

Delivering AI Programs in the Public Sector: Guidelines for Government Leaders

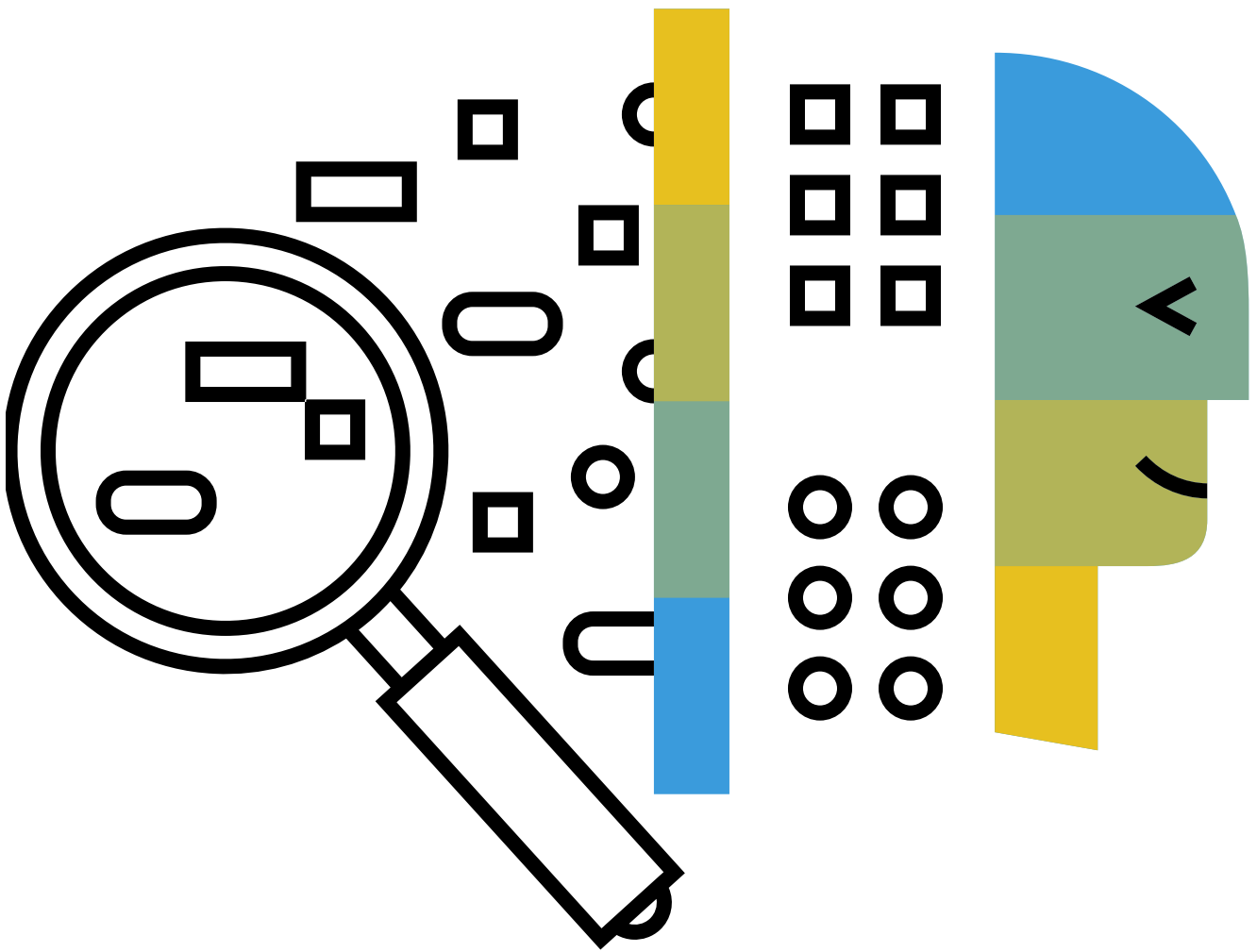


Table of Contents

4	Introduction
5	The Challenges
6	Building a Successful AI Transformation Program
7	Building AI Capability
9	Redesigning Work for AI
12	AI Oversight and Assurance
14	Managing Cultural Change
16	Creating Stakeholder Value
18	Conclusion

Artificial Intelligence (AI) is underpinning the next technology revolution. This is a revolution that offers huge potential benefits for the public sector, including improving process efficiency, speeding up medical research, creating smart cities, and ensuring public security and safety.

