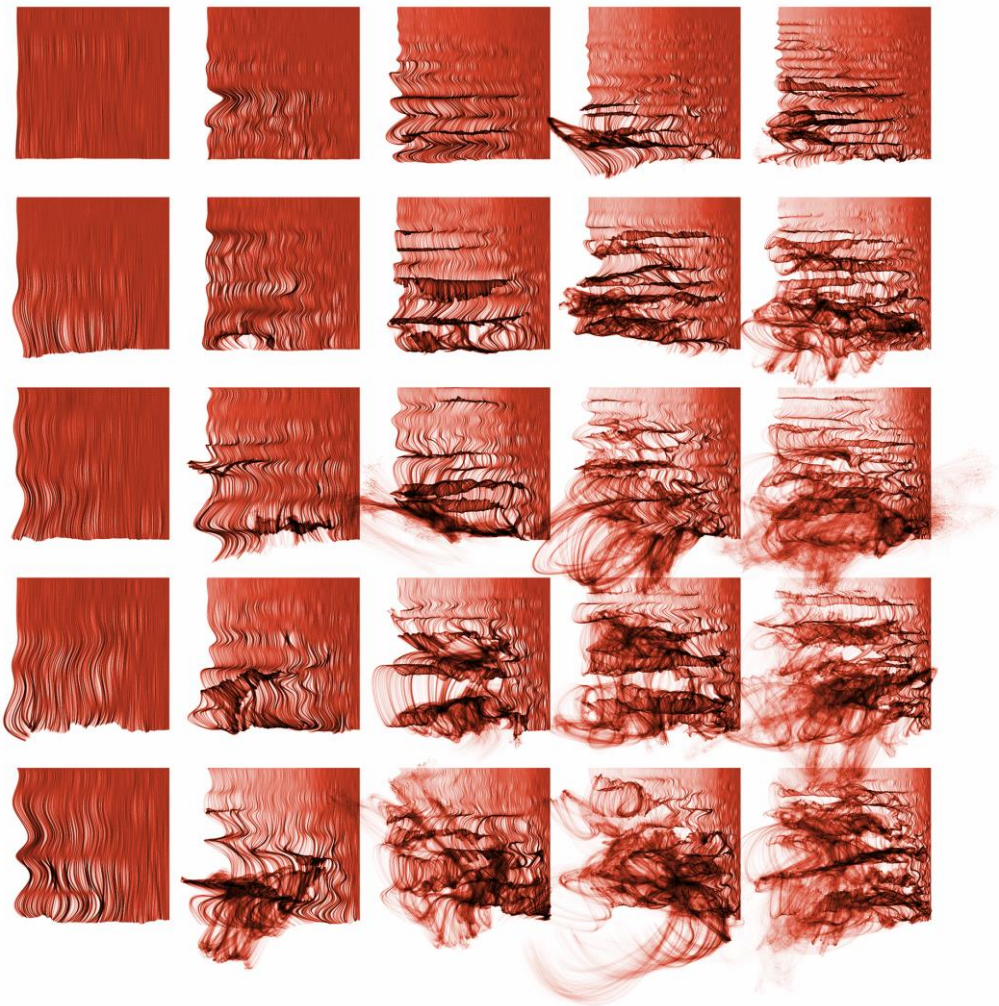
[56] Goodman, B. and Flaxman, S. (2016)
[57] The Atlantic (2015)
[58]The White House (2014)
[59] Harvard Business Review (2014)

for the best for the individual? And where does the boundary between a helpful nudge and a paternalistic guardian state lie?

In contrast to open public awareness campaigns, more subtle use of behavioural psychology and nudging can be criticised for being both invisible and manipulative.[60] Instead of giving citizens weighted information to make independent and informed choices, the window of opportunity closes around an outcome that is defined as the "right choice" in advance.[61] Such a development may be reinforced when the authorities receive large amounts of data about each individual citizen, which can be used to personalise the nudge.[62]

Therefore, if the Norwegian public sector is to use digital nudge, it is necessary to have clear ethical guidelines and constraints, a design that is transparent to the citizen and a democratic supervision of the activity.

[60] Evans, N. (2012)
[61] Farell, H. and Shalizi, C. (2011)
[62] Scientific American (2017)



Sand Spline 0f19884 (2016), Anders Hoff, inconvergent.net

PREDICTIVE INSTITUTIONS

Prevention is often better than cure. With predictive analyses, the public sector can acquire new tools for averting problems or planning before problems arise.

Public entities provide wide-ranging services and follow residents from cradle to grave. Together, these will create a safe society with good living conditions for all.

Problems that may develop over time are often both more difficult and more resource-intensive to deal with retrospectively – whether these involve common diseases such as diabetes, school dropout, inability to work or crime. When risk signals are detected early, it is easier to implement measures that avert or alter undesirable developments.

Targeted and effective prevention will help to create new opportunities and improve people's quality of life. For the state, prevention in the long term is often both cheaper and less resource-intensive than repairing damage and problems that have already occurred. However, targeted prevention assumes that risk factors are detected early and that appropriate counter-measures are taken. Here, new forms of data analyses can help.

PREDICTIVE ANALYSES

Digitalisation, cheaper computing power and large data sets can be used to gain a good and accurate overview of how public resources are distributed. Predictive analysis techniques can reveal complex relationships between different factors, drawing a picture of where it is most likely that the needs will be greatest, and contributing to a better understanding of the measures that are most effective.

Such models try to quantify connections between an unknown future quantity given different factors. For example, how great the risk of diabetes is, given different factors such as eating habits, exercise and hereditary factors. The models can also group a new quantity into a category based on different similarity characteristics with historical data. For example, the risk of re-admission to hospital, given similarity characteristics with historical data from former patients.

In some areas of the private sector, such predictive analytical methods have already been in use for a long time:

- *The banking industry* uses analyses to assess whether an applicant for a loan would be able to pay back a loan. By looking at factors such as personal income, job type, age, previous credit history, etc., the bank can compare the applicant with previous similar applicants and thus calculate the risk of the applicant defaulting on the loan.
- *The retail industry* uses analyses to predict which products various customers would be most interested in buying. The grocery chain Walmart has used analyses to predict which products people buy when there are reports of extreme weather so that they can fill the stores with these products in advance.[63]
- *Customer programs* use analyses to predict which customers will break away and go to a competitor. The mobile phone company Telenor uses predictive analyses to identify customers who have a high risk of moving their mobile subscription to a competitor, so that they can come up with a counter-offer in advance.[64]

[63] Mayer-Schönberger, V., Cuckier, K. (2013)
[64] Siegel, E. (2013)

When public services are digitalised, public entities obtain increasing amounts of data about citizens and the services they use. At the same time, many public entities already have large amounts of historical data that may be useful in predictive analyses.

Several public entities have expressed an ambition to work more preventively. In 2009, Stoltenberg's government launched a strategic focus on prevention "to strengthen, renew and improve the welfare of society"[65].

In spite of this, it can often be difficult to move resources from reactive to preventive activities because it is not known how effective the measures are, the effects can be difficult to measure and because the gains are often experienced elsewhere, away from the business that made the "investment".[66]

Here, predictive analyses could provide a push in a preventive direction. By providing public entities with a basis for meeting future challenges, by streamlining services through the more targeted use of resources and by informing the choice of appropriate measures. [67]

TAXES AND FIRE: TARGETED CONTROL

When it is possible to predict where the risk of errors or deficiencies is greatest, it is easier to facilitate targeted controls.

Every year, the fire department in New York City checks more than 25,000 buildings that they suspect have serious faults that should be remedied for reasons of fire safety. In order to make such checks more efficient, NYFD has analysed various types of data about the city's building stock and risk factors for fire.

The result of the analysis is a prioritised list of the buildings with the greatest risk. Then they can start the checks on the buildings with the greatest fire hazard. Previously, they found serious errors in 21 percent of the top quarter of the list. Now this figure has risen to 70 per cent.[68]

[65] The Norwegian Government (2009), p. 7
[66] The Norwegian Government (2009), p.
[67] NESTA (2016)
[68] Copeland (2015)

The tax authorities in Great Britain and Australia, among others, use predictive analyses to identify taxpayers who are suspected of filing erroneous tax returns or who are deliberately trying to avoid paying tax. As with the assessments made by a bank before approving or rejecting a customer's loan application, predictive models can be used to sort taxpayers into different risk groups and to implement control resources where the need is greatest.

In Norway, the Tax Administration has begun to use such methods to highlight tasks with a high probability of error. The risk of error increases with the number of deductions a person enters on a tax return. Therefore, returns with multiple deductions are often selected for manual control.

