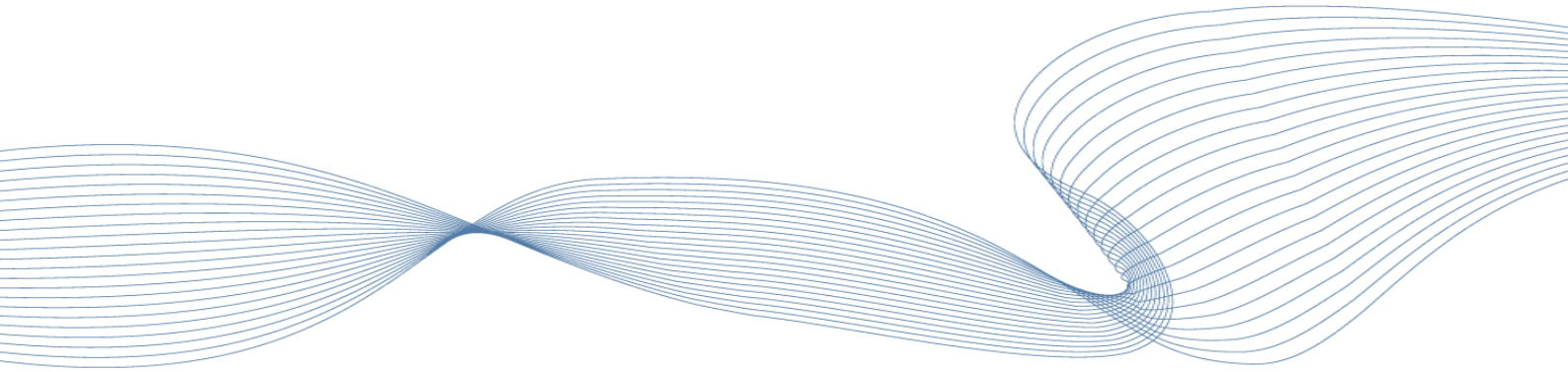
Digital CX & IoT I Worldwide I 2018

TOWARDS AI-BASED DIGITAL GOVERNMENT & SMART CITIES

SITSI I Market Analysis I InBrief Analysis



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THE DIGITAL TRANSFORMATION OF THE PUBLIC SECTOR LEADS TO AI

Digital government and smart cities are the third stage of digital transformation in the public sector

Digital transformation is not – or at least not only – about selling more products to consumers through innovative interfaces. It is a profound transformation of the entire society, of the way we work and live. B2C companies have been spearheading digital transformation as they have had to respond to dramatic changes in consumer behavior. As consumers, we are better informed, we are less patient, we call for easy-to-use solutions, and we care less about the product and more about the overall experience. The same is true for B2B and B2B2C; many companies around the world have realized that they can increase customer intimacy and generate recurring revenue by providing innovative digital services.

The public sector simply cannot ignore this transformation. Major forces are at work that require public entities at all levels (from local authorities to the national government) to implement a digital strategy.

Fig. 1: Forces driving the public sector towards digital transformation

As shown in fig. 1, the public sector is faced with multiple demands and challenges, and digital transformation can help with all of them:

- **Economic pressure**: Local and national government authorities everywhere have to provide a range of services while reducing cost. Digital technologies, such as online services, process automation, Internet of Things (IoT) or advanced analytics can lead to a dramatic increase in efficiency.
- **Sustainability**: Despite dissenting voices here and there, there is a general consensus on the need to protect natural resources and promote more sustainable ways to live. Again, digital technologies can help better predict the need for specific resources, prevent leaks, assist people and companies in optimizing their consumption, etc.
- **Local companies**: Whether at national or local levels, governments are turning to digital technologies to create a more business-friendly environment through virtualized procedures and easier access to data – but there is still a long way to go.

- **Citizens**: They are the consumers of digitally enhanced products and services, which means that they have the same level of expectations from public authorities as from businesses.

Countries and cities all over the world are of course at very different stages in their digital transformation journey. Most of them have acknowledged the need to interact with citizens through the Internet, and many have implemented a number of online services and other digital helpdesks. Some have even appointed chief digital officers and/or innovation teams to realize this first stage and think about the future stages of their digital transformation. In PAC's view, digital transformation is a strategic journey with 3 main stages, as described in fig. 2 below.