But, despite AI's promise to accelerate growth and streamline day-to-day operations, AI uptake in the public sector worldwide has been limited. This white paper examines the challenges and the reasons behind the reluctance to the uptake.

Introduction

The promising capabilities presented by AI have incentivized government organizations to invest significantly in AI programs. In 2020, the US government budgeted almost \$1 billion in nondefense AI research and development and the European Commission is ramping up its AI investment by 70% to €1.5 billion¹.

AI technologies seek to mimic human ability to understand data, find patterns, make predictions, and find recommended actions without explicit human instructions. AI differs from traditional information technology applications in its abilities to simulate human reasoning and surpass human performance, manifested as self-learning and natural language processing capabilities, among others. AI takes on different forms, ranging from predictive algorithms and machine learning through to complex robotics.

The current enthusiasm for AI has been described as an 'AI Spring', where ongoing optimism for its use is due to a number of factors, including the rapid advances in technology, wider availability of technology, and machine learning coupled with an abundance of data².

Despite AI's potential to accelerate growth, AI uptake in the public sector appears to have been limited. According to the SAP Institute for Digital Government, while 80% of public sector organizations are actively working towards data-driven transformation, less than 15% have progressed beyond the prototype stage³.

Public sector organizations face mounting challenges that slow down AI adoption and pervasive use.



- 1 Kevin Körner, "(How) Will the EU Become an AI Superstar ?," Deutsche Bank Research, 2020, 1–13. www.dbresearch.com.
- 2 Jamie Berryhill et al., "Hello, World: Artificial Intelligence and Its Use in the Public Sector," OECD Observatory of Public Sector Innovation (OPSI), no. 36 (2019): 1–148. <https://oe.cd/helloworld>.
- 3 Ryan Van Leent, "Maturity Model for Data-Driven Government," 2018, <https://www.sap.com/documents/2020/05/e0dca00c-9a7d-0010-87a3-c30de2ffd8ff.html>.

The Challenges

CHALLENGE ONE: AI DEVELOPMENT IS RESOURCE INTENSIVE

Accessing high-quality data, development platforms, and data-science talent can require significant ongoing investment. Data in the public sector tends to be siloed and its use can be constrained by privacy legislation and data sovereignty regulations.

CHALLENGE TWO: AI MODELS HAVE LIMITED COGNITIVE ABILITIES

Algorithms are able to process massive datasets but can lack the context-sensitive processing capabilities that humans have. Leveraging both human and AI agents' strengths to maximum impact can require imaginative redesign of work processes.

CHALLENGE THREE: AI MODELS ARE OFTEN OPAQUE

Understanding how and why AI reaches certain decisions is difficult and, in some cases, can be impossible for human decision-makers. With power imbalance between the state and citizens, lack of transparency may allow biased and discriminative decision-making.

CHALLENGE FOUR: AI CREATES FEAR AND MISTRUST

Public sector organizations can face resistance both from their internal and external consumers regarding use of AI for decision-making. Past AI implementation failures often fuel controversy around investing public money in AI.

CHALLENGE FIVE: AI VALUE IS NOT PROVEN

Governments are accountable for public expenditure, and are typically not motivated to be early adopters of emerging technology. Internally this can render AI projects susceptible to problems when high expectations are not able to be fulfilled.

These challenges call for the need to rapidly develop best practice frameworks and solutions for the development and use of AI systems that are accurate, robust, and scalable but also reliable, fair, and transparent. To understand how public sector organizations are dealing with these AI challenges, we studied nine AI projects, ranging from revenue collection, including tax compliance and fraud detection, to service delivery, including social protection, postal services, transport, and healthcare. For each project, we interviewed and surveyed data scientists, system developers, domain experts, and managers.

Building a Successful AI Transformation Program

Our research suggests that to ensure successful use of AI, public sector organizations need to initiate transformation programs that systematically address the five AI challenges described above. The focus of these programs should be to maximise value creation for a range of stakeholders, especially citizens. Such programs should take a five-pronged approach that concurrently focuses on, and develops, five key areas, as presented in figure 1.