The largest group of tax returns, however, have two deductions or less, and it is therefore much more difficult to identify returns with a high risk of errors in this group. It is estimated that about 17 percent of these returns are incorrect. Following the introduction of predictive analyses, the Tax Administration found errors in 71 percent of the selected returns. The algorithm thus correlated well with identifying tasks selected for control.[69]

With such analyses, resource usage becomes more targeted and efficient. Other models could give a risk score, for example, for a specific taxpayer submitting a tax return with a deduction to which he or she is not entitled. Again, such predictive risk models provide a stronger basis for targeted controls, which in turn results in greater compliance, less use of assessments and a more even workload for the case managers.

Where similar analyses can be used within the same area, this saves resources and is efficient for the agency.[70] In Great Britain, the HMRC tax authority estimates that similar initiatives within VAT evasion have increased the tax revenues from each task manager by 100%.[71]

[69] The Norwegian Tax Administration (2016), p.14
[70]The Norwegian Tax Administration (2016)
[71] Civil Service Quarterly (2015)

HOSPITALS: PREDICTIVE EMERGENCY SERVICES

All hospitals face a fundamental challenge: they must balance the need for planned operations against the needs of people and resources in the emergency department. Predictive analyses can help solve this. In Queensland, Australia, several hospitals have used the PAPT (Patient Admission Prediction Tool) program. Using the hospital's historical data and predictive modelling, the program can predict how many patients are expected to be admitted to the emergency department on a given day, up to six months ahead. The program not only predicts the need for emergency services but also the degree of severity, the clinical skills required and how many beds are likely to be available.[72]

Staffing is planned and adjusted accordingly, resulting in less stress for the employees, shorter waiting times for the patient and quick access to vital medical treatment. According to the CSIRO public research institution, the project has resulted in AUD 1 million in efficiency gains in Queensland, with a projected productivity gain of AUD 23 million at national level.[73]

EMPLOYMENT: PREVENTING UNEMPLOYMENT AMONG YOUNG PEOPLE

A welfare state financed by high taxes requires a relatively high number of people to work relatively hard. Preventing early unemployment and inability to work is important for ensuring opportunities and quality of life for the individual, and to ensure the welfare of the wider society.

The Ministry for Social Development (MSD) in New Zealand has been experimenting with data analysis for several years to target welfare services. By compiling and analysing data across different public entities, the Ministry could reveal that more than 70 percent of total welfare costs could be linked to residents who became beneficiaries of benefit plans before they reached the age of 20.[74]

[72] CSIRO (2014)
[73] CSIRO (2016)
[74] Australian Government (2015)

Together with the Ministry of Education, the MSD studied information related to students who did not complete high school. They looked at results, exclusions and expulsions, the reason why the student dropped out and the student's age. By compiling such data with information from the country's agencies for employment and for children, young people and families, the Ministry was able to develop a model that calculates the likelihood of a person needing social benefits within three years of leaving school.[75]

With such a predictive analysis model, the Ministry could target social support services towards at-risk individuals in order to reduce the number of young people who are not in employment or education.

According to the analysis company behind the model, benefit payments fell to their lowest level in five years after the method was introduced.[76] Similar methods have reportedly reduced the number of single parents on social benefits by more than nine per cent. It is expected that the use of such computer technologies will save the MSD billions over a four-year period.[77]

POLICE: PREDICTIVE POLICING

A proactive police force that can prevent crime is better than a police force that reacts retrospectively. In several countries, the police have begun to use data analyses to identify where and when new offences will take place.

Predictive police work is based on the assumption that where and when the crime occurs is not entirely random, but that crimes are often concentrated in specific places and at certain times.

Data analyses can help the police identify not only sites that have previously had high crime rates, but by using prediction models they can also identify areas with a high risk of crime in the future.

[75] New Zealand Government (2014)
[76] SAS (2014)
[77] Australian Government (2015)

In the United States, the use of predictive analyses in policing contexts is already widespread, but the police in countries such as United Kingdom, Germany, Switzerland and the Netherlands are also making use of the technology.

With better knowledge of when and where crimes occur, police resources can be made available where and when the need for police services is greatest. The police can also analyse the conditions that facilitate crime. Changing these conditions, such as improving street lighting, restricting access or escape routes from the area, or through a more visible police presence, can have a preventive effect.[78]

ARE YOU A PROBLEM OR DO YOU HAVE A PROBLEM?

When predictive analyses are directed at human actions such as shopping habits, defaults on loans, burglaries or tax evasion, the analyses seek to predict how people will behave in certain situations, under certain conditions and under certain assumptions.

The more individualized or group-oriented such analyses are, the more important the framing of the analysis and the preventive measures for those perceived as useful or as deeply problematic. For example, there is a difference between predicting *when* a crime will happen and *who* will be involved.

Are the analyses being used to stigmatise individuals or groups as a problem for society, or are they used to offer more support, new opportunities and alternative choices? Are you a problem, or do you have a specific need for support? When can predictive analyses become unintended tools for unfair stigmatisation, discrimination and differential treatment?

[78] The Norwegian Board of Technology (2015)

The risk list: are you the problem or do you have a problem?

The Chicago police have made a list of about 400 people, using mathematical network analyses, whom they consider as having a particularly high probability of being involved in serious gang crime in the near future. The list has been used by the police to make targeted visits to at-risk people, or close acquaintances such as family and partners, to explain the risks they face and what consequences these may have.

The aim has been to encourage a change in behaviour among the individuals on the list before they become involved in a serious criminal act. The Chicago police have been criticised for the way in which home visits have been made and for the lack of transparency about the risk list and the assessments upon which it is based.

In New Zealand, the Ministry of Social Development has considered using predictive analyses to identify new-born children at high risk of abuse or other forms of neglect, so that preventative support measures can be implemented. However, ethical concerns have put the project on hold.[79]

Although the motives may be well-intentioned, poor framing and skewed data predictive analyses can lead to unfair stigmatisation or differential treatment of children, adolescents and adults long before they have done anything or have made independent choices that could justify differential treatment.

In each case, an assessment must be made of how predictive analyses should be used and what consequences such use may have for trust in public authorities. A supporting principle may be that framing should increase the citizen's opportunities, rather than narrowing them.

CAN WE OPEN THE BLACK BOX?

If we do not understand how the algorithms we use reach their results, predictive analyses can become a "black box" that masks important assumptions, uncertainties and normative choices. Then all the power will be concentrated with those who develop the methods, while citizens will be left with few opportunities to investigate, evaluate and contest algorithmic decision-making systems.

The increasing use of predictive analyses in the US police is controversial, and several citizen rights' organizations have pointed out that there are few independent studies that confirm that such methods work. At the same time, skewed

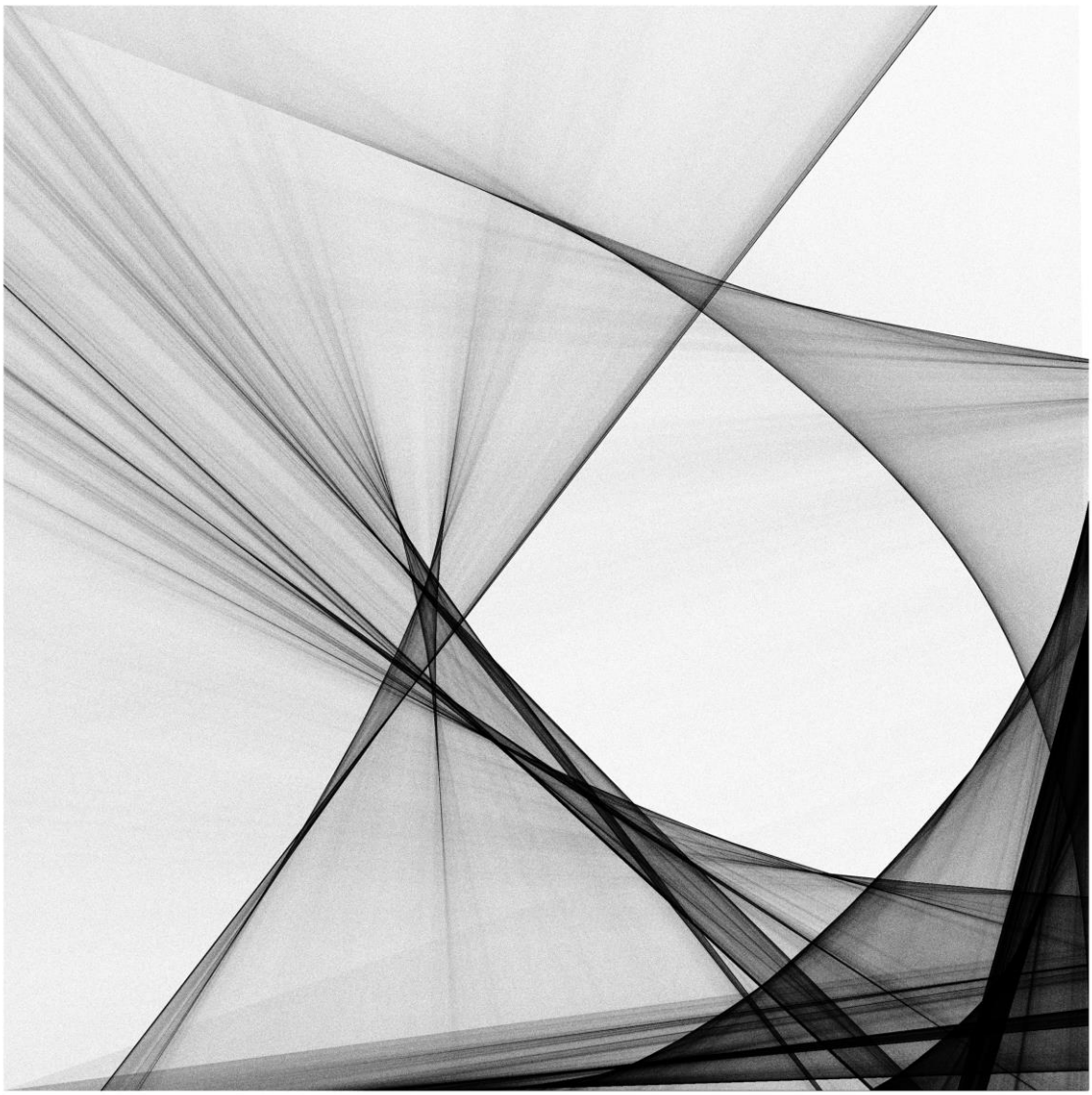
[79] New Zealand Government (2015)