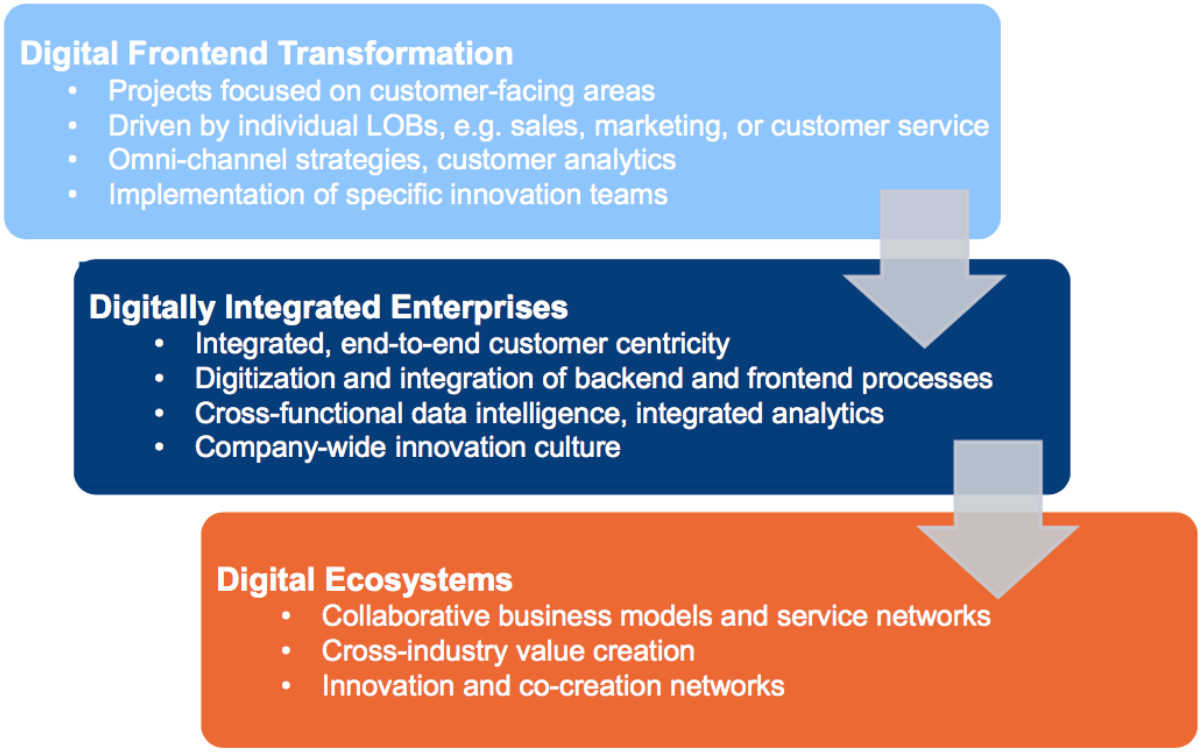

Fig. 2: The 3 stages of digital transformation

While every organization of course follows a highly individual transformation path, this three-stage model provides a good reference for evaluating the current state of digital transformation in companies, industries and government authorities. Today, some major public sector organizations have entered stage 2 by digitizing their backend processes and integrating them with their citizen-facing processes. However, the goal is to achieve a contextual digital transformation: In stage 3, organizations are fully integrated in an ecosystem, collaborating with third parties so that they can achieve optimal efficiency while at the same time delivering a seamless and satisfactory experience to all the people they interact with.

For a local government, for instance, becoming a smart city not only means dealing with pure public sector issues (such as taxes, elections, education etc.), but also with other vertical issues, such as transportation, utilities etc. This is why PAC now refers to digital contexts, which center on the users rather than verticals, which center on the industries, as shown below (fig. 3).