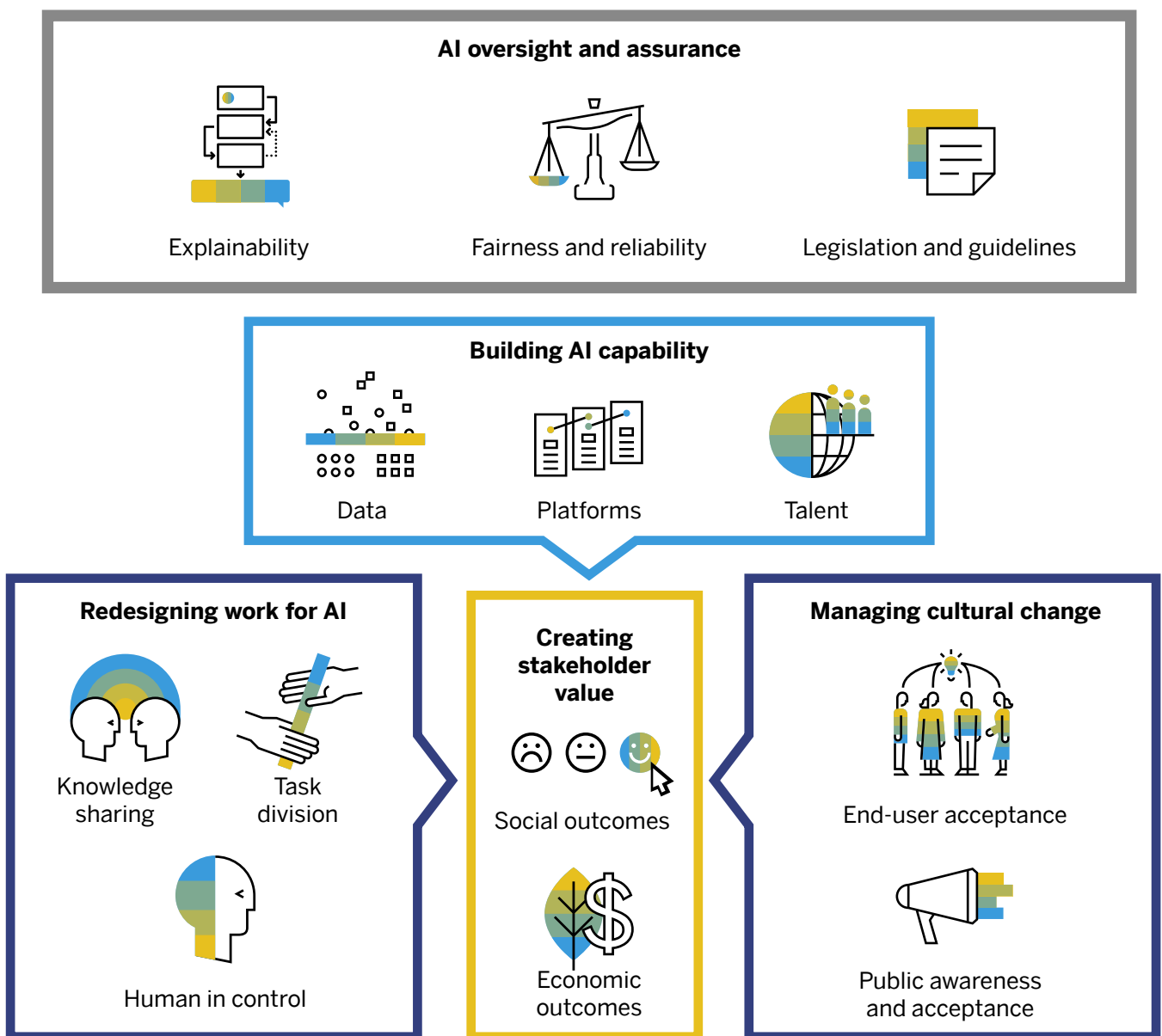


Figure 1: A framework for building a successful AI transformation program

Building AI Capability



Challenge one:

AI development is resource-intensive and requires significant ongoing commitment to secure high-quality data, platforms, and talent⁴.

AI models learn the rules of decision-making from training datasets. It is crucial to establish a viable ground truth (representative data set) that sets the basis for AI's accurate and unbiased learning and decision-making. The data can be structured or unstructured and amassed from a variety of internal and external sources.