data and a lack of transparency in many cases contribute to reinforcing already poor and unfair police practices.[80]

Openness about the design of such systems and supervision of their use, therefore, are important prerequisites for using predictive analyses in the public sector. In several countries, discussions are taking place about how citizens can gain insight into automated decision-making processes. France has recently considered a bill on algorithmic transparency.[81] One challenge of algorithmic transparency is that transparency in itself would not provide meaningful information to the citizens. Without the technical expertise to understand the source code and the mathematical techniques that underlie the process, transparency itself is not a complete solution.

It is therefore very important to have complete transparency about the assumptions and assessments that form the basis of the analysis, what data is used, how it is collected and how complete, correct and time-relevant it is. Citizens must have assurances that the analytical industry does not contain bias or weaknesses that can contribute to stigmatisation and unfair differential treatment.

[80] The Leadership Conference on Civil and Human Rights (2016)
[81] LSE (2016)



Square Step 5c18f98 (2016), Anders Hoff, inconvergent.net

POLITICAL APPROACHES TO A DIGITAL SHIFT

In the 2017 Perspective Report, the Norwegian Government describes the challenges facing Norway: An ageing population means fewer people in work, less tax revenue and more people who are chronically ill. At the same time, contributions from the oil and gas industry and investment funds will decrease. The golden age of the Norwegian oil economy is reaching its end.[82]

The implications for the public sector are obvious, if we are to keep welfare services at the same level, or improve them, new technology must be used. The alternative is a sharp increase in taxation. Increasing productivity in the private sector will not help a great deal if the public sector does not also improve.

The starting point is not so bad: Norwegian administration has been quick to use digital technology to improve case management and to make data available. We believe that the potential in the technology is greater and that there is a need for a new digital shift in the public sector. The most important changes come when the technology is used to solve old tasks in completely new ways, and by involving the citizens:

[82] White Paper 29 (2016–2017)

Interactive technologies can make citizens active and participative stakeholders in public services, increasing amounts of data allow for more personalised services and the use of data analysis can direct public institutions towards prevention rather than retrospective reaction and improvement.

We have indicated how high the bar is set for the new digital shift. The changes can challenge the model upon which the Norwegian welfare state is built, changing power relationships between citizens and the authorities, and reducing trust.

In this final chapter, we will describe some political approaches that can help realise the potential of technology without destroying the balance between the citizen and the state. There is no tried and tested master plan from other countries that shows how the digital shift should be carried out. Nevertheless, there are good individual initiatives at home and abroad that can show the way. Overall, the three relevant points are:

- Provide digital self-help
- Prioritise public experimentation
- Develop a new digital community contract

DIGITAL SELF-HELP

An important goal for Norwegian digitalisation policy has been "digital first choice".[83] Online services should be the general rule for communication between citizens and public organisations, including enabling a citizen not to have to search for something to which she is entitled and can claim.[84]

However, digitalisation opens the way to changing public services in a more fundamental way. Over the past 10 years, each of us has experienced a digital revolution. The Internet, smartphones and the Cloud have given us access to information, services and computing power that were previously reserved for

[83]The Norwegian Government (2012), p.
[84] White Paper 27 (2015-2016)

large companies. In the coming years, more and more people will be able to access artificial intelligence that interprets, assists and gives advice.

In other words, technology has become democratised: the vast majority of Norwegians have powerful digital tools such as their smartphone wherever they go. Thus, citizens have the opportunity to use these tools themselves to carry out public services that previously had to be done by professionals, for example in the follow-up of chronically-ill patients.

A main rule for digital self-help can be formulated as follows: If digital aids enable citizens to perform a task without reducing quality, this should be promoted by the state.

It is natural to start role-redistribution in areas where this will provide immediate benefits to the citizen. Internet banking was a success precisely because the service was better and easier for the user. An improvement to the service will in itself be an incentive to participate in service delivery. In addition, studies show that citizens are more likely to participate actively in services with which they have frequent contact.[85]

OFFER SELF-TESTING FOR THE CHRONICALLY ILL

With more Norwegians over 80 years of age, the number of people with chronic illnesses will rise rapidly over the next few years. Self-testing for people with chronic illnesses can provide better health care for the individual through more frequent testing and less time spent on visits to the doctor.[86]

Projects in Oslo and Sarpsborg have tested home-monitoring for people with COPD. The results show a reduction in hospital admissions and bed-days, as well as a reduction in the need for home visits.[87] Users also report an increased sense of empowerment and control over their illness, and feel that they will be followed up closely by the health service.[88]

---

[85] Pestoff, V. and Skondal, E. (2012)
[86] The Norwegian Board of Technology (2015)
[87] Intro International and the Oslo School of Architecture and Design(2016)
[88] Bjørkquist, C. (2015)

ESTABLISH A DIGITAL FIRST-LINE

People who undertake their own health testing will save time and get better service while relieving the health service by reducing the number of unnecessary requests. The health authorities should therefore establish a digital first-line for contact with the GP or the emergency medical service.[89]

In Great Britain, this type of digital first-line is being tested using the Babylon Health app. The app uses artificial intelligence to guide citizens through a symptom check, and then provides simple advice and feedback. If necessary, they are offered a video conference with a doctor and can carry out home tests for further investigation.

INCREASE INCENTIVES

In many cases, better services for citizens will not be sufficient to get them to use digital self-help. Public service providers also need incentives or requirements in order to change practices.

Today for example, the health service primarily rewards physical attendance at the doctor's surgery, instead of enabling citizens to carry out certain tasks at home. Online consultations in the health service should therefore be treated as physical attendance, and there is a need for new, profession-neutral rates that reward health professionals who have ongoing follow-up of citizens over the internet.[90]

At Kaiser Permanente, one of the world's largest healthcare providers, more than half of all consultations now take place through online portals, apps or video calls. 80 per cent of the doctors and patients are pleased with the treatment given and received over the internet.[91]

---

[89] The Norwegian Board of Technology (2016)
[90] The Norwegian Board of Technology (2015)
[91] mHelathIntelligence (2016)

MOBILISING CITIZENS WHEN AN INCIDENT OCCURS

The spread of smartphones, social networks and map and image services makes it possible to coordinate and mobilise citizens to action when the need is high.

The ambulance service in London provides volunteers with first-aid expertise messages about cases reported to emergency services through the GoodSAM app. They are given a map so they can easily find someone who needs help and offer life-saving first aid until the ambulance personnel arrives. They are also told where the nearest defibrillator is located.[92]

This shows how voluntary services can be scaled up and enhanced by incorporating them into existing public services. Enthusiastic and able citizens can help improve public services.[93] In the event of an accident or criminal act, people can contribute text, images, videos and audio recordings showing the precise time and location. Such information can be crucial, especially in the time before the emergency services arrive.[94]

TIME BANK FOR CARE SERVICES

In addition to solving tasks related to their own needs, such as health testing, citizens can also help meet other people's needs through sharing services. Time banks are platforms that enable the exchange of services. Instead of money, you earn hours that can be used to buy services from others. Time banks are used for many different types of services, from accounting and graphic design to cooking and gardening.