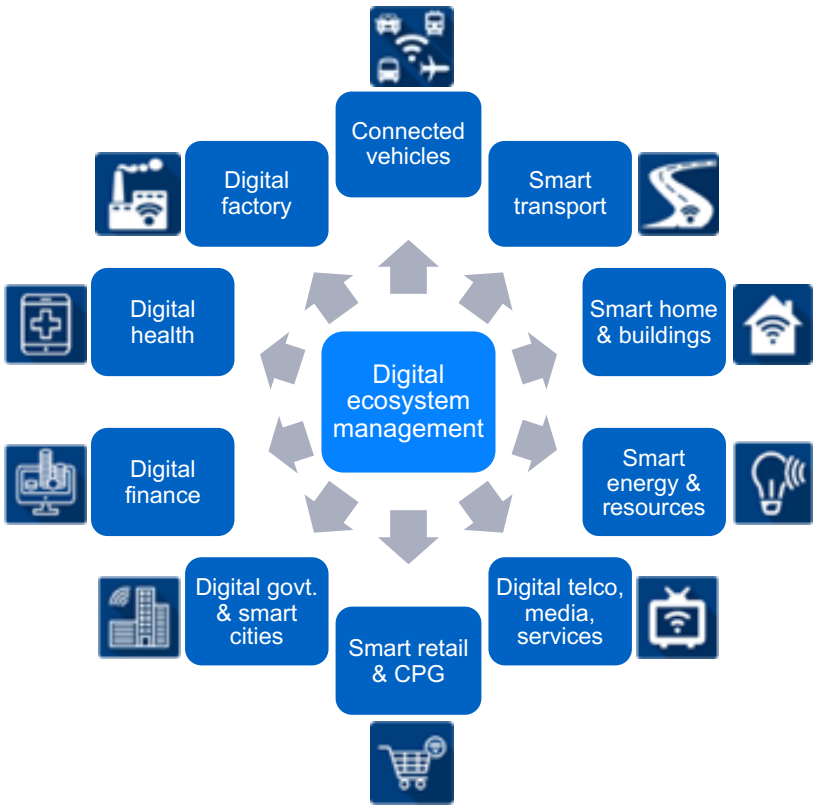

Fig. 3: 10 contexts for digital ecosystems

Many artificial intelligence aspects are relevant for public sector transformation

Artificial intelligence (AI) is a powerful technological lever to reach ambitious digital transformation objectives (see definition on the right). In PAC's view, AI is one of the major tools in the arsenal dedicated to digital business innovation.

In reality, from weak AI to strong AI, there are multiple flavors and use cases involving different forms of artificial intelligence, which is why so many aspects of digital transformation can be optimized through AI. "Strong AI", an autonomous, self-aware artificial intelligence able to replace and surpass all human capabilities (the one depicted in so many science-fiction books and movies), is still many years away. Today, many "weak AI" capabilities are already available: specific domains where, depending on the use cases, AI can complement or replace human beings (see fig. 5 next page).

PAC's definition of AI

AI is the combined use of algorithms, knowledge bases (big data sets) and neural networks/ deep learning techniques to mimic and complement human abilities in a variety of domains, including:

- Perception and understanding
- Reasoning and problem solving
- Learning and training
- Interaction with surroundings and people

Fig. 4: Definition of artificial intelligence

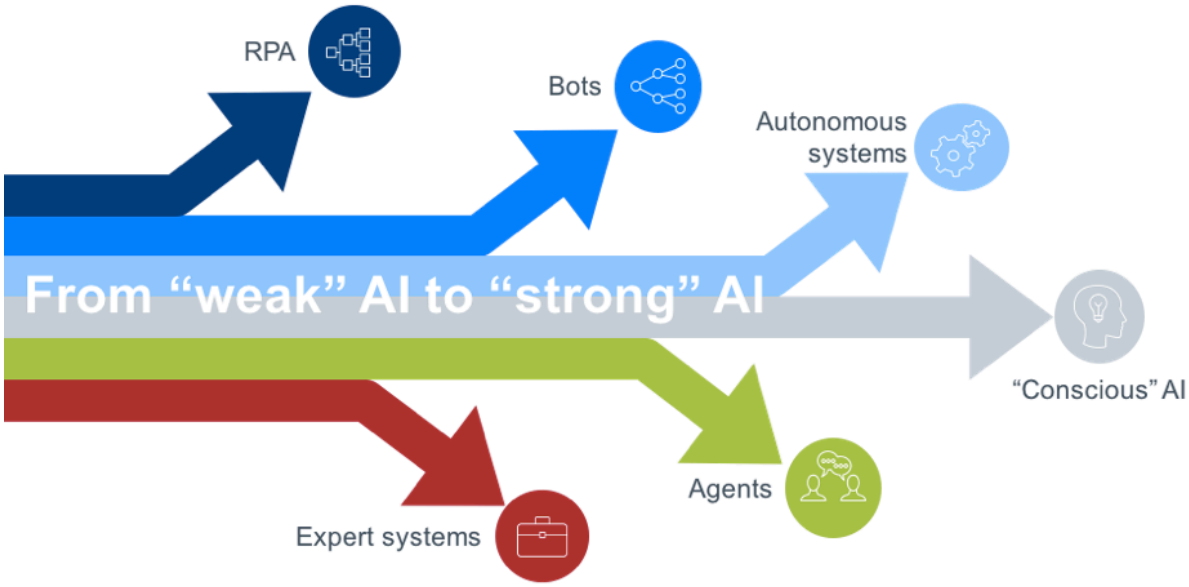

Fig. 5: The multiple solutions within the AI family

This is of course a schematic view, as technologies may be a mix of different elements. However, this graphic sums up the different capabilities available today for any public sector organization:

- RPA, which stands for robotics process automation, is an extension of the business process management family of tools, equipped with AI capabilities so that it can automatically learn from human actions and create business rules.
- Expert systems are extremely relevant for specific tasks such as understanding written or spoken natural language, forecasting the weather, playing a game, etc.
- Bots, or chatbots, help users through a text- or voice-based interface – hopefully with a better level of context awareness than previous interactive systems, which just followed scripts.
- Agents are able to take specific actions depending on real-time analytics and a set of conditions.

