Smart Government

How the civil service can use data intelligently

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McKinsey&Company

bitkom

Contents

Smart Government – what applications are possible?

"Data is the new oil" – and the intelligent leverage of data has now become critical to gaining a competitive advantage in the private sector.[1] Three trends explain this development: ever more and increasingly varied data can be collected. Costs for storing and analyzing the collected data are falling. And finally, scientific advances in the field of statistics and artificial intelligence offer increasingly improved possibilities for data analysis (e.g., machine learning, deep learning).

The data revolution also promises huge potential for the state, as evidenced by this report highlighting international success stories of "Smart Government". The term refers to the intelligent use of data to improve services, processes, and decisions in the civil service.

Practical examples of Smart Government fall into three categories: user friendly and efficient services for citizens and businesses, data-supported aid in decision-making for the civil service, and innovative use of "open data" (see Box).

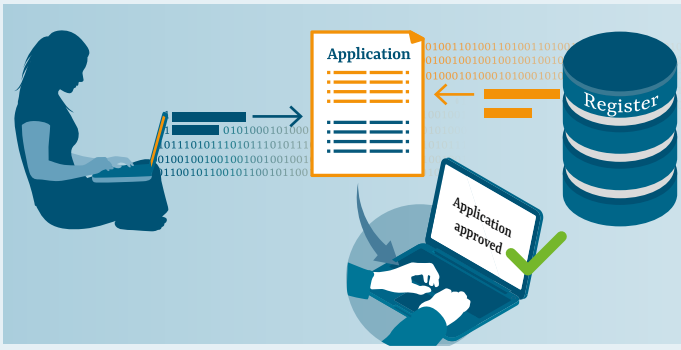
For each category, we have identified cases where the public sector has not only experimented with, but also successfully implemented the intelligent use of data. These success stories reveal a common pattern: if the civil service adopts a user-focused and agile approach, is open to innovative technologies and partnerships, and proactively addresses legal and political barriers, it can often achieve impressive results with astonishingly low costs.

Germany is also seeing some initial success stories (such as the data-supported monitoring of fish catch quotas – see p. 13-14). In general, however, there is still much untapped potential when it comes to Smart Government in Germany. Taking the success factors identified in the case studies as a basis, we conclude the report by recommending concrete steps for politicians and the civil service to take in order to accelerate further development in Germany.

Box: Categories of Smart Government in practice

User friendly and efficient government services

1



Potential

~ 50-60% time savings for citizens and civil service[2]

~ EUR 1 billion annual savings for businesses[2]

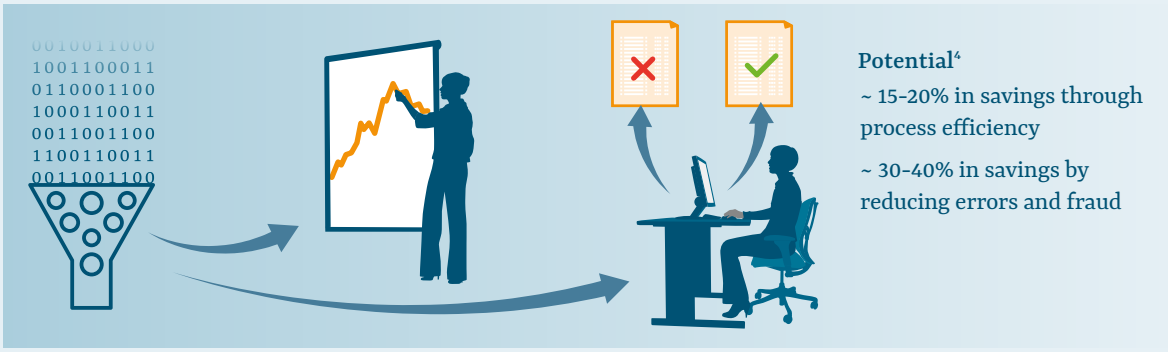
10 times more trust in the state and its bodies[3]

Many citizens and businesses now expect government services to be just as simple to access online as services offered by the private sector. One key example is the prepopulation of forms – citizens and companies should only have to share their details with the state once ("once-only" principle).

Users can even access some services without submitting an application; local authorities automatically trigger the necessary processing as soon as a certain event occurs and independently compile the required information from existing registers – in Austria, for example, an application is no longer necessary to claim child benefit ("Familienbeihilfe"). Electronic forms and automated data retrieval also increase efficiency within authorities.

Ultimately, the intelligent use of data paves the way for completely new government services – such as AI-based chatbots to advise citizens online.

2 Data-supported aid in decision-making for the civil service



Potential[4]

~ 15-20% in savings through process efficiency

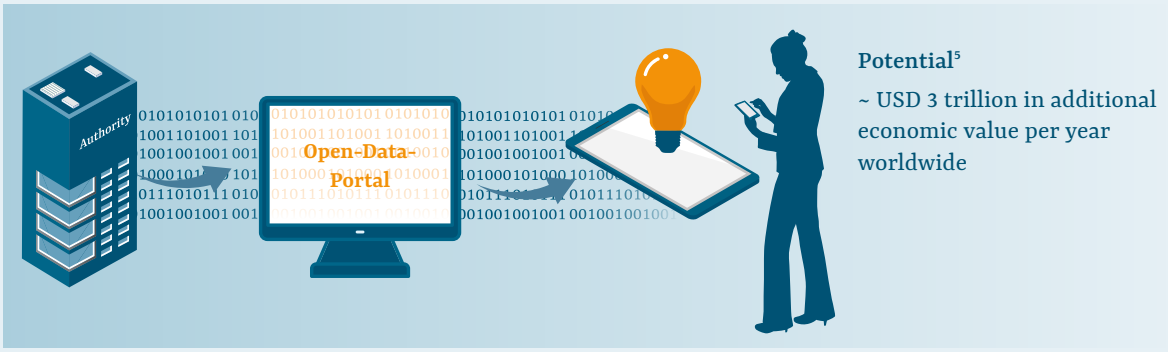
~ 30-40% in savings by reducing errors and fraud

Model-based data analyses can significantly improve many strategic and operational decisions taken in the civil service.

When it comes to complex decisions, it is often extremely helpful for employees in the respective authorities to be able to visualize the relevant information at a glance. Take customer support in employment centers for example: agents can offer far more targeted advice if they have access to user friendly software to retrieve helpful information such as the customer's employment history or information about the local job market.

In other cases, statistical forecasts can significantly increase the quality and efficiency of internal processes. In some countries, such models are used to help filter tax returns for closer inspection and audit.

3 Innovative use of „open data“



Potential[5]

~ USD 3 trillion in additional economic value per year worldwide

Authorities possess vast pools of valuable data records that offer possibilities beyond civil service applications. They could share such information with third parties via portals or as part of targeted collaborations – for example with start-ups or research institutes.

This can lead to innovative applications that would not be possible without such collaborations. The civil service provides the data, while private initiatives deliver the necessary creativity, technical expertise, and financial resources.

Success factors for Smart Government

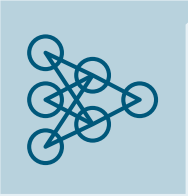
A glance at concrete applications demonstrates how Smart Government is being used successfully today. To this end, we have compiled ten examples from ten countries. In all cases, data in the public sector is used intelligently to design user friendly and efficient government services, support decision making in the civil service, or enable innovative applications from third parties. Each example therefore belongs to one of the three application categories of Smart Government. Seven typical success factors can be found across the cases.

Focus on the user

Successful initiatives always start with a clear understanding of the specific added value that can be offered to the user. Government services can only be made user friendly once developers precisely understand how complexity can be reduced for citizens. Authorities should therefore prioritize services that are relevant to the target group and design them so that citizens and businesses actually use them. The project "Smart Transport Moscow", for example, reduced access barriers by integrating citizen surveys into the already widely used public transport app of the city. Early and continuous inclusion of feedback is also vital to ensure ongoing improvement of the service.

Agile collaboration in interdisciplinary teams

Successful applications are created when interdisciplinary teams comprising functional, legal, and technical experts work together in an agile fashion. Involving all key perspectives leads to higher quality solutions. The agile approach allows products to be tested quickly with users and to improve them in iterative cycles, thus reducing the time required until a practical, functioning application can be released. One example of this is the intelligent monitoring of fish catch quotas in Germany. Working in short sprints, an interdisciplinary team produced subproducts in clearly defined development units of a maximum of four months. Weekly design thinking workshops co-chaired by an external IT provider were also held together with the involved authorities and eventual users of the software.



Central coordination of data linking and processing

Many successful projects require data to be linked from numerous sources and authorities, often with the involvement of a central player coordinating the process. In Sweden, the association of local authorities assumed this role when it came to linking data for social security applications. A project team coordinated the connection of numerous national registers as well as the use of the platform by almost all Swedish local authorities.

Openness for structural change through technology

In the case of particularly innovative applications, a key requirement is ensuring that all stakeholders are open-minded about the new technologies and the associated structural changes. A data-supported decision-making process often means radical change in the daily work of employees. For example, cases of suspected violations of fish catch quotas are now selected entirely automatically in Germany – the employee in the back office only has to examine the selections and determine which measures should be taken. Smart Government succeeds if managers and employees see the opportunities presented by such change – for example, more time for important tasks that would often otherwise be rushed.