While public sector organizations might have access to massive datasets, data tends to be siloed by design, buried in complex legacy systems, and the quality of data may vary across the silos. Data sovereignty can also impede efforts to leverage cloud infrastructure (most commercial AI systems are cloud-based) and to outsource development. AI initiatives in the public sector must find ways to manage the tensions between protecting citizen's privacy and breaking down barriers to sharing data. One state revenue office that we studied had been able to outsource its AI model development to an external vendor's platform because the model was trained with citizens' payment data only and sensitive personal data was kept private.

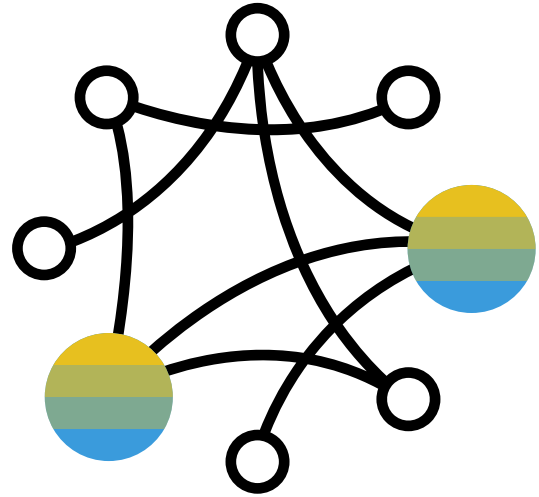
Building an AI capability necessitates development of platform technologies that enable fast and efficient processing, manipulation, and transformation of large amounts of data as well as providing access to and distributing AI services. Public sector organizations are usually weighed down by aged legacy systems⁵ and face dilemmas in setting up their platform environments. Some build their own platforms and others use vendor platforms. In-house platforms may provide higher control and the solutions are fit-for-purpose but require significant maintenance efforts over time. This latter option allowed one national business register to establish a shared AI development environment, which has facilitated collaboration in development and reusability of components. In contrast, a state revenue office chose a commercial-off-the-shelf AI development platform to decrease the IT maintenance burden.

⁴ Ida Someh, Barbara Wixom, and Angela Zutavern, "Overcoming Organizational Obstacles to Artificial Intelligence Project Adoption: Propositions for Research," Proceedings of the 53rd Hawaii International Conference on System Sciences, 2020.

⁵ Makena Kelly, "Unemployment Checks Are Being Held up by a Coding Language Almost Nobody Knows," The Verge, April 14, 2020, <https://www.theverge.com/2020/4/14/21219561/coronavirus-pandemic-unemployment-systems-cobol-legacy-software-infrastructure>.

AI development also hinges on the availability of unique data science talent who specialize in leveraging sophisticated algorithms to build predictive and prescriptive models. Attracting and retaining data science talent can be a challenge in the private sector, let alone in the public sector.

Gaining sufficient funding and executive sponsorship can be challenging in the public sector's bureaucratic and political environment. Organizations that strategically invest in the abovementioned AI capabilities are likely to reap benefits when it comes to reusing and scaling their AI services.



Key aspects of building AI capability:

- Building representative and unbiased training datasets
- Investing in new architectures and scalable technologies
- Attracting and retaining data-science talent

Redesigning Work for AI



Challenge two:

AI systems' growing ability to outperform humans in some tasks can represent a compelling managerial challenge. Despite its capabilities, AI is limited in its ability to understand context and interpret situations. Thus, it is important to keep people in the loop as safeguards to machine fallacies.

Domain experts can play an important role in training AI models, for a myriad of reasons including identifying relevant use cases, setting goals for AI, and reviewing and validating AI's inputs and outputs.