Autonomous systems will combine all these capabilities, but challenges remain, both technological and legal or ethical in nature, as anyone can see with the research around autonomous vehicles. Today, conscious AI is still science-fiction.

AI HAS THE POTENTIAL TO DRAMATICALLY IMPROVE EFFICIENCY IN THE PUBLIC SECTOR

Citizen relationships and the work of back-office agents are candidates for quick wins

Improving citizen satisfaction while at the same time relieving the administrative burden of public employees has been a major driver for digital transformation in the public sector. Artificial intelligence allows to go even further.

The digitally most advanced governments have managed to move online nearly 100% of their administrative processes. In Estonia, which claims a 99% share of online public services, this leads to an impressive list of services to choose from (see fig. 6 on the right). Even though these services are grouped by subjects, it may in the end prove ineffective as there are many choices and many personal matters that may not be fully covered by the proposed choices.

Online merchants are already faced with this dilemma and are looking for ways to deal with their customers in a more intelligent way by providing personalized information ("if you are interested in this, that should also be relevant to you") and some form of interaction ("how can I help you?").

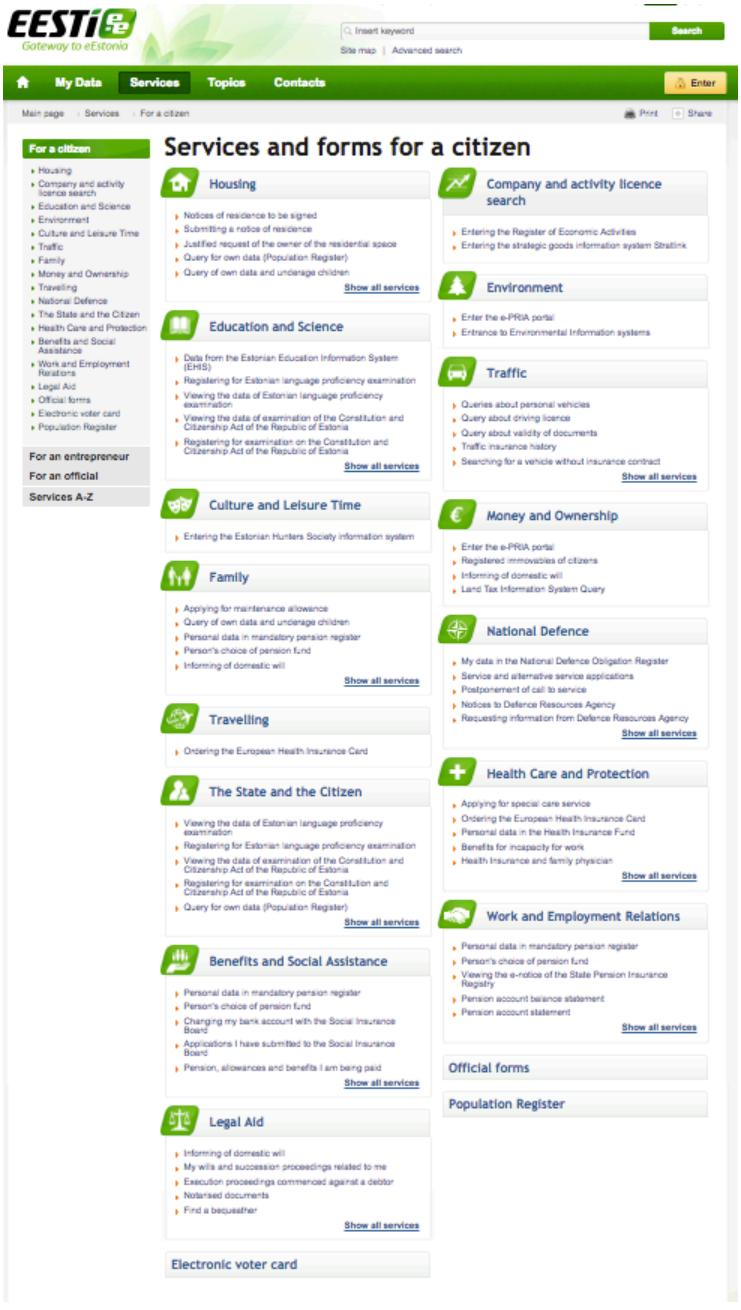

Fig. 6: The impressive list of online services offered on the Estonian government's portal