"Privacy by design" – effective protection of personal data

When it comes to the use of civil service data, the protection of personal information is a key factor that must play an important role already in the design phase. In many cases, authorities can find pragmatic and creative solutions that ensure a high level of data protection. On its borger.dk platform, Denmark links personal data only at the time it is required following the digital authentication of the user.

Strategic partnerships

Strategic partnerships and collaborations help the civil service to build skills for implementing Smart Government and mobilizing external resources. The city of Helsinki, for example, worked with the Technical University of Munich to optimize and refine methods to analyze the energy efficiency of buildings as part of its "3D City Map". The collaboration of the French employment office and Bob Emploi is another example of how start-ups can help to develop innovative citizen services in short time frames.

Effective stakeholder management

Successful Smart Government initiatives require the close involvement of the senior levels of politics and the civil service to ensure visibility and support. This is particularly important for cross-authority projects where it is much easier for employees to devote the time required if given the express backing of superiors. Good public relations can often also be important to inform users about new services and to address potential concerns related to issues such as data protection. For instance, early in the development phase of its application, Bob Emploi was careful to communicate how exactly the application could benefit jobseekers.

Overview

Success stories from ten countries

Go directly to the success stories

Sweden | SSBTEK

Use of register data for social security applications

Finland | Helsinki 3D

Greater energy efficiency through smart processing of open data on buildings

Denmark | borger.dk

Prepopulated forms on central online portal for government services

Estonia | E-Police

Real-time information from state databases for police deployments

Germany | Catch quota monitoring

Data-based monitoring of fishing in German waters

Russia | Smart Transport Moscow

Citizen surveys for targeted optimization of public transport

US | LA GeoHub

Improved safety for schoolchildren by analyzing traffic data from different sources

Singapore | Beeline

Optimized bus routes for commuters in real time using AI

France | Bob Emploi

Use of employment office data for AI-based job counseling by a start-up

Abu Dhabi | Analytics in tourism

Personalized travel experiences through advanced analytics

US | Safe school routes in Los Angeles

Some 20 percent of those seriously injured in road accidents in Los Angeles are schoolchildren. Particularly dangerous for children are the roads around schools. With the "Vision Zero Initiative", the city of Los Angeles has set itself the goal of reducing the number of traffic deaths to zero by 2025. The initiative is supported by the "LA GeoHub" platform, which employs intelligent data linkage to identify high-risk roads in the city area to highlight safe routes on the one hand and to introduce targeted construction measures on the other.

LA GeoHub: Simple identification of high-risk roads in the urban area

The LA GeoHub is the city's open-data portal, which provides, processes, and links a wide range of data. The portal gives access to over 500 data records (including geodata from the city as well as traffic and infrastructure data) pooled from over 20 departments and city authorities. Interactive maps can also be created and processed in real time via the portal to visualize the data.

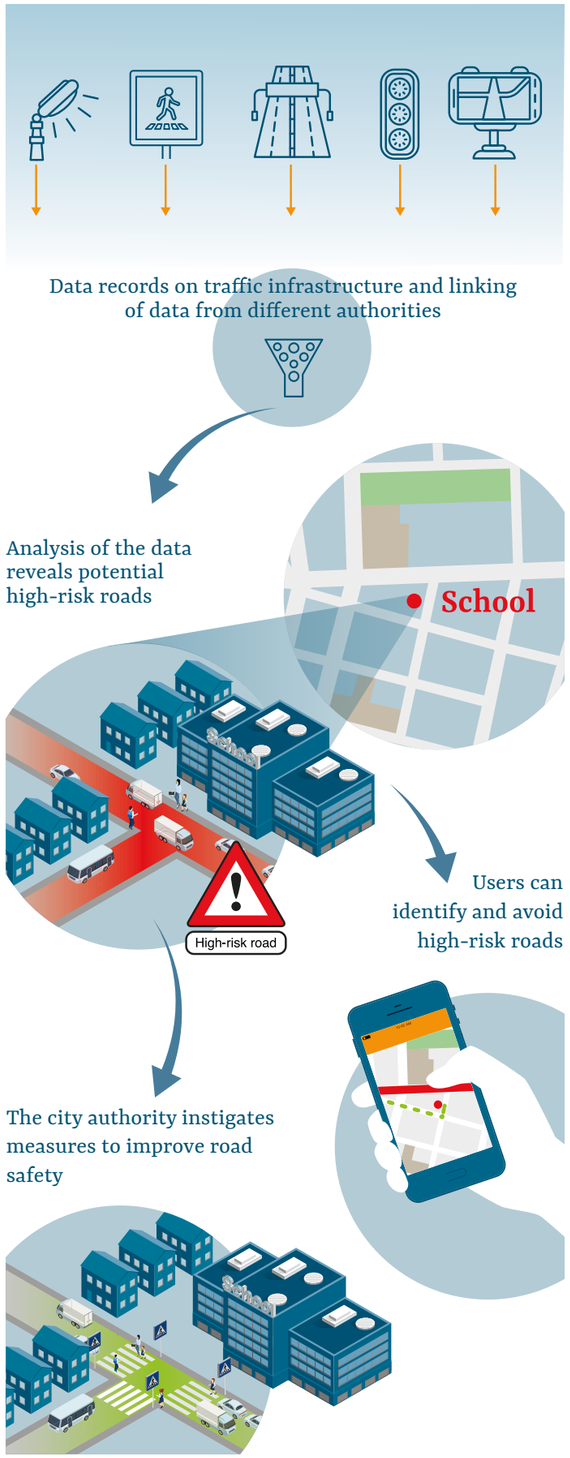
Parents can plan safer school routes for their children. Users can quickly and easily identify high-risk roads via the interactive accident map of the "Safe Routes to School" application, where geodata from the city is intelligently linked with other data sources such as accident statistics. This allows parents to avoid critical traffic areas and create awareness for hazardous road traffic areas together with their children.

School authorities can use resources better to improve road safety. By integrating infrastructure data such as current schools in the city area, the LA city authority can also identify schools that are located in particularly dangerous areas. This ensures effective use of public resources to increase road safety around the affected schools through new infrastructure (e.g., additional traffic lights, traffic signals, speed limits, cycle and pedestrian overpasses). Thanks to this application, 50 such schools have already been identified and the corresponding measures introduced.

Success factors

Central coordination of data linking and processing. The underlying platform of the LA GeoHub merges data from over 20 departments from a wide range of authorities such as the Departments for Energy, Transport, and Finance. A cross-departmental working group helped build the platform with the aim of establishing collaboration and data sharing. The innovative application was therefore the result of centrally coordinated and carefully connected data sources as well as targeted data processing.

Effective stakeholder management. The LA GeoHub project benefits from administrative and political support at the highest level. The open-data program was driven forward by mayor Eric Garcetti and his executive order to promote overarching data availability and transparency. Thanks to the effective involvement of different levels of the public sector (including the Bureau of Street Lighting, Department of City Planning, LA Fire Department, LA Department of Transport), it was possible to secure the support and cooperation of the respective authorities and ensure the rapid development of the GeoHub and its data linkage projects.



At a glance

Go-live of the LA Open Data Portal in 2014 after just 6 months' development time

Currently at least 40 applications based on the GeoHub

Over 500 data records provided by the GeoHub

Denmark | Government services as simple as online shopping

Applying for government services is frequently very time consuming for users. Citizens need to complete complicated forms and provide extensive evidence – sometimes on paper. Denmark is now simplifying these processes through the intelligent use of existing data – making applications for government services as easy as online shopping.

borger.dk: Simple forms and personalized content

The Danish portal borger.dk offers citizens central access to all digital government services. By linking different registers of national authorities (such as the national registration system and tax authorities), data can be shared and used across departments. The portal has an intuitive structure based on life situations, allowing users to navigate the government services within and outside the portal.