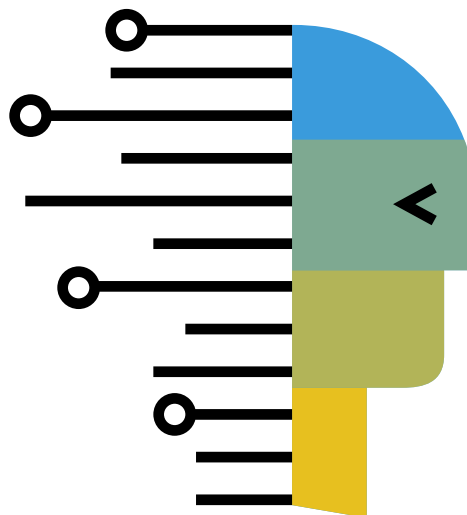
Domain experts can turn their implicit knowledge into explicit data points for algorithms to learn from. In one case, a start-up producing self-driving cars hired truck drivers to drive in bad weather conditions and by doing so it created data points for training the model⁶. Such domain-expert input may help to train AI models so that their representation of reality becomes more accurate. Despite the importance of integrating analytics and business knowledge, there are often knowledge and structural barriers between data scientists and domain experts.

The organizations we studied tackled such issues by co-locating data scientists and domain experts or facilitating constant dialogue through collaborative workshops. The cases showed consensus that data-science groups with proximity to business had better opportunities in developing robust AI models that could easily be integrated into business processes. Our interview data highlighted the importance of soft skills and good communications for the data scientists so as to communicate the value of the data to the business outcomes.

⁶ Ida Someh, Barbara Wixom, and Angela Zutavern, "Overcoming Organizational Obstacles to Artificial Intelligence Project Adoption: Propositions for Research," Proceedings of the 53rd Hawaii International Conference on System Sciences, 2020.

AI deployment requires integrating AI models into work processes which can create tensions in dividing tasks between human agents and AI agents⁷. While AI's strengths lie in its ability to perform structured tasks and process massive datasets in real time, humans usually fare better with less structured tasks, especially ones that require creativity and interpretation. Optimally, human-AI configurations would leverage both agents' strengths in a complementary manner. However, finding the right balance between automation and human involvement is not always easy and practical guidelines are still emerging⁸. The issue could be especially challenging in public organizations with conventional and entrenched work roles and structures.

The organizations we studied were clearly aware of this challenge and were actively redesigning their processes. Instead of handing off a work process entirely to an AI agent, the organizations we studied want to enhance the process to deliver better, faster, and higher-quality outcomes, and to free the workers' hands for tasks that require higher-level thinking. AI is being deployed to work through massive datasets that would pose too much burden on humans' cognition, one data scientist stated: *"No other methods can successfully navigate datasets of millions of points in different contexts, or do image clustering and recognition."* While human workers act as the controllers of the AI and make the final decisions, AI can inform those decisions by doing the heavy lifting and crunching through masses of data.



For further information:

- 7 Sue Newell and Marco Marabelli, "Strategic Opportunities (and Challenges) of Algorithmic Decision-Making: A Call for Action on the Long-Term Societal Effects of 'Datification,'" *The Journal of Strategic Information Systems* 24, no. 1 (2015): 3–14, <https://doi.org/10.1016/j.jsis.2015.02.001>.
- 8 Aleksandre Asatiani et al., "Implementation of Automation as Distributed Cognition in Knowledge Work Organizations: Six Recommendations for Managers," 40th International Conference on Information Systems, ICIS 2019, 2019, 1–16.

However, humans have a tendency to become complacent in the presence of automated systems⁹.

In the short term, this trend could represent a danger to humans' control over the work process as their ability to detect and rectify AI's mistakes diminishes. In the long run, having less hands-on involvement in the work can jeopardize humans' skills and expertise¹⁰.

Thus, ensuring that humans maintain control of operations and upgrade their skills instead of becoming complacent and deskilled, remains a compelling managerial challenge¹¹.

To this end, the organizations we studied emphasized the importance of keeping humans in the loop and educating their workers on how to act based on AI's probabilistic outputs. We saw signs of upskilling taking place: the organizations hoped that AI's recommendations would help the workers to gain a more holistic understanding of the process. In healthcare, AI's recommendations were expected to not only improve patient care but also help nurses to better understand the various indicators of patient's condition.

Key aspects of redesigning work:

- Facilitating ongoing dialogue between data scientists and domain experts
- Dividing tasks appropriately between human and AI agents
- Preventing automation complacency

For further information:

⁹ Raja Parasuraman and Dietrich H Manzey, "Complacency and Bias in Human Use of Automation: An Attentional Integration.," *Human Factors* 52 (2010): 381–410, <https://doi.org/10.1177/0018720810376055>.