The objective here is to offer online the kind of interaction people expect when going to see an employee in an office. This is what the City of Los Angeles did with its Business Assistance Virtual Network (BAVN), which citizens can contact to find out about business opportunities with the city. Although there is a search engine available on a dedicated website, people would send an average of 80-100 questions by e-mail to the BAVN support staff every week. In May 2017, the city unveiled a

chatbot assistant named Chip (for City Hall Internet Personality), which is able to connect to different backend systems to collect data on various contract opportunities and regulations and to self-improve its knowledge base over time from its interactions. This quickly proved to be extremely useful. In the first two months, Chip held over a thousand conversations, answering more than three thousand questions, pushing the average number of e-mails sent to the staff down to 30-40 per week.

Fig. 7: Chip, the Los Angeles AI-based assistant

The next step, of course, is to use voice-based assistants. This will be particularly helpful for people that are not familiar with technology or that are visually impaired – which are often cited as an obstacle to digital transformation programs by governments not willing to go digital. According to US-based GovTech Magazine, seven US state or local governments are already using Amazon Alexa vocal assistant to deliver all kinds of information and answer multiple inquiries about weather forecasts, administrative procedures etc. In some cases, the AI-based systems can even perform some tasks, such as training people for an exam or renewing a driver's license.

All these improvements in the front office also benefit the back office by freeing up time for administrative tasks and providing tons of accurate data that can be automatically processed. Process automation may be less spectacular than fancy personal assistants, but it has the potential to help public sector organizations save millions. Administrative staff spend a large part of their workday on routine and repetitive tasks that can quite easily be automated. In the UK, an organization that collects appeals for 10.8 million parking tickets issued annually uses process automation (RPA) to manage the entire process. The RPA solution automatically validates the information entered, asks for additional information if needed, gathers all the information and evidence related to the case and finally passes the file to a human adjudicator. This series of automated tasks typically accounts for 15% of the time spent on the process.

Letting an RPA solution perform these tasks gives people more time to spend on complex issues and matters that require human judgment. It also increases the overall quality of the process, as shown by our research on companies implementing RPA: automation eliminates the risk of human error – provided that the process is well documented and correctly implemented. Above all, this kind of automation increases satisfaction among both citizens (who can benefit from automatic handling of their claims, for instance) and public employees, who get fewer complaints from impatient or angry citizens and can spend more time dealing with sensitive issues.

All major public functions are impacted by AI improvements

Artificial intelligence can help people in most cases, even with tasks that we think can only be carried out by humans. For instance, the results of food inspections in Las Vegas have been improved thanks to AI. The Southern Nevada Health District conducted a three-month experiment using nEmesis, an

AI-based application developed by researchers from the University of Rochester. The application learned from social media how to identify tweets related to food poisoning and to connect them with specific restaurants. “In the test,” says GCN magazine, “half of the health department restaurant inspection selections were made randomly, and half were selected with the help of nEmesis. Inspectors did not know of the change in the system. The results of the experiment showed the tweet-based system resulted in citations in 15 percent of inspections compared with 9 percent using the random system. The team estimated that using nEmesis prevented 9,000 food poisoning cases and 557 hospitalizations in Las Vegas during the three-month experiment.”[1]

Applications of artificial intelligence are countless in the health sector, where AI can detect some pathologies much better and earlier than any human eye could. However, health is not covered by this report. Nevertheless, AI can be deployed in numerous aspects of digital government. The table below lists possible improvements AI can bring to the major functions of public authorities, giving our assessment of how strong an impact AI can make and of the current maturity of AI-based solutions.

	Potential of AI in this area	Maturity of AI-based solutions	PAC’s comments
Public services			Artificial intelligence can help streamline processes through new, natural language-based interfaces and through automation.
Safety & security			AI can perform real-time monitoring and analysis of countless text, audio and video streams to detect any issues. AI can also be used to model patterns related to health issues, violence etc.
Tax collection			Thanks to its learning capabilities, AI can ingest regulations and data and stay up to date, providing relevant information and scenarios. AI can also be used to strengthen fraud prevention mechanisms.
Infrastructure management			In combination with the IoT, AI can complement predictive maintenance systems by making recommendations for an optimal use of resources such as buildings, parking lots, roads and utility grids.
Education			First uses of AI help students revise for exams, improve courses (when it detects that many students fail because of a specific issue) and assist in passing exams.
Public transit			Electric, connected and autonomous vehicles will completely change urban mobility and its supporting infrastructures. In the meantime, AI can greatly alleviate traffic and parking-related issues.
General welfare			A first use of AI is in identifying large-scale abuse of the welfare system. However, work automation and the optimization of resource utilization are likely to lead to new welfare policies.