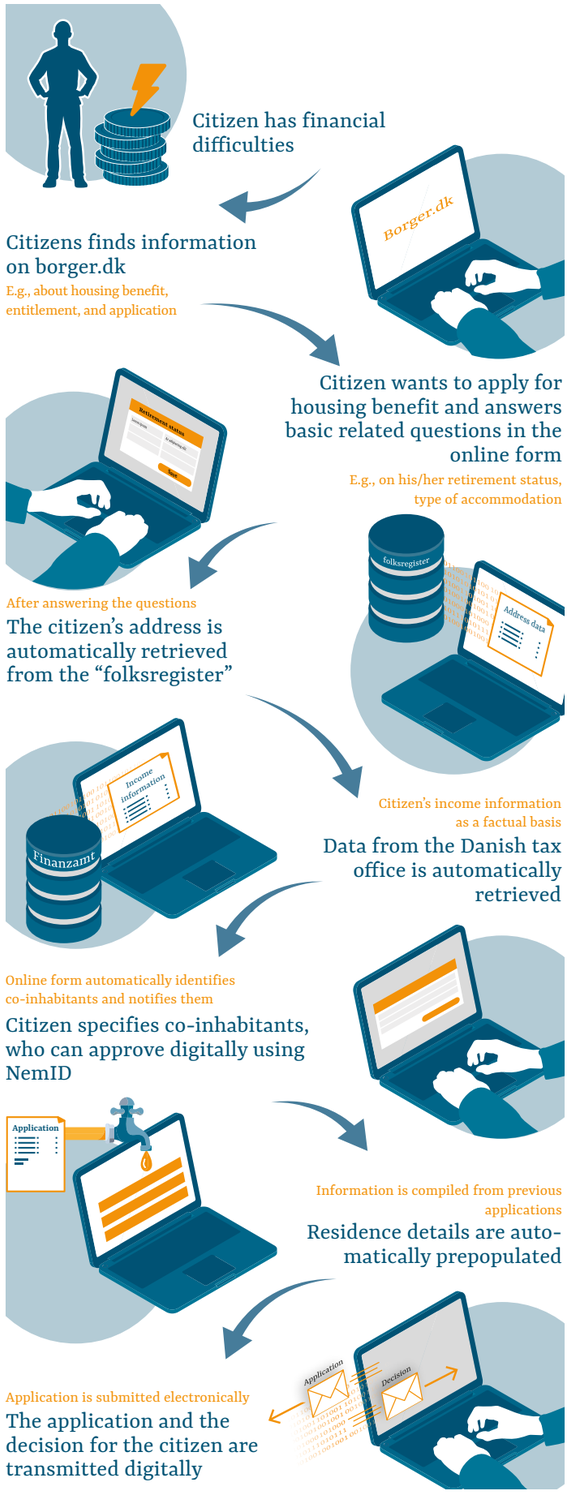
Complex applications are completed quickly and efficiently. Numerous fields are already prepopulated with existing identity and subject data. This means that when applying for housing benefit, for example, data on co-inhabitants is already completed and registration data can automatically be retrieved. Such data prepopulation can also be used for nonportal government services, which saves users time because they do not have to submit multiple documents and data. Back-office workload is also considerably reduced because of the lower number of input errors and the fact that data does not have to be manually checked as often.

At the same time, citizens can be addressed more directly. Stored user data helps generate personalized content on the portal homepage (i.e., "themes" or life situations). For example, users who are close to retirement age may see a personalized message to remind them to apply for their state pension before they turn 65. This is possible thanks to cross-authority use of the relevant data, which is automatically linked when the user logs in. This makes the approach far more tailored to the target group and to the life situation of the respective user – while maintaining data protection.

Success factors

Focus on the user. When implementing borger.dk, the main focus was on the specific needs of users – and how these can best be served through intelligent use of data. Experts in intuitive language and user navigation were drafted into the development process, and the user experience was continuously measured. User tests were also carried out with citizens to identify potential areas where the portal could be improved.

Central coordination of data linking and processing. It was quickly recognized that overarching collaboration was crucial to ensure data could be shared and used across departments. To this end, the government initiated a cross-hierarchy and cross-departmental "basic data" program headed by the national digitization authority. Its activities focused on defining a harmonized data model that clearly defines and specifies the basic data. Uniform technical standards and the establishment of a cross-departmental committee – set up to ensure the efficient and coherent development and leverage of basic data – also meant that the data could be linked across departments and registers.



At a glance

94% of citizens below the age of 70 know about borger.dk

Over 90% user satisfaction

34 million website visits in 2017

87% of users regard the site content as high quality

Germany | Data-supported catch quota monitoring in German waters

Fisheries monitoring in Germany has historically been characterized by distributed data volumes, media disruptions, and manual spot checks. This made it difficult to implement EU directives for seamless monitoring. With the new Fisheries Information Technology (FIT), the Federal Office for Agriculture and Food (BLE) has created a modern, central data platform that allows comprehensive fisheries control and catch quota monitoring in German waters.

Smart fisheries monitoring in real time

The FIT platform allows previously separate data volumes (such as satellite-based position and speed reports, electronic logbooks, first sale data, underwater geology, and fish stocks) to be merged. Analyses also include data from inland and sea monitoring as well as reports of sightings from inspection units. For the first time, this extensive data pool enables integrated fisheries monitoring in real time without media disruptions. It also means that EU requirements can be implemented in the form of monthly reports and real-time access to data by the EU.

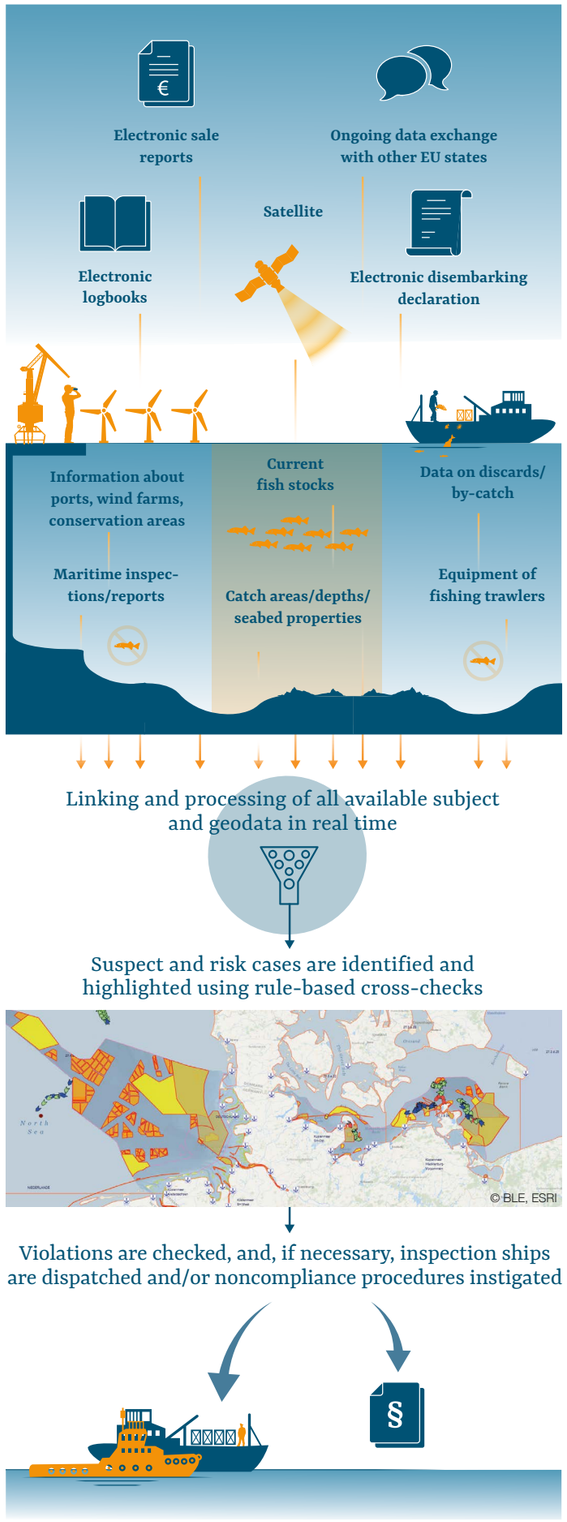
The data-driven monitoring of fishing vessels increases the efficiency of controllers. FIT has substantially changed the daily work of land-based employees and of the controllers at sea. Thanks to automated, rule-based cross-checks, anomalies can be determined and risk assessments performed, allowing employees to concentrate on suspicious incidents. For example, the system can determine differences in the weight of the catch – from the captain's estimate at sea, the recorded weight in the port, to the weight at first sale. This approach makes it considerably easier and faster to identify and check suspicious cases.

Targeted implementation of measures to counter catch quota violations and overfishing. Determining suspicious cases in real time allows inspection vessels to make targeted and rapid inspections of potential infringements at sea. The new system also strengthens the body of evidence because noncompliance procedures can be identified and instigated based on the data. And there are also indirect benefits of the system: knowing that systematic checks are now being carried out in German waters, fishing companies have an even stronger incentive to comply with the regulations.

Success factors

Openness for structural change through technology. New technical standards and processes were necessary for the successful implementation of FIT. To replace the existing data silos, however, reservations on the part of the various participating bodies had to be overcome. This was achieved by involving the users early in the development process and by clearly communicating the considerable benefit of the end product.

Agile collaboration in interdisciplinary teams. In developing FIT, the BLE worked closely with the external software provider Scopeland, who contributed their technical expertise in the form of a low-code platform.[6] As part of this collaboration, agile work methods were a key to success. Instead of simply compiling a list of specifications, the BLE experts collaborated continuously with the development team, for example by conducting weekly design thinking workshops. Working in short sprints, tightly defined development units achieved go-live within four months at most. The eventual end users (such as data loggers and controllers) were also involved at an early stage to help design components such as the data layers and front end.