In Japan, an ageing population is already putting a great deal of pressure on the care services. To meet such needs, many municipalities have adopted time banks. Through such schemes, volunteers are linked to elderly people who need help. Volunteers are paid in hours with which they can buy services themselves. Since many elderly people do not have the opportunity to earn hours, the Japanese time bank "Fureai Kippu" allows the transfer of hours between people. In this way, citizens living in one part of the country can work voluntarily and earn hours that they can "donate" to parents living in another part of the country.

---

[92] London Ambulance Service (2015)
[93] NESTA (2016)
[94] The Norwegian Board of Technology (2014)

The use of time banks has, e.g., contributed to the fact that the elderly can live at home longer, and the system has been very well received by both volunteers and the elderly.[95]

PUBLIC EXPERIMENTATION

In this report, we have shown that digitalisation provides opportunities for creating personalised and predictive services within different areas of the public sector, from fire services and taxes to schools, child welfare and the health service. In order to develop these new services, the public sector can learn from the way in which the internet companies have been successful. These have largely used experimentation when working on developing new products and regular improvements. For example, Google says it is conducting 12,000 experiments a year.[96]

One reason for this is that digitalisation itself opens the way for a greater degree of experimentation. It is easy to make changes to digital services, it is possible to upscale faster and information about the effects is often available more quickly. In other words, management is given the opportunity to replace or supplement conceptual assessments and reports with prototypes that provide quick response at a low cost. In this way, you can find out what works before rolling out new services to the entire population.

In a survey conducted for the Norwegian Board of Technology and the Data Protection Authority in 2016,[97] Norwegians are positive about services that make use of predictive models and personalised services. For example, 71 per cent say they are positive about personally-adjusted measures to get the unemployed into work. 65 per cent are positive about the fact that the Tax Administration uses predictive analyses to identify people at high risk of committing fraud. The survey shows that citizens are ready, and the public sector should start experimenting with new services.

[95] New Economics Foundation (2012)
[96] Alliance for Useful Evidence (2015)
[97] Survey by Opinion, for the Norwegian Board of Technology and the Data Protection Authority

However, the public sector differs from private companies in important ways. The services can be based on rights, the requirement for transparency and equal treatment will be different and citizens cannot easily switch to another supplier The public sector cannot "move fast and break things" in the pursuit of innovation and market power, as the practice has been in Silicon Valley.

SUPPORT DIGITAL DEVELOPMENT FROM THE TOP

In Finland, the introduction of an experimental culture is one of the strategic objectives of the government's manifesto.[98] Such support from the top political level is important to create space for testing new services in the public sector. By default, experimentation will sometimes produce poor results, and agencies lower down need to be covered for this. At the same time, such central support could ensure that the testing is systematic and ambitious enough.[99]

In Great Britain, several digital initiatives such as Open Policy Lab and The Behavioural Insights Team have been assigned to the Cabinet Office, which report to the Prime Minister. This shows that innovation and experiments have solid support and are coordinated.

CREATE A LAB FOR THE PUBLIC SECTOR

The public sector usually does not consist of flexible organisations where it is easy to experiment. In an early phase, therefore, it may be appropriate to organize stand-alone units that promote this.

In Great Britain and Denmark, public entities have been established that test the use of new technology and new services. Both the British Open Policy Lab[100], and the Danish Mindlab[101] operate outside traditional organisational lines. They go into agencies and departments where there is a desire to test and improve processes in the services they provide.

If the experiments are successful, measures can be implemented at a national level. An independent organisation enables them to contribute innovative

---

[98] Prime Minister's Office, Finland (2015)
[99] Alliance for Useful Evidence (2015)
[100] https://openpolicy.blog.gov.uk/about/
[101] Mindlab.dk

thinking around complex issues. The OECD points out that such organisations can contribute to change in areas where it is difficult to challenge existing practices.[102]

In large cities like New York[103], Chicago[104] and New Orleans[105] "labs" have been set up for data analysis. These analyse large datasets from many of the city's services in order to create new insights and practices. One example is how New York City's fire department conducts inspections of buildings with a high fire hazard (see Chapter 4).

HELP PILOTS TO FLY

Pilot projects in the public sector often create enthusiasm and have a great impact on local communities, but few projects are scaled up and contribute to the further development of national policies and the public sector as a whole. Once the project period and funding are over, knowledge development and testing also stop.[106]

A public sector experimentation program must therefore be based on a systematic approach, so that you learn along the way and retain knowledge about why the project was successful or not.[107]

One method for evaluating the effect of new measures is randomised control trials (RCT). A sample of individuals or institutions (such as schools or municipalities) is randomly placed in a test group or a control group. New measures to be evaluated are tried out on the test group, while the control group carries on as usual. After a given time, the test group is compared with the control group. Such testing is particularly useful for digital services, as it is easy to make small changes and get results quickly.[108]

Ever since the Blair government, What Works Centres in Great Britain have emphasised that political decisions should be informed by knowledge of what

---

[102] OECD (2013)
[103] http://www1.nyc.gov/site/analytics/index.page
[104] https://www.cityofchicago.org/city/en/depts/doit/provdrs/data_science.html
[105] http://www.nola.gov/performance-and-accountability/nolalytics/
[106] Andreassen, Kjekshus, and Tjora (2015)
[107] OECD (2017)
[108] Handforth (2017)

works.[109] They examine which measures at any time are most effective and active in various parts of the public sector, such as schools, health, crime prevention and care services.[110] One example is the Education Endowment Foundation, which works to ensure that various initiatives in schools are tested and evaluated. Amongst other things, they have developed a "Teaching and Learning Toolkit"[111] which summarises the effect of measures such as the use of technology, the introduction of school uniform and the learning effect of homework.

Denmark is also investing in evidence-based policies, and the government has set aside DKK 250 million for the next four years to put evidence-based measures on the agenda.[112] Initially, it will focus on developing and testing methods to clarify the effect of various measures. Then these methods will be rolled out to all Danish municipalities.

Here too, digitalisation of the services can help. A number of Danish municipalities are now analysing measures in the social field, by looking at historical data about their users. The municipalities hope that big data analyses can find patterns and contexts that can document how different measures have influenced citizens.[113]

DON'T ONLY INVITE CONSULTANTS TO SOLVE THE PROBLEMS

Major public sector projects have not always been painless, especially where digital solutions are involved. Many different considerations need to be weighed against each other and the projects have often become large and complex. At the same time, relatively few players are involved in the technical solutions.

In some cases, it may be advisable to bring in more players who together can study how a concrete problem can be solved in the best possible way.

Hackathons bring together different IT developers, experts, users and policy makers for a short period of time – often only a few days or weeks – to consider possible solutions to a specific problem. The aim is not to develop ready-made solutions, but rather to develop technical prototypes and pilots that can tested

[109] "What Works Network", Cabinet Office
[110] What Works Network (2014)
[111] https://educationendowmentfoundation.org.uk/resources/teaching-learning-toolkit/
[112] Mandag Morgen (2016)
[113] Mandag Morgen (2017)

in reality, without these having to accommodate all the existing technical and regulatory constraints.

Hackathons have recently been used by public services in several countries and cities worldwide. In Norway, the Agency for Public Management and eGovernment (Difi), and the Norwegian Mapping Authority organised theHack4no[114] competition, where entrepreneurs, students and others use public data to create new services. In India, the authorities have opened the way for inclusive innovation processes through hackathons. In the Smart India Hackathon, a number of ministries and other public institutions can ask for help in solving specific challenges in their digital services.[115]

In other countries, the concept has been taken further and hackathons are included as part of the competitive bidding for public procurements. In 2016, the Finnish authorities launched a platform to support experimentation in the development of services. When this platform was to be developed, a hackathon was held instead of traditional competitive bidding.[116] This made it possible to see early prototypes of alternative solutions before decisions were taken. The contributions were assessed anonymously by a jury.[117]

In Mexico City, citizens have been involved in collecting information about the city's public transport. The city has a vast network of minibuses that operate on more than 1,500 different routes. Due to its size, it has been difficult to get an overview of where the routes go and at what time. In a new project to chart this, an app has been developed[118] to collect GPS data. The app is designed as a game, and citizens have been encouraged to play this game when they are travelling on buses.