very low low average high very high

Fig. 8: Evaluation of areas where AI can have a significant impact

Artificial intelligence can also be used in less obvious areas. AI can improve traditional analytics and reporting to gain better insights as a basis for evaluating public sector activities, both through machine learning for enhanced analytics to predict outcomes and through the analysis of public comments (by

[1] *https://gcn.com/articles/2016/03/16/nemesis-twitter-food-poisoning.aspx*

phone, on social networks etc.). AI can also be used to automatically gather relevant information, use cases and regulations in order to anticipate major trends in society and the changes necessary to cope with these challenges.

Finally, by keeping up-to-date with AI-related developments, governments will also be able to play their role in terms of ethics and regulations, as autonomous systems are appearing in our streets, and in our professional and private environments, interacting with us on a daily basis, and new economic models and lifestyles may emerge in the near future.

A PATH TO AI-POWERED DIGITAL TRANSFORMATION IN THE PUBLIC SECTOR

How to overcome the challenges

Talking about artificial intelligence can cause ambivalent or even alarmed reactions. Many people associate AI with robots that may easily turn evil, as they do in most science-fiction novels and movies. More recently, consulting firms and influencers have also alarmed people by predicting that AI might replace up to 99% of the majority of today's jobs and by talking about basic income in a post-job society. True or not, we do not have a crystal ball to tell. However, what we can say is that:

- AI is here to stay this time. Scientists have been talking about artificial intelligence for decades, with few tangible results. Today, algorithms are mature, we have tons of data (transactional, social, personal, etc.) to train neural networks and unprecedented computing power, thanks to special processors and the scalability brought by the cloud.
- Digital transformation is a reality, with tangible effects both on our society and our economy. People use more and more digital communication tools and expect the best experience as consumers, citizens and workers, which means that personalization and real time have become paramount. Both are only possible if they are backed by an AI-based tool.
- Public authorities everywhere are faced with limited budgets and the need for cost savings. Although implementing AI may require a significant investment, the benefits are obvious as it allows to perform operations that would not be possible with conventional means, it helps streamline processes and thus improves overall efficiency.

That being said, public sector officials should not launch "AI projects" that may end up with a proof of concept not rooted in reality and may prove critics among the public employees right, who rightly fear for their jobs and for the quality of public services. Instead, public sector officials should look for ways in which AI-based innovations can make life easier both for public employees and citizens, while ensuring long-term savings. This can be achieved through a service design methodology that brings about real digital transformation and a high level of acceptance from users.

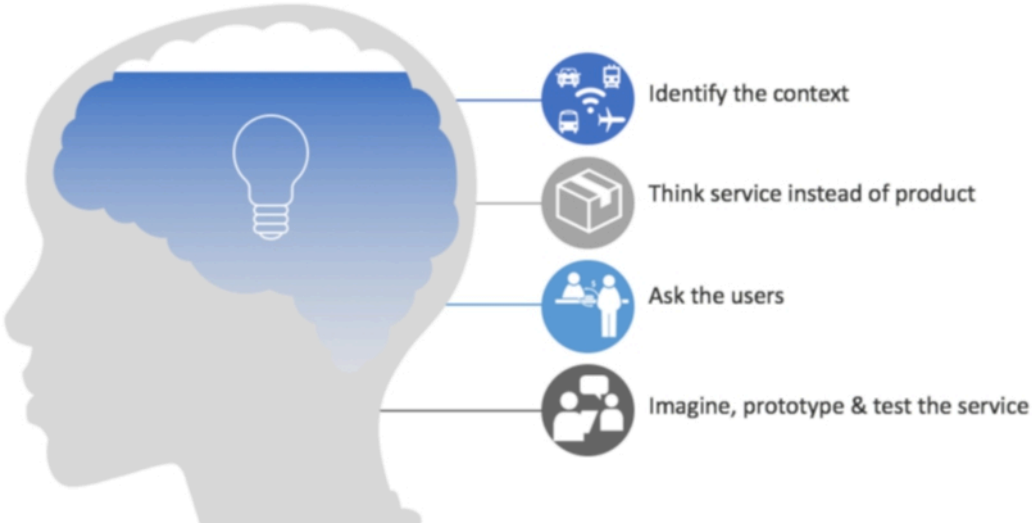

Fig. 9: Service design thinking applied to digital transformation

The service design methodology helps to figure out the context of the users, how they perform their tasks and how they would like to perform them in order to – sometimes completely – reinvent processes and generate the best outcome for everyone. The aim is not to introduce some degree of artificial intelligence into a process, but to improve or reinvent processes and services, partly thanks to AI.