At a glance

Module-based development in 4-month cycles with up to 10 developers working in parallel

About 400 internal and external users

26 daily cross-checks with ~ 10,000 results from which suspicious and risk cases are filtered

France | Artificial intelligence for job searches

Jobseekers often find it difficult to assess their skills and opportunities in the labor market, which makes it considerably more difficult to search for a job. Bob Emploi, a French start-up, links detailed labor market data with information provided by the user and evaluates it using artificial intelligence (AI). Jobseekers gain a comprehensive understanding of their situation and are able to take targeted measures thanks to personalized counseling offers.

AI-supported understanding of the jobseeker's situation and personalized counseling

To help the unemployed find work, the French employment agency (Pôle Emploi) provides the nonprofit start-up Bob Emploi with extensive labor market data. This includes information about regional and seasonal demand, salary information, vacancies, and anonymized profiles of other jobseekers. Based on this data, Bob Emploi developed an innovative, AI-based tool. Users first complete a short online questionnaire on aspects such as the preferred work and contract, motivation, salary expectations, education, and preferred region. Linking this information to the data of the employment agency enables an empirical assessment of which measures are most effective for certain groups.

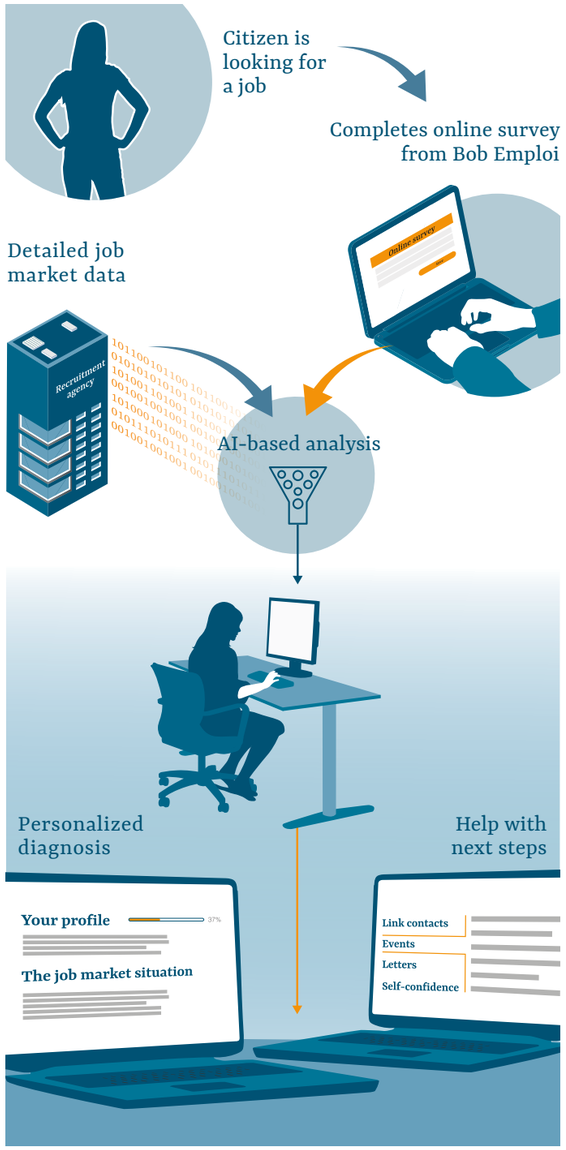
Users can quickly gain a detailed understanding of their situation. After completing the questionnaire, users receive a structured assessment of their key challenges, e.g., the amount of other people in the region applying for similar jobs, the fact that current demand is low, or that the user's salary expectations are unrealistic. The results also reveal qualification gaps. Ultimately, this means that such detailed information can be obtained without visiting the employment office. At the same time, the case workers in the employment office also have access to their own version of Bob Emploi that allows them to leverage labor market data and broaden their solid – but possibly subjective – wealth of experience.

Personalized counseling services replace simple job matching. Bob Emploi goes beyond diagnosing the situation and offers personalized job search support based on the evaluation of the data. It proposes, for example, related industries or neighboring regions, retraining and further education, speculative applications or open positions. It also provides personalized material (e-mails for making contact, templates for letters and resumés) as well as interview tips. Users also receive further support by e-mail to ensure long-term help with the job search.

Success factors

Strategic partnerships. In Bob Emploi, the French employment agency found a strategic partner to develop innovative support services for jobseekers. From the outset, the management supported the project, allowing the necessary data to be provided. The development and improvement of data records and intersection points (APIs) are also regularly discussed in workshops with the authority. Thanks in part to a clear communication strategy regarding the benefit of its services to society, Bob Emploi receives support from public and private partners, including a EUR 1 million donation from Google.org.

Openness for structural change through technology. Right from the start, the employment agency proved open-minded to a redevelopment of the job search process and the innovative approach of Bob Emploi, showing a willingness to move forward rapidly and to tolerate mistakes. Just two months after developing the prototype, the first test runs with jobseekers were in place. An adaptive implementation process and consistent monitoring of results enabled continuous improvement. For example, the chat support function offered on the site is regularly evaluated and an anonymized selection of user results is analyzed each day for quality assurance.



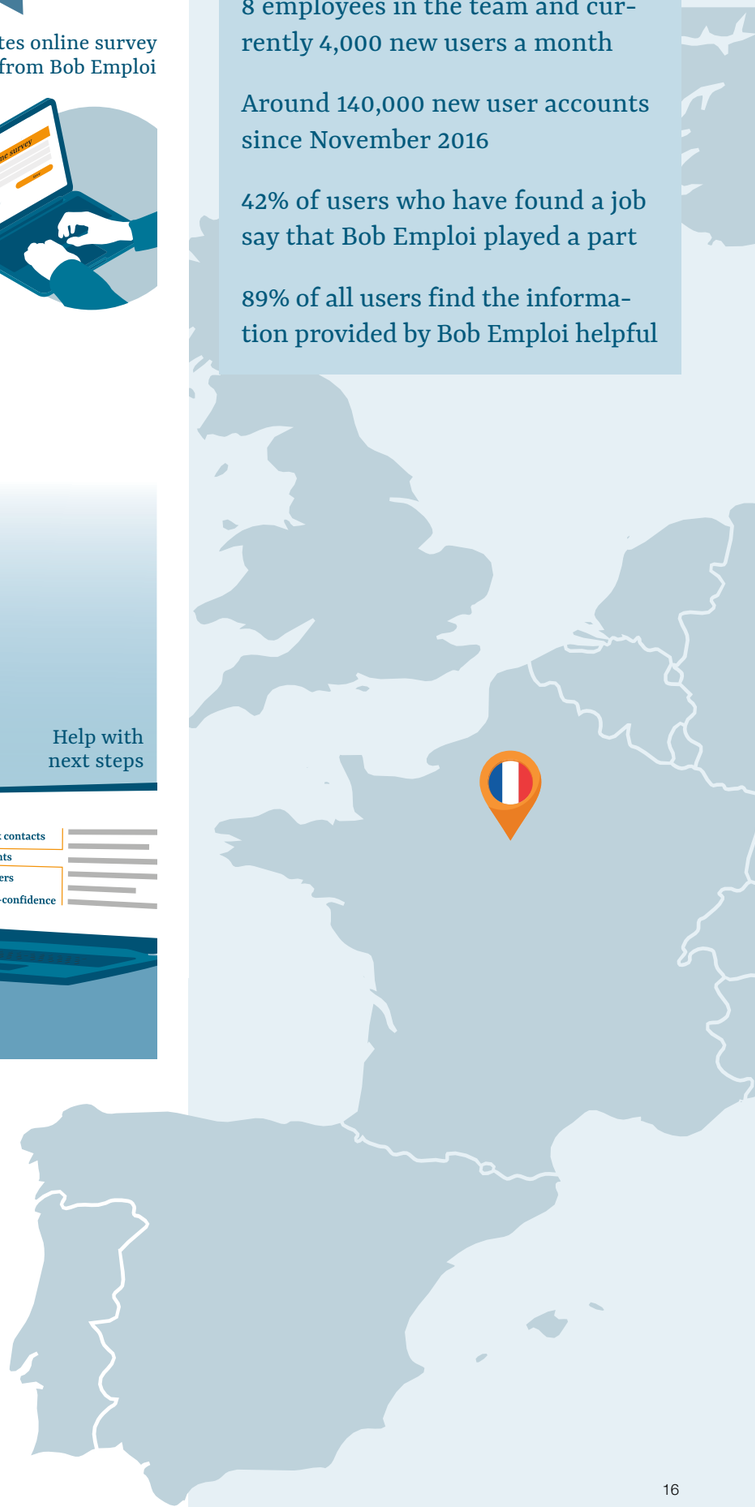
At a glance

8 employees in the team and currently 4,000 new users a month

Around 140,000 new user accounts since November 2016

42% of users who have found a job say that Bob Emploi played a part

89% of all users find the information provided by Bob Emploi helpful



Sweden | Fast and error-free processing of social security applications

To receive social security services, citizens generally have to submit complicated applications and are asked to request and submit information from many different authorities. Case workers in the responsible offices spend the majority of their time checking the forms and liaising with other authorities. In Sweden, this application process has been significantly improved for both sides through the sharing of administrative data, which has also helped reduce errors.