¹⁰ Tapani Rinta-Kahila et al., "Consequences of Discontinuing Knowledge Work Automation – Surfacing of Deskilling Effects and Methods of Recovery," in *Proceedings of the 51st Hawaii International Conference on System Sciences*, 2018, 5244–53; V.

¹¹ Tapani Rinta-Kahila, Esko Penttinen, and Kalle Lyytinen, "Organizational Transformation with Intelligent Automation: Case Nokia Software," *Journal of Information Technology Teaching Cases* (Forthcoming).

AI Oversight and Assurance

3

Challenge three:

AI decision-making can be opaque for human decision-makers and some AI has been shown to be biased and discriminatory. Public sector organizations need to establish precise oversight and assurance mechanisms to minimize risks for stakeholders (especially vulnerable people).

Many advanced AI systems are ridden by the explainability problem, i.e. their inner workings are not understandable to humans. The complexity stemming from AI's inductive and experimental logic of making sense of massive datasets tends to render AI's decision-making opaque¹².

Considering that government agencies need to be able to explain the rationale for their decisions, lack of explainability is a literal showstopper for many public use cases. Indeed, organizations sometimes had to abandon algorithms because of their inscrutability.

In high-reliability contexts, understanding the rationale behind AI model's recommendations was imperative. A hospital data scientist advised that he would not include a factor in analysis just because the AI model suggested it, unless he knew there was reason to think there was a causal relationship between the factor and what was to be predicted.

Some business-register informants emphasized the importance of transparency behind any AI driven decisions due to the public accountability of the organization. However, we also observed various ways to tackle explainability issues. For instance, in predicting debt the AI's end-user interface visualizes a customer journey and shows where risk-increasing payment behaviours are. This capability can provide the service advisors an understanding of the factors that have influenced the risk estimates. We also noticed that not all public sector use cases require external explanation, for example where the AI is only being used to prioritise risky cases for investigation by a human agent.

AI comes with a risk of bias or error. AI may return biased estimates if its training data or input data perpetuates real-world biases. Mitigating bias is especially important in the public sector due to the power imbalance between the state and the individual (especially vulnerable people), as welfare beneficiaries typically cannot opt out from government programs or go to a different provider.

¹² Aleksandre Asatiani, Pekka Malo., Per Rådberg Nagbøl, Esko Penttinen, Tapani Rinta-Kahila., and Antti Salovaara "Challenges of Explaining the Behavior of Black-box AI Systems," MIS Quarterly Executive, 2020, 19(4), 259-74.

One state revenue office's decision to exclude demographical data and to use only behavioural data helped to prevent bias creeping into the model's estimates. Potential errors in AI's decision-making raise questions about accountability: who is accountable when AI makes mistake that affects an individual or the society? This issue connects to the question of explainability: if AI operates as a black box, the government organization needs to accept accountability on decisions whose rationale it cannot explain.

Therefore, government systems and procedures should be beyond reproach and oversight is needed to prevent extensive profiling of

individuals, dehumanization of citizens and government employees, and discrimination against already marginalized people¹³.

However, legislation and guidelines can lag the rapidly evolving AI technology. Useful high-level guidance is becoming available from international organizations with regard to ethics, privacy, and governance frameworks, some specifically for the public sector context¹⁴.

For instance, the European Union has introduced General Data Protection Regulation (GDPR) legislation to ensure the privacy and security of citizen data and citizens' rights with regard to algorithmic (AI) decision making and profiling¹⁵. Similar legislation may be useful for non-EU organizations but more specific and enforceable frameworks are still missing.

Key aspects of AI oversight and assurance:

- Ensuring transparency when using complex AI models
- Mitigating bias and error
- Heeding legislation and guidelines that lag technology

For further information:

¹³ Shoshana Zuboff, "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization," *Journal of Information Technology* 30, no. 1 (2015): 75–89, <https://doi.org/10.1057/jit.2015.5>.

¹⁴ International Public Sector Fraud Forum 2020; OAI 2020)

¹⁵ Bryce Goodman and Seth Flaxman, "European Union Regulations on Algorithmic Decision Making and a 'Right to Explanation,'" *AI Magazine Fall* (2017): 50–57, <https://doi.org/10.1609/aimag.v38i3.2741>.

Managing Cultural Change



Challenge four:

Public sector organizations can face resistance both from their internal and external consumers regarding use of AI for decision-making.