Another main difference from traditional projects is that the service design methodology is well adapted to an agile and iterative approach. Processes and technical projects are designed and tested in close cooperation with the users. The benefits are obvious:

- It limits the risk of proofs of concept without any subsequent concrete application, as expectations are rapidly turned into a minimum viable product (MVP), which is then enhanced through short sprints (cycles of development) involving user feedback.
- It facilitates change management, as users are involved throughout the entire process and as they can rapidly see the outcomes, test the limits of the service or application, and contribute new ideas.

As we have seen in other sectors during our research, when an AI-based innovation is implemented in this way and allowed to rapidly produce outcomes for the users, these users and their colleagues will ask for more AI.

Looking for inspiring quick wins and longer-term projects

During the ideation phase of the service design approach, all ideas from all stakeholders are welcome. In order to promote these ideas, it may be useful to know what is possible, both in terms of technologies and in terms of use cases. What has been achieved in other public sector organizations as well as in other industries might serve as a basis or be adapted to the issues at stake, even though each organization thinks it is unique, and so are the issues it is faced with. This is a common pattern we observe in the projects we do for our customers. Their objectives and issues can actually be very specific; however, there are invariants regarding the way they need to position themselves, the expectations of both internal and external users, and the set of technologies that can be deployed.

Being open to what is going on in other organizations is very useful when trying to imagine what innovation could be worth trying. Use case repositories such as our PAC Innovation Register (see fig. 10 below) should be thoroughly explored to find potential ideas and sources of inspiration.