SSBTEK: Automatic retrieval of application-relevant information

The SSBTEK platform allows a range of information to be automatically retrieved when processing social security applications. It combines the registers of various national institutions (such as the tax office, pension and social insurance, employment agency, student grants) with the IT systems of local authorities, who are responsible for granting social security. SSBTEK has been run by the association of Swedish local authorities since 2014 and has been continuously expanded with new registers ever since.

The automatic data retrieval saves customers and authorities time. After receiving the application, local authorities can retrieve much of the data required for approving benefits via the platform. This includes information such as current income, employment status, and receipt of other social security benefits or state educational loans. As a result, applicants do not need to enter as much information in the form, and back-office staff no longer need to perform as many tasks when retrieving and verifying data. Accordingly, the time gained could be used for more focused customer support.

At the same time, SSBTEK reduces the error rate and prevents fraud. A study conducted prior to the launch of SSBTEK found that 8.2 percent of social security applications were deliberately falsified by applicants and 5.9 percent of applications were incorrectly processed by local authorities. The automatic retrieval of data has largely overcome these problems, as the administrative staff can use the complete and up-to-date information held by government services. Furthermore, the information is processed electronically on the local authority websites, which makes it less prone to error.

Success factors

Effective stakeholder management. To implement SSBTEK, several stakeholders at the local and national level had to be involved. The primary concern of the association of Swedish local authorities was to balance stakeholders' interests to achieve the shared goals. The association assumed all investment costs and now charges fees for use of the platform. To increase the cost effectiveness of the investment, the platform is to support additional use cases in the near future beyond social security, e.g., processing cases in youth welfare centers.

"Privacy by design" – effective protection of personal data. A wide range of personal information is shared via SSBTEK. As such, the individual local authorities enter into data protection agreements with the authorities that provide information. To uphold these agreements, they are required to implement and demonstrate adequate data privacy safeguards. Moreover, the data from the registers is only to be combined at the time of and for the purpose of the application and is then separated again. During the establishment of SSBTEK, various technical legal amendments required for the electronic sharing of certain sensitive data were quickly identified and implemented.

At a glance

275 of 290 local authorities as well as 7 national authorities connected

1.5 million hours a year estimated time saving for back-office staff

Roughly EUR 2 million development costs for local authorities and EUR 700,000 for the central platform

Finland | Open data for climate protection

The city of Helsinki has set itself the goal of becoming carbon neutral by 2035 and reducing its use of fossil fuels. Yet to achieve this, vital information on relevant urban planning measures has been lacking. The "3D City Information Model" and the smart linking and use of energy and solar data, however, has enabled comprehensive analyses on energy efficiency and the use of solar energy in the urban area to help achieve this ambitious target.

3D City Information Model: Improved energy efficiency and use of solar in the urban area

The climate and energy atlas – an interactive and open-data-based 3D application of the City Information Model – provides town planners and property owners with extensive data on Helsinki's buildings. The atlas combines basic building information (including building approvals, construction material, conversions, and living space) with data on the energy properties of buildings (e.g., energy efficiency class, energy and water consumption) and links this to the 3D model of the city. The application also includes a solar atlas, which estimates solar radiation for all roofs and wall surfaces in the 3D model of the city and calculates the solar potential both on a monthly basis and across the entire year.

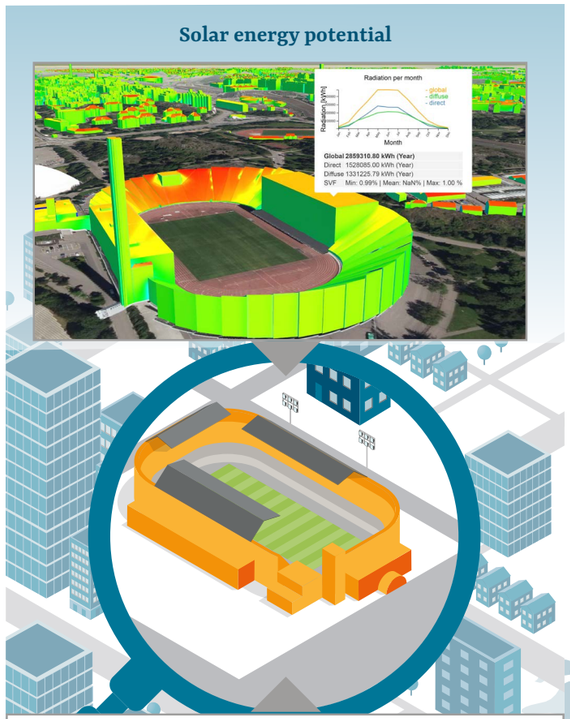
The energy efficiency of buildings is being improved. Using the model, comprehensive analyses and simulations can be run for the energy efficiency of the city and for individual buildings. Residents, business owners, and authorities all benefit, since the smart use of building data significantly simplifies complex investment decisions when buying or building property, and municipal measures to improve energy efficiency can be implemented better.

In Helsinki, no-one has to clamber over roofs when it comes to choosing solar energy. This is because the solar atlas of the City Information Model very precisely calculates and visualizes the solar potential for each building in the urban area, thus enabling residents and businesses to analyze the solar potential of the sunlight received by a building surface – even areas previously regarded as inaccessible – for any time of the day or year. This allows better decision making on the installation and use of solar panels (e.g., at Helsinki Zoo) and more targeted promotion of renewable energies.

Success factors

Central coordination of data linking and processing. The data compiled from various sources is made accessible to the public both via the 3D City Information Model and via the Helsinki Regional Infoshare, Finland's central open-data portal. As well as providing data, the 3D City Information Model intelligently combines a very wide range of data records in order to run extensive analyses and simulations as well as build innovative applications such as the climate and energy atlas and the solar atlas. And to further increase the data quality, feedback was collected from property owners on building and energy properties.

Strategic partnerships. Helsinki 3D was supported by numerous experts, and pilot programs targeting the innovative use of the 3D model were run with universities such as the Technical University of Munich with whom methods for analyzing energy in the climate and energy atlas were further optimized and developed. In this way, the energy properties of nonmunicipal buildings, for example, were approximated.



At a glance

~ 80,000 buildings and 500 km² area mapped in the 3D model

11 terabytes of data on the initial structure of the model

Mapping of the city structure accurate to a resolution of 10 cm

About EUR 2 million investment costs until completion and go-live

Estonia | Fast-response and targeted police work

Decisions need to be taken quickly during day-to-day police work. In most cases, the information needed is exchanged between the operation center and dispatch vehicle, which leads to waiting times and possibly critical deployments being delayed. Estonia is making police work faster and more effective thanks to data-driven applications for the mobile provision of real-time information and location tracking of dispatch vehicles.

E-Police: Fast and effective police work

The e-Police application used by the Estonian police accesses data from dispatch vehicles almost in real time to ensure fast-response and targeted deployments. To this end, all vehicles now carry a mobile workstation in the form of a portable, weatherproof tablet. The workstation is linked to over 15 central databases of the Estonian government via a secure data connection, and also to international databases like Schengen and Interpol. Thanks to cross-border cooperation, the Estonian police can also retrieve Finnish data on vehicles and owners.

The Estonian police can be directed to a location quickly and precisely in an emergency. With the e-Police application, information about the location and status of dispatch vehicles can be retrieved in seconds. The mobile workstation means that dispatch vehicles can be pinpointed quickly and reliably and visualized on an overlay map in the operation center. By optimizing police activity to the situation and requirements, deployments can be coordinated quickly and effectively in emergencies.

Emergency teams can make well-informed decisions quickly. If necessary, personal information such as address, contact details, driver's license details, or registered gun ownership can be retrieved wirelessly. Vehicle information can also be accessed such as vehicle registration, registered owner, or technical inspection data, allowing teams on-site to determine whether a vehicle is stolen or if the driver is wanted in another country. This enables efficient processing of deployments and increases safety because dangerous situations can be detected early and officers are able to respond quickly.

Success factors

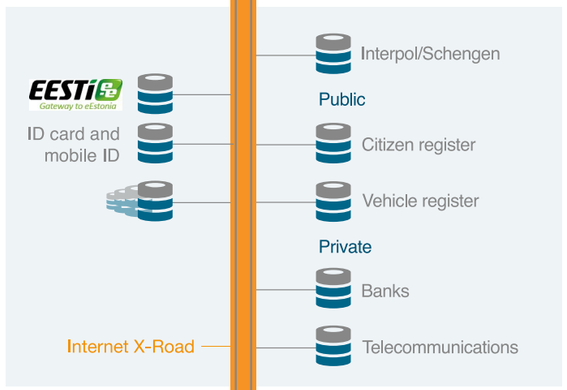
Agile collaboration in interdisciplinary teams. The e-Police application was built and developed in interdisciplinary teams using agile methods. End users – police officers and border agents – were actively involved to provide direct feedback during the pilot. The first submodules (such as location tracking of dispatch vehicles) were tested immediately after completion and further developed in an iterative process.