In this way, the city has been mapped with the routes and times for buses. The citizens collect points by playing, which they can redeem for cash. After the most popular routes were surveyed, the more remote routes rewarded with higher scores. In this way, citizens were encouraged to contribute to mapping all the

[114] http://hack4.no/pages/om-hack4no
[115] https://innovate.mygov.in/sih2017/
[116] http://kokeilevasuomi.fi/en/design-contest
[117] Experimental Finland (2016)
[118] http://www.mapatoncd.mx/

routes. Over 3,500 citizens participated in the survey, and all data that was collected has been made publicly available. The data sets have also been used in hackathons.[119]

A DIGITAL SOCIAL CONTRACT

The inhabitants of the Nordic countries expressmore confidence in their national authorities than is the case anywhere else in Europe. Confidence in the system and in the public entities that manage, operate and develop it, is crucial for the general acceptance of the welfare model.[120] Therefore, the bar is set high when technology is used to solve old tasks in entirely new ways.

In this report, we propose that the government should use data from the citizens in new ways. This will involve more use of data than ever before, and the sharing of data between different public entities. The public sector wants to get closer to us - could it become too personal?

We thus need a clear social contract for digital interaction between citizens and public entities. The citizen herself controls her own physical "being". So, she must also have a real opportunity to control and shape her digital profile in public systems. Meanwhile, the authorities must make arrangements for independent monitoring and inspection.

GIVE CITIZENS CONTROL OF THEIR OWN DATA

Just as citizens manage their personal finances in online banking, citizens need a digital interface that provides an easy and understandable overview of how their personal data is managed and used by public entities. Citizens must also have the opportunity to actively provide or withdraw permission for various applications.

[119] Fast Company (2016)
[120] Green Paper 2011:7, chapter 3.3

In Norway, citizens currently have limited control over data about themselves. Citizens' data is located in various private and public "silos", with different policies for collecting, sharing and use. Thus, it is also difficult to understand, assess and manage the risks associated with data collection and use.

Personal Data Stores (PDS) is a generic term for technologies that give the individual the ability to collect, file, update, correct, analyse and share personal data with other players. The ability to grant or revoke access permits to third parties is a particularly important element.[121]

One example is Healthbank, a Swiss sharing service for health data owned by the users. Here, citizens collect health data from, for example, doctor visits, fitness apps, self-testing, and decide for themselves with whom the data is to be shared and what the data can be used for. For example, the patient can choose to share data with research projects. The citizen has full control over how the data is used at all times, and is free to change the sharing arrangements.[122]

In Estonia, citizens already have access to almost all the data recorded about them through a portal.[123] The portal provides citizens with access to logs of who has seen and used their information. They are also able to alter entries that are not correct. [124]

In 2015, Open Knowledge Finland and the Finnish Transport and Communications Ministry drafted a conceptual outline with frameworks, principles and a description of a possible model that provides citizen with full control over their

---

[121] A number of different initiatives are now trying to use PDS technologies to give individuals greater control over their personal data in the digital economy.

- The British Mydex gives the user the opportunity to store, manage and share data in an encrypted area, to which the user alone has access. Third parties who want access must sign up to the Mydex network and accept the rules of use defined by the user before any data is released.
- At MIT Media Labs, the users have full control of their own data which is never shared directly with third parties. However, third parties can ask questions associated with the data sets, and get responses in accordance with the rules defined by the user. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0098790
- The Dutch Qiy network gives the users control of their own data via a portal. These are primarily found amongst various commercial and state third parties, but through the Qiy network, third parties are required to adhere to stringent guidelines for use and mandatory encryption.

[123] https://www.eesti.ee/eng/

[124] Government Digital Service Blog (2013)

own data and how such data is shared and used by both private and public players.[125] The aim of the framework is to ensure digital human rights and at the same time open the way for more data-driven innovation, based on mutual trust between citizens, authorities and companies. The Ministry now facilitates a network of different organisations that have started pilot projects with "MYDATA", including within health.[126]

ENSURE THAT DATA BENEFITS THE COMMUNITY

Good management of the oil resources on the Norwegian continental shelf gave political space to develop the Norwegian welfare state and has helped to ensure the high level of welfare we enjoy today. Similarly, it is important that public data is treated as a national resource and managed in a way that ensures future prosperity for the community.

Norway has a well-organised public sector with activity data from a variety of different areas of society. As such, Norway has a competitive advantage compared to many other countries. The public sector also has a stated goal of making public data freely available, so that businesses and civil society can contribute to greater efficiency, innovation and economic development.[127]

The aim of greater transparency and wider access to public data must be complemented by political guidelines that ensure that citizens can reap the benefits of public data. These must be managed in a way that strengthens future welfare and prosperity.

CLARIFY VALUES AND OWNERSHIP

Machine-learning algorithms are trained on data. Without data as raw material, there can be no artificial intelligence. Public institutions are natural targets for suppliers of machine learning because they often possess unique and large data sets in important areas, such as health, education and transport.

Public data therefore has a special value, not only for the public sector but also for private players wanting to develop commercial services. At least two questions arise from this:

---

[125] Ministry of Transport and Communication (2015)
[126] https://mydatafi.wordpress.com/
[127] White Paper 27 (2015-2016)

What exactly is the value of public data? As with the oil industry, industrial policy for public data must be organised so that the values benefit the wider society. When public data is released or shared with third parties, the community must gain added value in terms of new business development, jobs, tax revenues or better and cheaper public services.

When foreign companies were given access to the oil resources on the Norwegian continental shelf, they had to help to train Norwegian companies and to support Norwegian industry. This laid the foundation for a national oil industry. Similarly, should foreign access to public data in Norway be conditional upon digital expertise and resources being used to strengthen Norwegian businesses or build up similar expertise in Norway?

The second question relates to ownership. When public data is used to train algorithms that may have commercial value outside the Norwegian public sector, who then owns the resulting algorithms – the service provider or the public sector? Should the public sector have to pay for services trained using public data? Is it right for public institutions to exchange public data in return for free services?

STEER CLEAR OF MONOPOLIES

Commercial artificial intelligence is currently dominated by a handful of large foreign IT companies with access to large amounts of data. Network effects reinforce this position: the more people who use the services, the more data the companies acquire. With more data, services can be further improved so that more users are attracted to them, which in turn produces further data.

Good financial resources and unique insight into the digital economy also make it possible for the largest companies to buy up innovative start-up companies that could threaten the market position. It will often be very difficult for smaller players to compete on equal terms.

This may also have implications for public procurement: In Great Britain, a group of publicly-funded hospitals shared anonymised health data with the London-based company DeepMind, which is owned by Google and is a world leader in artificial intelligence. It is understandable that the British healthcare system wants a partnership with this environment in order to improve public health services.

Meanwhile, critics of the agreement have expressed concern that the company will benefit from access to public data to develop a commercial AI platform for healthcare. The agreement could help the company consolidate its dominant position, displacing smaller players from the market, and eventually creating an unfortunate dependency on a single player.[128]

Network effects can be large in the face of data-intensive technologies such as machine learning. Therefore, it is necessary for politicians to think long-term about competition conditions, first-mover advantage and monopolisation in the delivery of future public services.

SET RULES FOR EXPERIMENTATION

In practice, experimentation will often mean that a small group of the population is subject to different treatment than the rest of the population during the trial period. How does it feel when you discover that your neighbour who is in the test group is getting a basic income, while you, as a jobseeker, are not?

We would argue that this is acceptable if the experiments benefit all the citizens and the public sector in the end. It provides an opportunity to test and improve promising ideas on a small group before national implementation. It may also make it easier if you do not succeed, simply because you have a limited number of citizens who are affected by the measure at the trial stage.[129]

The public sector needs room to experiment, but rules need to be drawn up so that citizens can be confident that activities operate within a strict ethical framework. Examples of such rules are:

- Experimentation should have a clear benefit to society, without exposing citizens to unnecessary risk
- Personal privacy should be assured throughout the process, for example by anonymising data. [130]
- Participation in such experimentation should be voluntary, and it should be possible to opt out.

[128] Powles and Hodson (2017)
[129] Alliance for Useful Evidence (2015)
[130] Nokso-Koivisto and Kaskinen (2016), p 10

- As a starting point, there should be full openness about all experimentation in the public sector and the consequences for citizens.
- In some cases, such transparency can be counterproductive, as people may then behave differently than they would otherwise have done. This may apply to experimentation with digital nudges. If the experimentation has consequences for citizens' life choices, options, finances or health, transparency should be given the highest priority.

ALGORITHM SUPERVISION

In chapters 3 and 4 of the report we pointed out how algorithms can reinforce social inequalities, lead to inadvertent stigma and discrimination, and hide normative choices. Machines are taking over tasks that were previously done by humans, making it difficult for lay people to understand the assessments that have been made. Artificial intelligence reinforces this because not even experts can always explain how algorithms make their assessments.

Citizens therefore need help above and beyond gaining access to their own data. In Great Britain, the creation of a "machine intelligence commission" has been proposed[131], but we believe that existing institutions such as the Data Protection Authority and the Office of the Auditor General of Norway could potentially address this at least as well, if their legal and social science expertise is supplemented with insights into the technology.