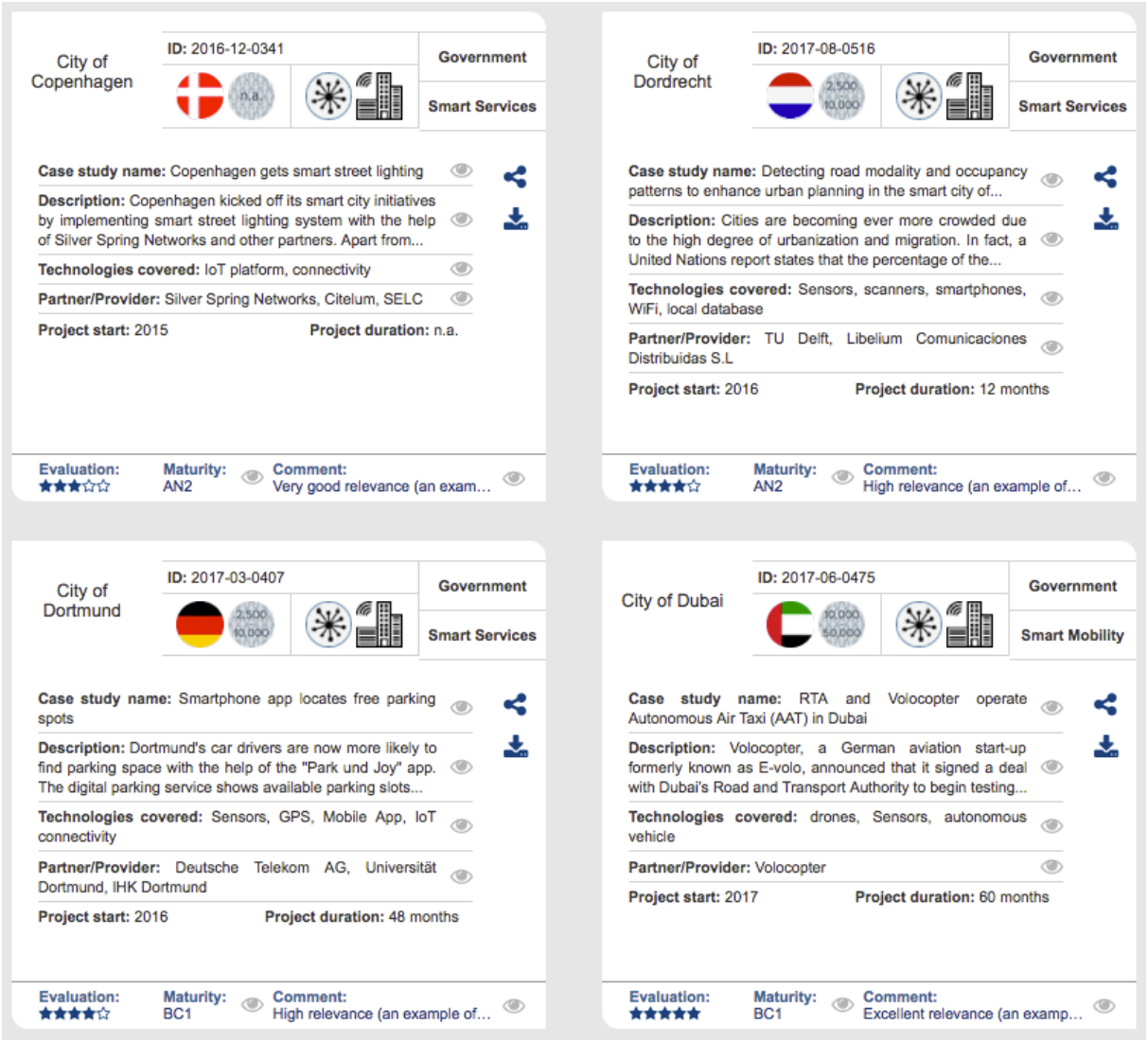

Fig. 10: Some digital government and smart cities use cases from the PAC Innovation Register

Technology platforms should also be considered. As shown in our previous report on artificial intelligence (Artificial Intelligence: Demystification and Market Opportunities – InSight Analysis – Worldwide[2]), all major technology vendors offer AI-based tools on their PaaS, accessible through an API and very easy to embed in any application. This means that trial and error can be the norm here when innovation teams go into the prototyping phase.

As technology evolves at a fast pace these days, especially in the AI space, it is particularly interesting to look at what capabilities these platforms are bringing to the market and what developments can be expected in the coming months. As projects should be started as MVP and enhanced over time, it is important to be well aware of where the technologies are heading.

Start-ups should also be watched. This is a more difficult task of course, given the lack of internal resources and the exponentially increasing number of start-ups claiming to be part of the artificial

[2] *https://www.pac-online.com/artificial-intelligence-demystification-and-market-opportunities-insight-analysis-worldwide*

intelligence fray. Our own database of AI start-ups now contains more than 500 names. We have selected some (see fig. 11) that are particularly relevant to the challenges governments and cities are facing. This monitoring and assessment work is even more critical for system integrators, which should definitely act as ecosystem orchestrators, working with a selection of partners able to tackle these challenges.

Fig. 11: Selection of relevant AI start-ups for government and city issues

PAC'S RECOMMENDATIONS

Recommendations for IT providers

- Consider digital government and smart cities as a specific context rather than a public sector-specific area and make sure to address this context with an ecosystem of solution providers.
- Monitor the market for innovative AI tools, start-ups and solutions you can integrate as a partner or as a member of your ecosystem.
- Provide your customers with a methodology framework to initiate long-term AI-based innovations.
- Assess which existing data, systems and processes can be leveraged and which have to be transformed in order to identify possible quick wins and longer-term projects.
- Make sure to involve public employees in the transformation process, as their acceptance and willingness to work with AI is key for any successful project.

Recommendations for IT buyers

- Do not implement artificial intelligence just for the sake of it; instead, leverage AI capabilities as part of a broader digital transformation strategy.
- Observe and talk to the users to understand them, think about what it would be like to live their journey, share their experience in order to imagine what innovations would be really useful.
- Assess what AI-based technologies software and service providers can deliver to promote your creativity when coming up with new scenarios for work and processes.
- Identify the right partners or members of an ecosystem to team up with to deliver the best possible AI-based experience.
- Human resources are usually very hierarchical in public organizations such as governments and cities; be smart enough to bring together people from different services, irrespective of their rank, to form efficient innovation teams.
- Look for quick wins that will convince everyone of the effectiveness of AI in the context of a public organization; even though people may be worried at first, they are usually happy when the boring part of their job is automated.

ABOUT PAC

Founded in 1976, Pierre Audoin Consultants (PAC) is part of CXP Group, the leading independent European research and consulting firm for the software, IT services and digital transformation industry.

CXP Group offers its customers comprehensive support services for the evaluation, selection and optimization of their software solutions and for the evaluation and selection of IT services providers, and accompanies them in optimizing their sourcing and investment strategies. As such, CXP Group supports ICT decision makers in their digital transformation journey.

Further, CXP Group assists software and IT services providers in optimizing their strategies and go-to-market approaches with quantitative and qualitative analyses as well as consulting services. Public organizations and institutions equally base the development of their IT policies on our reports.

Capitalizing on 40 years of experience, based in 8 countries (with 17 offices worldwide) and with 140 employees, CXP Group provides its expertise every year to more than 1,500 ICT decision makers and the operational divisions of large enterprises as well as mid-market companies and their providers. CXP Group consists of three branches: Le CXP, BARC (Business Application Research Center) and Pierre Audoin Consultants (PAC).

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