Central coordination of data linking and processing. The e-Police application is based on the "X-Road" platform, which allows secure and centralized encrypted data sharing between applications of public authorities. Each authority independently saves and manages its data and makes it accessible to other bodies via the platform. This means access to more than 15 national databases (including residence and vehicle registers, banking and telecommunications details) as well as international databases (e.g., Scotland Yard and Interpol). X-Road is also the first platform worldwide that allows automatic data sharing between countries: in June 2017, for example, data sharing was set up between Estonia and Finland.

Police officer on duty

Information/order: "Pursue, we are sending backup"

X-Road Platform



Information request

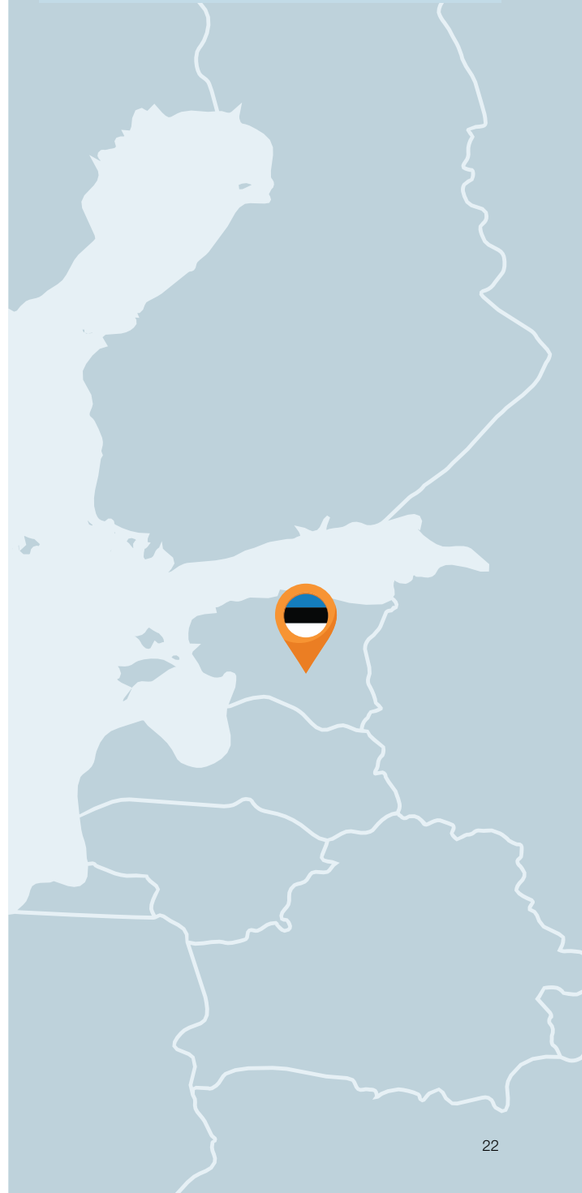
Operations center

At a glance

Over 400 vehicles already equipped with e-Police application

20,000 queries to e-Police system each day

Queries via on-board radio previously took minutes – now just 2 seconds



Russia | Better public transport via citizen feedback

The traffic situation in Moscow has has traditionally been tense. Overcrowded train stations and faulty equipment have led to high dissatisfaction levels among residents. With only moderate investment, however, the city has significantly improved public transport thanks to app-based citizen surveys, which in turn has considerably improved satisfaction.

Optimizing public transport and improving satisfaction levels

The city of Moscow is able to identify the most pressing problems that citizens face in relation to public transport using data-driven methods. This is thanks to a transport app, which continuously receives feedback from citizens regarding their satisfaction with public transport. To understand the causes of the dissatisfaction, additional surveys are automatically started in districts with lower satisfaction levels. Using further plausibility analyses, the city authority determines whether routes identified as overcrowded really do experience high passenger volumes.

Citizen surveys allow resource-efficient avoidance of overcrowding on public transport. The app achieves this by offering targeted recommendations of alternative transport on heavily used routes, which also allows medium-term rerouting of traffic flows. Over 1.5 million city residents have already been reached following more than 15 pilot campaigns. The app also provides up-to-date traffic information and alternative routes for users in real time. The campaigns do not require significant investment and yet have the potential of being just as successful as capital-intensive infrastructure expansion.

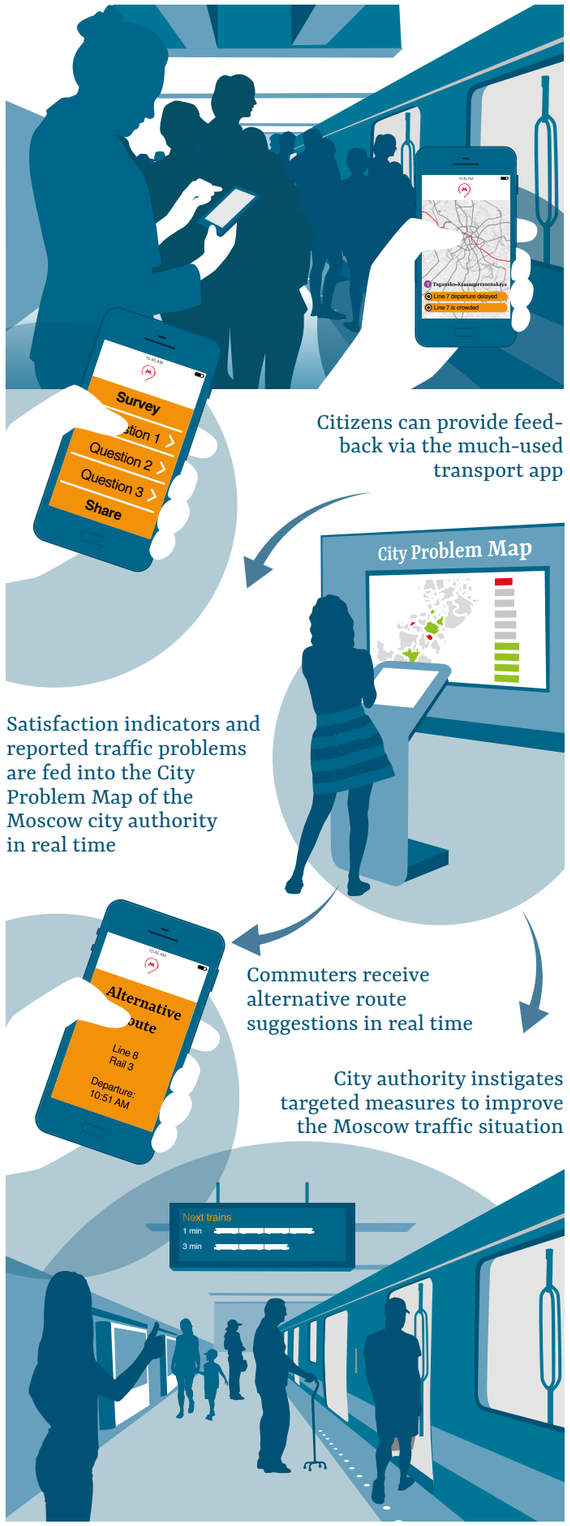
Investments can be targeted to improve traffic in problem districts. Together with geographic and socio-demographic data, the survey data is fed into the "City Problem Map," showing detailed satisfaction indicators (e.g., overcrowding or jostling when boarding) as a heatmap for each mode of transport. The Moscow city authority then uses this consolidated data as the basis for measures to improve public transport. This has enabled the authority to significantly improve satisfaction levels, and it now boasts one of the world's three best subway systems with real-time information.

Success factors

Focus on the user. The citizen surveys have been directly incorporated into the already much-used transport app, thus contributing to the high number of users. The easy-to-understand and accessible City Problem Map also allows both citizens and the city authority to process and access results in a user friendly format.

Effective stakeholder management. Right from the start, the data-driven measures of the Moscow city authority to improve public transport had prominent political backing. The project regularly reported directly to the deputy mayor of Moscow, who played an important role in public relations and communicating with stakeholders. This made it easier to collaborate with the various bodies of the city authority and enabled fast and easy access to data volumes from a wide range of jurisdictions.