The Data Protection Authority currently controls the collection and processing of personal data in accordance with the law, and ensures that errors and omissions are corrected. In the future, if public entities want to use and share data about citizens to a greater extent, and develop algorithms for personalised and predictive services, the Data Protection Authority has an important role in ensuring that citizens' personal data is safeguarded.

In Norway, the Office of the Auditor General of Norway ensures that the national administration uses the community's assets and values in the way that Parliament has decided. The performance audit assesses whether fundamental values are met, such as equality and transparency in the services. This may also

[131] NESTA (2016)

include an assessment of the measures the administration uses to influence citizens and whether it is possible to track all the decisions and elements in a case management process.[132] In the future, performance audits should also include the supervision of the algorithms in public administration.

Such audits should be able to scrutinize the entire chain associated with algorithmic systems, such as:

- data collection and cross-coupling
- machine training and evaluation
- whether the systems are being used correctly by staff
- what opportunities citizens have to ask for an explanation or contest algorithmic decisions
- assess whether the responses are sufficiently good and broad

[132] Office of the Auditor General of Norway (2012)

REFERENCES

Aftenposten (2016) Bjørnestad, S., *Ekspertgruppe varsler om skatt på 65 prosent*. Aftenposten, published 10.02.2016
Retrieved from: http://www.aftenposten.no/okonomi/Ekspertgruppe-varsler-om-skatt-pa-65-prosent-9160b.html

Aftenposten (2016) Kirkebøen, S. E., *Moderne teknologi effektiviserer helse- og omsorgstjenestene*. Aftenposten Osloby, published 20.05.2015
Retrieved from: http://www.osloby.no/Moderne-teknologi-effektiviserer-helse--og-omsorgstjenestene-8025793.html

Alliance for useful evidence (2015) *Better public services through experimental government*. Alliance for useful evidence
Retrieved from: http://www.alliance4usefulevidence.org/publication/better-public-services-through-experimental-government/

Andreassen, Kjekshus. og Tjora (2015) *Survival of the project: A case study of ICT innovation in health care*. Social Science and Medicine 132 (2015)

Australian Government (2012) *Australian Public Service ICT Strategy 2012-2015*. Australian Government, Dept. of Finance
Retrieved from: https://www.finance.gov.au/policy-guides-procurement/ict_strategy_2012_2015/

Australian Government (2015) *Public Sector Data Management*. Australian Government, Dept. of the Prime Minister and Cabinet
Retrieved from: https://www.dpmc.gov.au/sites/default/files/publications/public_sector_data_mgt_project.pdf

Australian Government (2015) *Australian Public Service Better Practice Guide for Big Data*. Australian Government, *Dept*. of Finance
Retrieved from: http://www.finance.gov.au/archive/big-data/

Baumol, W. J. (2012) *The Cost Disease. Why Computers Get Cheaper and Health Care Doesn't*. Yale University Press, New Haven

Bjørkquist, C. (2015) *Erfaringer fra pilotering av velferdsteknologi i Sarpsborg kommune. Mobile trygghetsalarmer, digital medisindispenser og KOLS-monitorering*. Høgskolen i Østfold
Retrieved from: https://brage.bibsys.no/xmlui/handle/11250/285071

Brookings Institution (2016) *Are you safe? Facebook's Safety Check and the future of emergency management*. Brookings Institution, published 31.08.2016
Retrieved from: https://www.brookings.edu/blog/techtank/2016/08/31/are-you-safe-facebooks-safety-check-and-the-future-of-emergency-management/

Bulger, M (2016) *Personalized Learning: The Conversations We're Not Having*. Data & Society Research Institute.
Retrieved from: http://datasociety.net/pubs/ecl/PersonalizedLearning_primer_2016.pdf

Cabinet Office, UK (2011) *Government ICT Strategy*
Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85968/uk-government-government-ict-strategy_0.pdf

Civil Service Quarterly (2015) Athow, J., Lord, J. og Potter, C., *Predicitive analytics: the science of non-compliance*. Cabinet Office, published 27.01.2015
Retrieved from: https://quarterly.blog.gov.uk/2015/01/27/predictive_analytics/

Copeland (2015) *Big Data in the Big Apple. The lessons London can learn from New York's data-driven approach to smart cities*. Capital City Foundation
Retrieved from: https://policyexchange.org.uk/wp-content/uploads/2016/09/big-data-in-the-big-apple.pdf

CSIRO (2014) *A digitally-enabled health system*. Commonwealth Scientific and Industrial Research Organisation
Retrieved from: https://publications.csiro.au/rpr/download?pid=csiro:EP145606&dsid=DS1

CSIRO (2016) *Improving patient care and reducing waiting times*. Commonwealth Scientific and Industrial Research Organisation
Retrieved from: https://www.csiro.au/en/About/Our-impact/Our-impact-in-action/Health/Patient-care

Dagsavisen (2016) *Tidsbank på Tøyen*. Dagsavisen, published 02.08.2016
Retrieved from: http://www.dagsavisen.no/oslo/tidsbank-pa-toyen-1.760183

Digi.no (2016) *Ny IT-plattform skal følge Oslo-innbyggerne fra vugge til grav* Digi.no, published 29.09.2016
Retrieved from: http://www.digi.no/artikler/ny-it-plattform-skal-folge-innbyggerne-fra-vugge-til-grav-med-api-er-a-bygge-videre-pa/358689

Education Week (2014) Cody, A., *Is Common Core Creating the Code for a Computerized Education System?* Education Week, published 09.05.2014
Retrieved from: http://blogs.edweek.org/teachers/living-in-dialogue/2014/05/is_common_core_creating_the_co.html

Episerver (2016) *Personaliserte nettsider kuttet antall henvendelser*. Episerver, published 17.04.2016
Retrieved from: https://episerver.no/artikler/2016/02/personaliserte-nettsider-kuttet-antall-henvendelser/

EU (2012) *eGovernment Benchmark Framework 2012-2015*. European Union
Retrieved from: https://ec.europa.eu/digital-single-market/sites/digital-agenda/files/eGovernment%20Benchmarking%20method%20paper%20published%20version_0.pdf

EU (2016) *The Digital Economy & Society Index*. European Union
Retrieved from: https://ec.europa.eu/digital-single-market/en/desi

EU (2016) *Digital Scorecard*. European Union
Retrieved from: https://ec.europa.eu/digital-single-market/en/digital-scoreboard

European Commission Joint Research Centre (2014) Institute for Prospective Technological Studies. *The Potential of Time Banks to support Social Inclusion and Employability*.
Retrieved from: http://ftp.jrc.es/EURdoc/JRC85642.pdf

Evans, N (2012) *A 'nudge' in the wrong direction* Institute of Public Affairs Review Volume 64, Desember 2012
Retrieved from: https://ipa.org.au/publications/2129/a-'nudge'-in-the-wrong-direction

Experimental Finland (2016) *Mesenaatti to build the digital platform for Experimental Finland – Ambientia won the hackathon.*
Retrieved from: http://kokeilevasuomi.fi/en/article/-/asset_publisher/10616/mesenaatti-rakentaa-kokeilevan-suomen-digialustan-ambientia-voitti-hackathonin

Farell H. and Shalizi C. (2011*) 'Nudge' policies are another name for coercion.* New Scientist Issue 2837, published 05.11.2011
Retrieved from: https://www.newscientist.com/article/mg21228376-500-nudge-policies-are-another-name-for-coercion

Fast Company (2016) *Mapping Mexico City's Vast, Informal Transit System.* Fast Company, published 04.08.2016
Retrieved from: https://www.fastcompany.com/3058475/mapping-mexico-citys-vast-informal-transit-system

Finnish Ministry of Transport and Communication (2015) *MyData – A Nordic Model for human-centered personal data management and processing*
Retrieved from: https://www.lvm.fi/en/-/mydata-a-nordic-model-for-human-centered-personal-data-management-and-processing-860616

Forbes (2015) *The A.I. doctor will see you now.* Forbes Media, published 12.11.2015
Retrieved from: http://www.forbes.com/sites/parmyolson/2015/11/12/the-a-i-will-see-you-now/#8537bc15159b

Fædrelandsvennen (2014) *Norske læringsspill har millioner av brukere - i USA*. Fædrelandsvennen, published 31.08.2014
Retrieved from: http://www.fvn.no/okonomi/siste_nytt/Norske-laringsspill-har-millioner-av-brukere---i-USA-2665515.html

Goodman, B. and Flaxman, S. (2016) *European Union regulations on algorithmic decision-making and a «right to explanation".* Oxford: Oxford Internet Institute and University of Oxford, department of statistics
Retrieved from: https://arxiv.org/pdf/1606.08813.pdf