Redesigned processes can give rise to new roles and work tasks for humans, such as monitoring and altering the algorithm and auditing the algorithm's outputs.

Still, AI's threat to human employability due to its ability to automate tasks traditionally performed by humans can be a recurring concern, especially in the public sector that has traditionally offered high job security. Although recent research found that reducing personnel numbers was the least frequently stated motivation for AI implementation¹⁶, fears of being replaced are common among workers. Such fears were present among some organizations' domain experts, causing resistance toward AI.

However, educating staff as to how the AI tool could augment their work helped to alleviate concerns and facilitated acceptance. In addition, we were surprised to find that a system performing 'too well' appeared as another source of resistance, when it uncovered significant factors previously unknown or overlooked by domain experts who did not trust or believe the AI's decisions.

In this case, the organization emphasized sensitivity to a potential lack of knowledge among domain users, as they had had to navigate the resistance caused by AI's counterintuitive revelations. As one government official explained: *"the real challenge is not producing that first proof-of-concept, it's driving the change in the real world, that's really hard...[to] change peoples' minds."*

¹⁶ Thomas H. Davenport and Rajeev Ronanki, "Artificial intelligence for the real world," Harvard business review, 96, no.1 (2018): 108-16.

Public resistance can further complicate use of AI in the public services – government services have traditionally been delivered with a human touch, and some cohorts are not yet trustful of AI decision-making.

Media coverage of failed government AI implementations may have contributed to this distrust. Ability to foresee and manage unintended consequences is key to maintaining citizen trust in public institutions and this ability requires understanding vulnerabilities of the stakeholders who are affected by the AI use. It is important to note that political pressures may direct executives to ignore even foreseeable risks when governing AI development projects.



Key aspects of managing cultural change:

- Overcoming end-user resistance through training
- Managing public trust in AI and gaining a ‘social license’

Creating Stakeholder Value



Challenge five:

Justifying public expenditure for projects that are risky and have unclear value metrics, can make it difficult to be an early adopter of AI.

Government organizations are accountable for public expenditure and this may make it difficult to justify investing in resource-draining AI projects, especially if these are experimental and have a high risk of failure.

High expectations can cause challenges for the success and ongoing support of AI programs, especially in the public sector where the highest level of governance is represented by politicians who may not always be familiar with AI technologies but experience pressures to deploy them.

High-level executives' lack of understanding about the technology's capabilities has been found to plague AI implementation projects¹⁷. The gap in understanding the AI technology between governmental decision-makers and technical professionals can feed into a discrepancy between what is expected from the technology and what it can deliver. Project-level governance needs to manage these expectations to ensure the continued commitment of top management. Some of our interviewees had noted that

decision-makers who were less knowledgeable of how algorithms functioned often expected them to solve an entire problem even though a more appropriate way of utilizing such system would have been to have it assist humans in solving the problem.

Many public and private organizations struggle to define and measure AI value for stakeholders. Many of the existing IT metrics used in practice focus on financial and operational indicators and fail to capture and weigh AI's potential implications for citizens or other stakeholders. Even costly AI implementation can be successful if it adds other kinds of value to society.

Conversely, economically profitable investments

¹⁷ Ida Someh, Barbara Wixom, and Angela Zutavern, "Overcoming Organizational Obstacles to Artificial Intelligence Project Adoption: Propositions for Research," Proceedings of the 53rd Hawaii International Conference on System Sciences, 2020.

can result in harrowing societal consequences such as ethnic discrimination or unwarranted surveillance. The rapid evolution of AI technology can challenge government organizations to define the value pursued with AI, measure, and track it. This can help them to weigh the positive value outcomes against negative ones, for instance, weighing decrease in insurance fraud against greater diligence leading to longer processing times for claims.



Key aspects of creating stakeholder value:

- Justifying public expenditure and managing high expectations
- Defining AI project metrics that represent stakeholders' interests

Conclusion

Our investigations into various public sector AI projects provides a foundation for the significance of each challenge outlined in this document. Thus, the framework illustrated in figure 1 provides tentative foundations for successful AI development in the public sector. Our inquiry comes with four main insights:

1. Accessing and leveraging high quality training data sets presented a significant challenge. While we expected addressing potential biases in the data to represent challenges, we discovered that public sector organizations already struggle to access and utilize the data in the first place. Data can be siloed across different departments both in the technical and regulatory sense. Legacy systems can be ridden with incompatibility issues that can complicate the technical process of retrieving and recombining relevant data, and privacy concerns can inhibit the use of sensitive data. Therefore, we find that in addition to avoiding biases, there exist various aspects of data acquisition that warrant research attention. Better understanding of how organisations have overcome such data issues can help with building agile data pipelines in a cost-efficient manner.