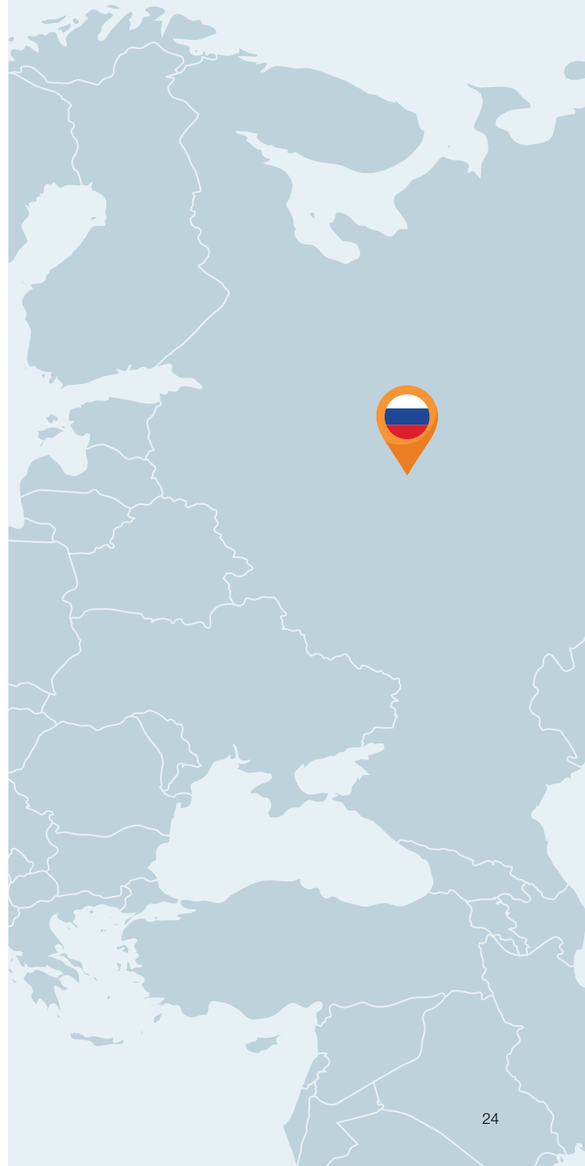
"Privacy by design" – effective protection of personal data. Data relevant for the individual transport profiles (such as frequency of used connections, ticket purchases, location of home) is stored on the existing cloud platform of the city. This means the data is processed in a central and secure infrastructure environment without it having to be shared between decentralized systems of various authorities – thus addressing reservations of the various city authority bodies and citizens regarding data protection and security.



At a glance

App-based citizen surveys form part of a sweeping initiative to improve public transport in Moscow

User satisfaction with the real-time information of the Moscow subway system is now in the world's top 3



Singapore | Minimized commute time thanks to interactive mobility platform

Commuters in Singapore lose valuable time each day because bus routes are not provided door to door at the desired times and direct connections are often not available. Bus companies do not precisely know which routes are attractive for commuters, which means it becomes a business risk to add new routes. With Beeline, GovTech Singapore has built an interactive mobility platform for demand-based planning of bus routes. It has already enabled the creation of over 200 tailored connections for commuters and businesses.

Beeline: Identifying and offering ideal bus routes

The Beeline platform enables tailored bus routes to be used between virtually all points of the city of Singapore. The routes are developed based on travel data (e.g., from the contactless "EZ-Link" travel card) and individual demand from commuters. Private bus operators can then use these findings to offer cheap and direct travel options on Beeline. The platform has been online and operating as an app since 2015, enabling the economic self-optimization of traffic flows while at the same time helping preserve the environment.

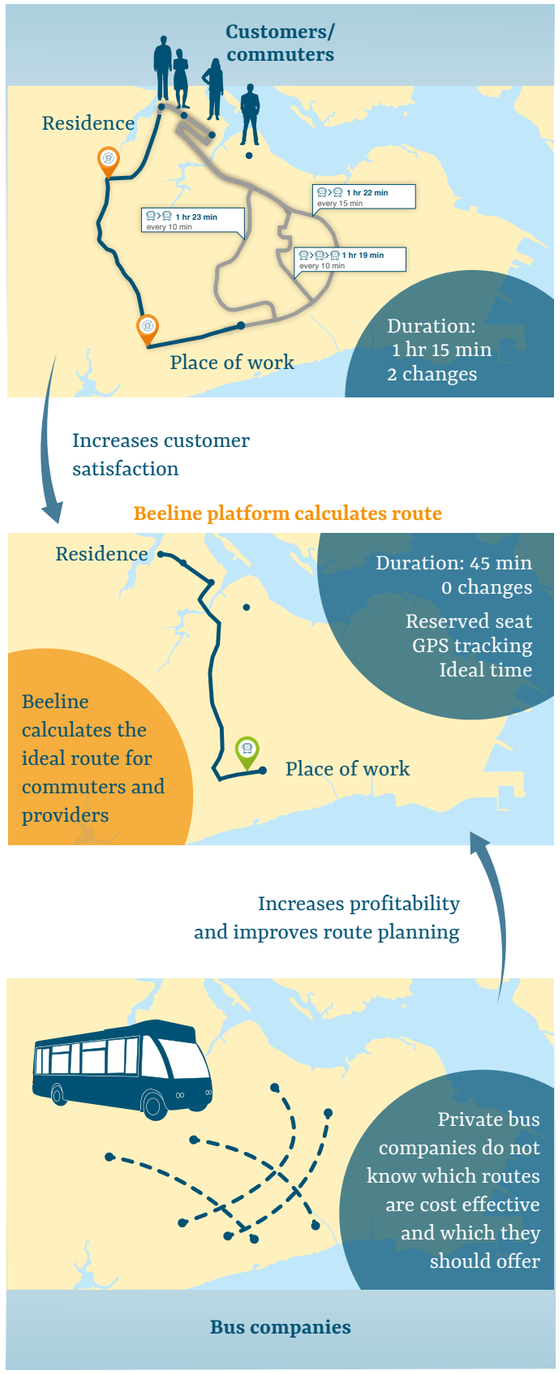
Beeline offers reliable and affordable door to door commuting without changes. This is due to the fact that users can propose individual routes. Based on algorithms, this leads to optimized routes and stops, which can be offered by private firms. Commuters can "activate" a route if a sufficient number of users (normally around ten) reserve a route pass via PayPal or credit card. As soon as a minimum number of commuters has been reached, the fare is collected. On the day of the journey, the reserved bus with its guaranteed seat can be tracked in real time. The resulting costs are usually cheaper than a taxi.

Transport firms can offer new routes risk-free and with higher service quality. Bus operators can view the routes calculated by Beeline and can offer these at their own prices as soon as there is enough demand. They can also plan their daily journeys, manage bookings, and monitor driver punctuality. An app informs drivers about the next stop and the number of passengers waiting there. Beeline is based on an open API architecture, allowing private transport firms and tech start-ups to connect to the platform and offer additional applications such as GrabShuttle (group bookings of minivans and buses).

Success factors

Focus on the user. The Beeline platform aims to increase commuter satisfaction in relation to time savings, since around 70 percent of Singapore residents regularly use public transport. The tracking and communication function of the app allows the bus driver and passengers to interact in the event of delays or accidents. Also, new Beeline routes can be published and accessed easily via social media like Facebook. The Beeline platform followed a philosophy of an open programming interface from the outset to enable users from the private sector such as BusPlus and Woodlands Transport to connect to the platform quickly.

Strategic partnerships. During the agile roll-out process, the Beeline development team collaborated with several organizations. Under these partnerships, direct bus connections for employee commuter routes were tested, which became the key to Beeline's success – including bus routes to the Changi Naval Base and the Singapore Wildlife. The team also tested and successfully started new shuttle services for visitors to Singapore Zoo with data-supported punctuality monitoring. GovTech Singapore was also involved in the development of the platform with experts from the Land Transport Authority (LTA).



At a glance

50,000 registered users

70,000 proposed routes

11 private bus firms with over 150 drivers on 200 Beeline routes with an average of 20 to 25 passengers

More than 3,800 active bookings a month

Abu Dhabi | Personalized travel experiences through advanced analytics

Government authorities and businesses such as hotels, retailers, and event agencies need to precisely understand the wishes of their guests to provide them with tailored offers and make them aware of attractive events through targeted advertising. By linking data and employing advanced analytics, the Department of Culture and Tourism of Abu Dhabi (DCT) is gaining key insights into the preferences of individual visitor segments and can provide targeted support for tourism offers and advertising.

Precise forecasts on the numbers and preferences of visitors from different countries

The "Data Analytics Studio" of the DCT analyzes large volumes of information about the travel behavior and preferences of tourists arriving from the biggest markets. Data sources include, for example, online evaluations, data from hotel visits, as well as historical trends of visitor numbers, vacation times, and temperature differences. The Studio also uses external data providers such as search engines, tourism websites, and travel databases. By predicting visitor numbers from specific countries and by analyzing preferences, better decisions can be made in the area of customer service as well as advertising in the private and public sectors.

Regular reports help hotels serve the preferences of their guests. The DCT compiles a monthly "Hotel Establishment Report" with precise information about trends in the hospitality industry, including statistics on overnight stays and countries of origin. Using information about the lengths of stay and spending behavior, hotels – as well as retailers and entertainment providers – can provide customers with more targeted gastronomy and event offers, or specifically advertise to high-value segments. The report also allows hotels to compare their own performance with the market and potentially develop special offers (such as discounts).

The travel destination of Abu Dhabi can be advertised with targeted campaigns. The DCT brings together stakeholders from the public and private sectors to continuously revise advertising campaigns as well as the associated data and analysis. The results of the DCT report also help optimize public sector spending on tourism campaigns and serve as the basis for decisions on the development of tourist attractions. This allows better differentiation of the preferences of tourist groups from different countries – who may visit Abu Dhabi for the shopping centers on the one hand or major events like Formula 1 on the other – and thus more targeted advertising.

Success factors

Effective stakeholder management. Continuous dialog between heads of department, local data providers such as telecommunications firms, and partners in the tourism sector ensures a holistic view of the value chain. In just the first 12 weeks following the introduction of the Data Analytics Studio, the team conducted over 80 sessions with internal stakeholders (including representatives from the areas of culture, tourism, marketing, and finance) and worked with over 30 external stakeholders and information providers.