Government Digital Service Blog (2013) "*Government as a data model": What I learned in Estonia.* Government Digital Service Blog, published 31. 10.2103
Retrieved from: https://gds.blog.gov.uk/2013/10/31/government-as-a-data-model-what-i-learned-in-estonia/

Government Offices of Sweden (2015) *Nu digitaliserer vi det offentliga Sverige*. Pressemelding
Retrieved from: http://www.regeringen.se/pressmeddelanden/2015/10/nu-digitaliserar-vi-et-offentliga-sverige/

Green Paper 2011:7 *Velferd og migrasjon - den norske modellens framtid*. Norsk offentlig utredning
Retrieved from: https://www.regjeringen.no/no/dokumenter/nou-2011-07/id642496/sec4?q=tillit#KAP3-3

Green Paper 2015:1 *Produktivitet - grunnlag for vekst og velferd***.** Norsk offentlig utredning
Retrieved from: https://www.regjeringen.no/no/dokumenter/nou-2015-1/id2395258/

Green Paper 2017: 4 *Delingsøkonomien – muligheter og utfordringer*. Norsk offentlig utredning
Retrieved from: https://www.regjeringen.no/no/dokumenter/nou-2017-4/id2537495/

Handforth, C. (2017) *Ideology + technology. Using digital, data and technology to build better government and to deliver better public services*. Winston Churchill memorial trust.
Retrieved from: http://www.wcmt.org.uk/fellows/reports/ideology-technology-using-digital-data-and-technology-build-better-government-and

Harvard Business Review (2014) Schrage, M., *Big Data's Dangerous New Era of Discrimination* Harvard Business Review online, published 29.01.2014
Retrieved from: https://hbr.org/2014/01/big-datas-dangerous-new-era-of-discrimination

Holmøy, E. and Kjelvik J. (2013) *Plassering av den norske helsesektoren i tid og rom* i Ramm, J. *Eldres bruk av helse- og omsorgstjenester*. Statistisk sentralbyrå
Retrieved from: https://www.ssb.no/helse/artikler-og-publikasjoner/_attachment/125965?_ts=13f8b5b6898

Intro International and The Oslo School of Architecture and Design (2016) *Velferdsteknologi i Sentrum. Innføring av velferdsteknologi i sentrumsbydelen i Oslo. En kartlegging av effekten*. Intro International og Arkitekt- og designhøgskolen i Oslo
Retrieved from: https://helsedirektoratet.no/Documents/Velferdsteknologi/Velferdsteknologi%20i%20sentrum_delleveranse%202%20av%202.pdf

Knewton (2014) *Gyldendal in Norway Partners with Knewton to Build Personalized Courses for Students*. Pressemelding, published 21.05.2014
Retrieved from: https://www.knewton.com/resources/press/gyldendal-in-norway-partners-with-knewton-to-build-personalized-courses-for-students/

London Ambulance Service (2015) *Getting to the heart of the matter*. London Ambulance Service, published 21.10.2015
Retrieved from: http://www.londonambulance.nhs.uk/news/news_releases_and_statements/getting_to_the_heart_of_the_ma.aspx?lang=en-gb

LSE (2016) de Rosnay, M. D., *Algorithmic Transparency and Platform Loyalty or Fairness in the French Digital Republic Bill* London School of Economics and Political Science, Media Policy Project blog, published 22.04.2016
Retrieved from: http://blogs.lse.ac.uk/mediapolicyproject/2016/04/22/algorithmic-transparency-and-platform-loyalty-or-fairness-in-the-french-digital-republic-bill/

Mandag Morgen (2016) *Karen Ellemann har 250 millioner til socialindsatser der virker*. Mandag Morgen, published 17.10.2016
Retrieved from: https://www.mm.dk/karen-ellemann-har-250-millioner-til-socialindsatser-der-virker/

Mandag Morgen (2017) *Data-mining skal understøtte sociale investeringer*. Mandag Morgen, published 20.03.2017
Retrieved from: https://www.mm.dk/data-mining-skal-understoette-sociale-investeringer/

Martin-Lesende, I. (2013) *Impact of telemonitoring home care patients with heart failure or chronic lung disease from primary care on healthcare resource use.* BMC Health Services Research 13:118
Retrieved from: http://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-13-118

Mayer-Schönberger, V. and Cuckier, K. (2013) *Big Data: A Revolution That Will Transform How We Live, Work, and Think.* HMMCO, New York

Mayer-Schönberger V. and Cukier K. (2014) *Learning with big data. The future of education.* HMMCO, New York

McKinsey Global Institute (2011) *Big data: The next frontier for innovation, competition and productivity*. McKinsey Global Institute
Retrieved from: http://www.mckinsey.com/business-functions/business-technology/our-insights/big-data-the-next-frontier-for-innovation

MediaNorway. *Andel som har smarttelefon.* Medienorge
Retrieved May 2017 from: http://www.medienorge.uib.no/statistikk/medium/ikt,oppdatering/388

mHealthIntelligence (2016) *Kaiser CEO: Telehealth Outpaced In-Person Visits Last Year*. mHealth Intelligence, published 11.10.2016
Retrieved from: http://mhealthintelligence.com/news/amp/kaiser-ceo-telehealth-outpaced-in-person-visits-last-year

NESTA (2016) *A machine intelligence commission for the UK: how to grow informed public trust and maximize the positive impact of smart machines.* NESTA
Retrieved from: http://www.nesta.org.uk/sites/default/files/a_machine_intelligence_commission_for_the_uk_-_geoff_mulgan.pdf

NESTA (2016) *Connected Councils: A Digital Vision of Local Government in 2025.* NESTA
Retrieved from: http://www.nesta.org.uk/sites/default/files/connected_councils_report.pdf

NESTA (2016) *Datavores of Local Government. Using data for make services more personalised, effective and efficient*. NESTA.
Retrieved from: http://www.nesta.org.uk/publications/datavores-local-government

NESTA (2016) *What does it take to go big? Insights on scaling social innovation from the Centre for Social Action Innovation Fund.* NESTA
Retrieved from: http://www.nesta.org.uk/sites/default/files/cfsaif_what_does_it_take_to_go_big.pdf

New Economics Foundation (2012) *Public Services inside out. Putting co-production into practice.* New Economics Foundation
Retrieved from: http://donate.neweconomics.org/page/-/files/Public_Services_Inside_Out.pdf

New Zealand Government (2014) *Speech to the SAS Users New Zealand Conference.* New Zealand Government
Retrieved from: https://beehive.govt.nz/speech/speech-sas-users-new-zealand-conference

New Zealand Government (2015) *Predictive Modelling*.
Retrieved from: https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/research/predicitve-modelling (hentet mars 2017)

Nokso-Koivisto and Kaskinen (2016) *Social experiments in Finland. From a research, ethics and legal perspective.* Kokeileva Suomi

Retrieved March 2017 from: http://kokeilevasuomi.fi/documents/1777665/3308603/Social+Experiments+in+Finland.pdf/a42076f4-5536-4617-a4b1-c31b10fbeb55

OECD (2013) *Observatory of Public Sector Innovation: Identifying policy levers to promote innovation.* OECD Conference Centre
Retrieved from: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=GOV/PGC(2013)15&docLanguage=En

OECD (2017) *Embracing Innovation in Government. Global Trends.*
Retrieved from: http://www.oecd.org/gov/innovative-government/embracing-innovation-in-government.pdf

Office of the Auditor General of Norway (2012) *Retningslinjer for forvaltningsrevisjon*
Retrieved from: https://www.riksrevisjonen.no/revisjonsmetodikk/Forvaltningsrevisjon/Documents/Retningslinjer.pdf

Pestoff, V. and Skondal, E. (2012) *Innovations in public services: co-production and new public governance in Europe. I Botero, A. Gryf Paterson, A. and Saad-Sulonen, J. (Eds) Towards peer production in public services: cases fram Finland.* Aalto University, Helsinki
Retrieved from: http://co-p2p.mlog.taik.fi/files/2012/06/p2p-public-services-finland-2012.pdf

Policy Exchange (2015) Copeland, E., *People who liked Nudge also liked Digital Nudge.* Policy Exchange, published 25.09.2015
Retrieved from: http://www.policyexchange.org.uk/media-centre/blogs/category/item/people-who-liked-nudge-also-liked-digital-nudge

Powles and Hodson (2017) *Google DeepMind and healthcare in an age of algorithms.* Health and technology, published 16.03.2017
Retrieved from: https://link.springer.com/article/10.1007/s12553-017-0179-1