2. AI explainability surfaced as a chief obstacle due to the public sector's need to operate in a transparent manner. While the technical explainability of various AI models was a recurring theme in the interviews, we learned that explanations had a significant social dimension. In some cases, the model's complexity did not allow a comprehensive technical explanation, but its use was allowed because its end users could understand the limits of AI's capability and the extent to which probabilistic results can be relied on, and were

able to control its sensitivity by adjusting thresholds. Moreover, even though a technical explanation could be available, it was not necessarily meaningful or useful to a domain expert who did not possess the statistical understanding of a data scientist. In such cases human-to-human explanations held a higher significance than machine-to-human ones. The dimensions of explainability should be further investigated to facilitate AI adoption in the public sector.

3. Our interviewees emphasized the importance of keeping a human in the loop as the controller of AI. We saw various examples of how this can be achieved, but due to the early stage of most AI projects, we could not derive many practical insights on what successful human-AI configurations look like. Thus, following up projects where AI is being deployed as an intelligent tool to augment human workers could reveal useful insights on how work needs to be rearranged to make the most of AI.

4. AI comes with a lot of hype and thus it was not surprising to note that projects sometimes failed to deliver the expected outcomes. This could sometimes be attributed to higher-level decision-makers' lack of understanding of the technology and what kinds of questions it can help answer. However, we noted that in cases where AI surpassed expectations and revealed something previously unknown from the data, the development teams sometimes struggled to convince domain experts and managers about the results' viability. Overcoming resistance and changing incumbent paradigms requires change management practices that might need to be updated for the age of AI.

About the **SAP** Institute for Digital Government

We live in an increasingly disrupted world and are witnessing an unprecedented transformation of how governments, businesses, and citizens operate and interact.

This transformation is readily evident in the changing role of government as it addresses this disruption: increasing expectations of citizens in how they engage with government services; the ability of government operations to effectively and safely utilise the valuable data within and across the ministries; creating secure and economically sustainable environments and delivering the mission of government in helping drive nation-building.

SAP has been a key enabler of government services and processes for over 30 years. As a global company, we have first-hand experience partnering with leading governments. In 2014, along with several academic and government institutions, SAP created the SAP Institute for Digital Government (SIDG) to support governments in responding to these challenges. The SIDG facilitates a forum for exchange of ideas and thought-leadership demonstrating the public value of digital government to tackle real-world, complex issues.

To learn more about the SAP Institute For Digital Government, please visit <https://discover.sap.com/sap-institute-digital-gov/en-us/index.html>.

THE UNIVERSITY OF QUEENSLAND RESEARCHERS

Australian Institute for Business and Economics

Dr Tapani Rinta-Kahila, Professor Marta Indulska

UQ Business School

Dr Ida Someh, Professor Nicole Gillespie, Professor Shirley Gregor

SAP ADVISORS

Ian Ryan, Ryan van Leent

ACKNOWLEDGEMENTS

We are grateful for the anonymous case organizations for their collaboration in data collection.

CITATION:

Rinta-Kahila, T., Someh, I., Gillespie, N., Indulska, M., Gregor, S., Van Leent, R., Ryan, I. (2020).

[Delivering AI Programs in the Public Sector: Guidelines for Government Leaders]. The University of Queensland and SAP SE. Link to report: [<https://dam.sap.com/mac/app/p/projects-workspace/71841>]

Follow us



www.sap.com/contactsap

71841enUS (21/04)

© 2021 SAP SE or an SAP affiliate company. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

The information contained herein may be changed without prior notice. Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors. National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE's or its affiliated companies' strategy and possible future developments, products, and/or platforms, directions, and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, and they should not be relied upon in making purchasing decisions.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. All other product and service names mentioned are the trademarks of their respective companies.

See www.sap.com/trademark for additional trademark information and notices.