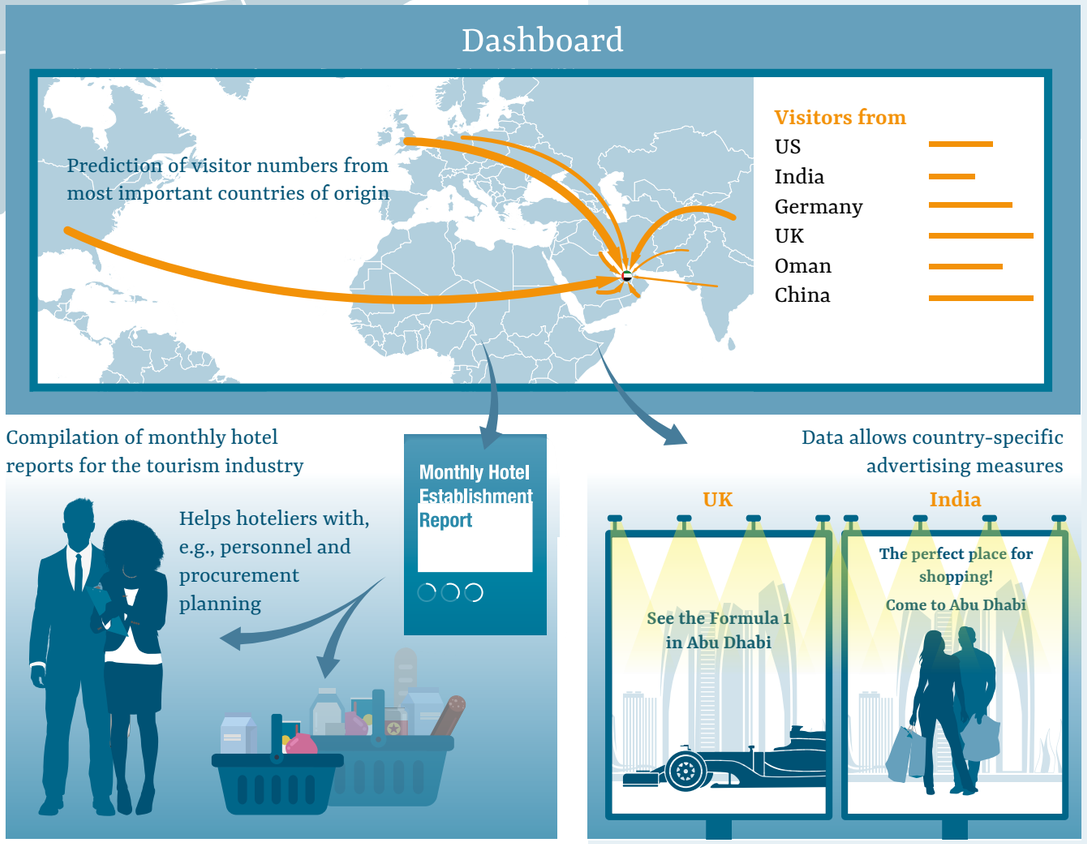
Agile collaboration in interdisciplinary teams. The Data Analytics Studio works in agile teams with private hotel firms and state authorities to rapidly develop high-quality application cases, demonstrating their worth and increasing acceptance. Cross-functional teams from the areas of tourism and culture, data management, technology architecture, and design work together on iterative further development. The Studio offers teams an immersive and innovative environment for weekly workshops as well as the opportunity to conduct continuous testing and achieve improvements together.

At a glance

Voluntary sharing of data and information by more than 100 private travel firms

Report cycles shortened from 30 days to 1 to 2 days together with private firms

Over 40 external stakeholders in Abu Dhabi's tourism system receive regular reports



Smart Government in Germany

As the case of the catch quota technology shows, there are already successful Smart Government initiatives in Germany. However, Germany has so far only scratched the surface of the enormous potential of Smart Government (see introduction). This is true for all three application categories of Smart Government.

User friendly and efficient government services. The Online Access Act ("Onlinezugangsgesetz") requires that all government services in Germany be available online by 2022 – a total of more than 500 individual government services.[7] The coalition agreement also states that a "once-only" principle of entering information should be applied. To date, however, there are only few successful examples. One flagship project is the prepopulated electronic tax declaration (ELSTER) where citizens retrieve various data, such as income and social security contributions, from tax authority registers. This has led to a very high usage rate of ELSTER: tax offices now receive 22 million tax declarations in digital form each year.[8] The extent to which other applications successfully apply the "once-only" principle will be revealed as the Online Access Act continues to be implemented.

Data-supported aid in decision-making for the civil service. There are only isolated success stories in this category so far in Germany. These include, for example, the intelligent fish catch quota monitoring (p. 13-14) and the use of voice recognition software in the BAMF (the German Federal Office for Migration and Refugees) to authenticate migrants' and refugees' countries of origin.[9] In many cases, however, innovative ideas have failed at the experimentation stage or earlier. To prevent this, public authorities must take a balanced approach to risks and opportunities. Model-based decision-making tools must, of course, comply with data privacy legislation and be ethically sound. Algorithms must not discriminate against certain groups, for example.[10] Without any practical experience, however, it is often impossible for an authority to foresee what specific risks will occur and whether these can be reduced. It is therefore important to try out new ideas as part of confinded pilots, and then decide whether implementation is feasible and desirable. Only then can the authorities leverage the opportunities of data analytics for customers and employees.

Innovative use of "open data". With govdata.de, the government and federal states have developed a user friendly portal for data retrieval. The public administration also uses creative formats like hackathons to promote the use of available information. However, concrete applications do not normally get beyond a prototype stage. One reason for this is that many data records on govdata.de are only available for individual states or local authorities, or only cover a limited period of time. Furthermore, information of the same type is often nonstandardized both in terms of precise content and format, which makes it harder to use and more difficult for users of "open data" to produce scalable business models for their idea.

Examples like the catch quota monitoring clearly demonstrate that Smart Government can function successfully in Germany today. Many authorities are already willing and possess the technical capabilities to adopt innovation. Which priorities should politicians and the civil service now set to further accelerate implementation? Of course, it is important to improve the legal and infrastructure frameworks – a task for the federal government and states. At the same time, however, there is much that individual authorities and local government can do. Above all, it is vital that they adapt their mode of operation and pragmatically embrace the opportunities that are already available today (see Box).

Box: Priority action areas for Germany based on the success stories

Priorities for the federal government and states

Further develop regulatory frameworks. The E-Government Act, Online Access Act, GDPR, and Open-Data Act already provide important frameworks for Smart Government. To further accelerate the intelligent use of data, the federal government and states can close specific regulatory gaps – by introducing new acts or recommendations of the relevant bodies (such as the IT Planning Council). Other expedient measures include:

- Anchoring the entitlement of citizens and businesses to "once-only" and improving the legal framework for implementation (such as rules for the use of data-privacy-compliant ID numbers or equivalent procedures governing the unique allocation of data records).[11]
- Clear rules governing the use of algorithms in government processes, in particular to prevent discrimination against certain groups. Authorities could be obliged, for example, to publish the parameters used by an algorithm.

Provide a common infrastructure. Smart Government applications are often required to share or merge data across authority boundaries. In this respect, it is particularly useful:

- To build an infrastructure for the electronic transfer of register data for use in service provisions (similar to the success stories from Sweden and Denmark as described above). Where necessary, this might also include establishing standards governing the precise content and format to ensure consistent storage of similar information in decentralized databases.[12]
- To promote new methods in which the civil service develops new cross-authority applications that allow data to be shared or merged (e.g., agile development in innovation labs similar to the digitization labs for implementing the Online Access Act).[13]

Priorities for individual authorities and local government

Develop a learning-by-doing mentality. For a successful implementation of Smart Government, authorities must try out applications to determine which ones help them to achieve their organizational goals and which do not. In so doing, it is important:

- Not to focus primarily on technological trends (such as, e.g., blockchain), but instead on assessing, prioritizing, and then pragmatically implementing possible applications based on user needs.
- To break up internal silos, that is, to simplify collaboration between functional and technical experts as well as to involve HR representatives, data protection officers, and internal and external communication managers at an early stage – similar to the approach taken by the Federal Office for Agriculture and Food when introducing its intelligent catch quota monitoring (see p. 13-14). The aim is to collaborate in finding a way to test a good idea – and to modify or reject it if it does not work or has negative or unintended consequences.

Look outward. Individual authorities often do not possess the necessary internal skills or resources to make Smart Government work in practice. This is where collaborations can play a key role. This includes:

- Building partnerships with third parties (e.g., start-ups or research institutes) who have the relevant expertise (similar to the partnership between the French employment office and Bob Emploi)
- Sharing ideas and collaborating with other authorities to learn from each other and share resources (e.g., the "Werkstatt Digitale Projekte" (Digital Projects Workshop) within the NExT network of government authorities, which focuses on the digital transformation of the civil service).[14]

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