Prime minister's office Finland (2015) *Statsrådets meddelande till riksdagen om programmet för statsminister Juha Sipiläs regering, tillsatt 29.5.2015.*
Retrieved from: https://www.eduskunta.fi/SV/vaski/JulkaisuMetatieto/Documents/SRM_1+2015.pdf

Prime Minister's Office in Singapore, Public Service Division. Challenge Magazine (2014) *Policy Making Tip: Nudge, Not Shove*
Retrieved from: http://www.challenge.gov.sg/print/cover-story/a-tip-for-policy-making-nudge-not-shove

Scientific American (2017) *Will Democracy Survive Big Data and Artificial Intelligence?* Scientific American, published 25.02.2017
Retrieved from: https://www.scientificamerican.com/article/will-democracy-survive-big-data-and-artificial-intelligence/

Siegel, E. (2013) *Predictive Analytics: The Power To Predict Who Will Click, Lie, Buy or Die*. John Wiley & Sons, Hoboken New Jersey

Thaler, R. and Sundstein, C. (2008) *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Penguin Group, London

The Atlantic (2015) Kirchner, L., *When Discrimination Is Baked Into Algorithms* The Atlantic Magazine, published 06.09.2015
Retrieved from: http://www.theatlantic.com/business/archive/2015/09/discrimination-algorithms-disparate-impact/403969/

The Danish Agency for Digitisation (2013) *Fællesoffentlig Strategi for Digital Velferd 2013-2020*.
Retrieved from: http://www.digst.dk/~/media/Files/Velfaerdsteknologi/Strategi-for-digital-velfaerd/digital_velfaerd.pdf

The Leadership Conference on Civil and Human Rights (2016) *Civil Rights and Tech Advocates Sound Alarm on Racial Bias in 'Predictive Policing'*. Pressemelding, published 31.08.2016
Retrieved from: http://www.civilrights.org/press/2016/predictive-policing-statement.html

The New York Times (2015) *Helping the poor in education: The power of a simple nudge*. The New York Times, published 17.01.2015
Retrieved from: http://www.nytimes.com/2015/01/18/upshot/helping-the-poor-in-higher-education-the-power-of-a-simple-nudge.html?_r=1&abt=0002&abg=1

The Norwegian Agency for Public Management and eGovernment (Difi) (2014) *Regelverk for digital kommunikasjon*.
Retrieved May 2016 from: https://www.difi.no/veiledning/ikt-og-digitalisering/regelverk-digital-kommunikasjon

The Norwegian Board of Technology (2012) *En skole for fremtiden*. Teknologirådet
Retrieved from: http://teknologiradet.no/wp-content/uploads/sites/19/2013/08/RTT-En-skole-for-fremtiden.pdf

The Norwegian Board of Technology (2014) *På nett med publikum. Hvordan smarttelefoner og sosiale medier gir nye muligheter for norsk politi.* Teknologirådet
Retrieved from: https://teknologiradet.no/wp-content/uploads/sites/19/2014/08/Rapport-Paa_nett_med_publikum.pdf

The Norwegian Board of Technology (2015) *Mobil helse for kronikere*. Teknologirådet
Retrieved from: http://d2dczhp6dhfxqb.cloudfront.net/sites/19/2015/02/RTT-Mobil-Helse-for-kronikere-endelig-versjon.pdf

The Norwegian Board of Technology (2015) *Forutseende Politi - kan dataanalyser hjelpe politiet til å være på rett sted til rett tid?* Teknologirådet
Retrieved from: http://teknologiradet.no/wp-content/uploads/sites/19/2013/08/ForebyggendeAnalyse_endelig_WEB.pdf

The Norwegian Board of Technology (2015) *Delingsøkonomien – grønn gründerboom eller løsarbeidersamfunn?* Teknologirådet
Retrieved from: https://teknologiradet.no/norge-2030/delingsokonomien-gronn-grunderboom-eller-losarbeidersamfunn/

The Norwegian Board of Technology (2016) *Mobile selvtester*. Teknologirådet
Retrieved from: https://teknologiradet.no/wp-content/uploads/sites/19/2013/08/RTT-mobile-selvtester-web.pdf

The Norwegian government (2009) *Regjeringens strategi for forebygging. Fellesskap – trygghet – utjevning.*
Retrieved from: https://www.regjeringen.no/globalassets/upload/JD/Vedlegg/Rapporter/Forebyggingsstrategi.pdf

The Norwegian government (2012) *Regjeringen vil fulldigitalisere forvaltningen*. Pressemelding
Retrieved from: https://www.regjeringen.no/no/aktuelt/regjeringen-vil-fulldigitalisere-forvalt/id677988/

The Norwegian Tax Administration (2016) *Prediktiv modell gir høy treffprosent på kontroll av selvangivelser*. Skatteetaten, Analysenytt 1/2016
Retrieved from: http://www.skatteetaten.no/globalassets/pdfer/skatteetatens_analysenytt/analysenytt-1_2016_web_hele.pdf

The Singapore Government, Infocomm Development Authority of Singapore, *ICT for Productivity and Growth Programme*
Retrieved May 2016 from: https://www.ida.gov.sg/Programmes-Partnership/Store/ICT-for-Productivity-and-Growth-IPG

The White House (2014) *Big Data: Seizing opportunities, preserving values*
Retrieved from: https://www.whitehouse.gov/sites/default/files/docs/big_data_privacy_report_may_1_2014.pdf

What Works Network (2014) *What Works? – Evidence for decision makers.* Cabinet office
Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378038/What_works_evidence_for_decision_makers.pdf

White Paper (2015-2016) *Digital agenda for Norge. IKT for en enklere hverdag og økt produktivitet***.** Melding til Stortinget
Retrieved from: https://www.regjeringen.no/no/dokumenter/meld.-st.-27-20152016/id2483795/?ch=1&q=

White paper (2016-2017) *Perspektivmeldingen 2017.* Melding til Stortinget
Retrieved from: https://www.regjeringen.no/no/dokumenter/meld.-st.-29-20162017/id2546674/

APPENDICES

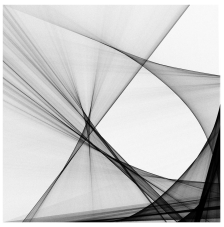
In this report, we were inspired by the report's themes and used illustrations generated by algorithms. Here we provide a brief explanation of how the illustrations were developed.

In generative art, algorithms "paint" the pictures and make the small choices along the way that an artist would have made. Generative art comes in many different forms. In this report, the pictures have been made by seeking the optimal solution to a mathematical problem, making choices based on random numbers and by mimicking processes in biology, among other things.

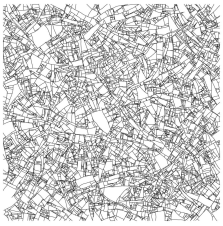
The picture on the cover is designed with a "hill-climbing" algorithm, which is given a picture of the Mona Lisa painting as a starting point. The algorithm then attempts, step-by step, to add geometric shapes onto a canvas, in such a way that each step is more similar to the original Mona Lisa image. The process is repeated until a satisfactory result is obtained. The process may be somewhat reminiscent of a mountain climber who is attempting to reach the summit in thick fog and poor visibility - if the path ahead neither flattens out nor drops away, she continues to climb.

In order to create the picture on the cover, we used the program "Primitive" from Michael Foglemann (Copyright (C) 2016 Michael Fogleman). You can read more about how the algorithm works here: https://github.com/fogleman/primitive#how-it-works-part-ii

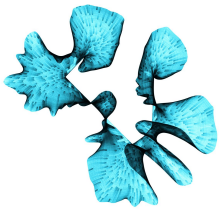
The illustrations inside the report were created by Anders Hoff, inconvergent.net



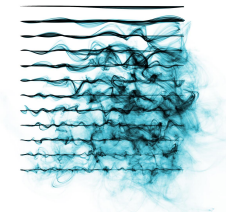
Square Step was drawn over time by pulling lines between two points that move randomly (independently) along the edge of a square. Illustration on page 43.



Fracture resembles cracks in glass, for example. You start with a few fractures that spread in different directions. As these grow, new fractures occur randomly from the "tip" of the existing fractures while they grow. All fractures stop when they collide with another fracture. Illustration on page 11.



Differential Line is based on a few simple principles from biological growth. Imagine a number of beads on a string. All beads are connected to their two neighbouring beads. Over time, growth is imitated by adding new beads. All beads have to be close to their two neighbours, but at the same time they are trying to avoid colliding with other beads in the system. This picture is drawn by simulating such growth over time and regularly drawing the structure as it looks at every step of the development. Illustration on page 6.



Sand Spline develops over time by gradually moving the points that control a line. The points will be moved based on different amounts of "noise" that lead to different behaviours. Illustrations on pages 22 and 33.