# When Does Automation in Government Thrive or Flounder?


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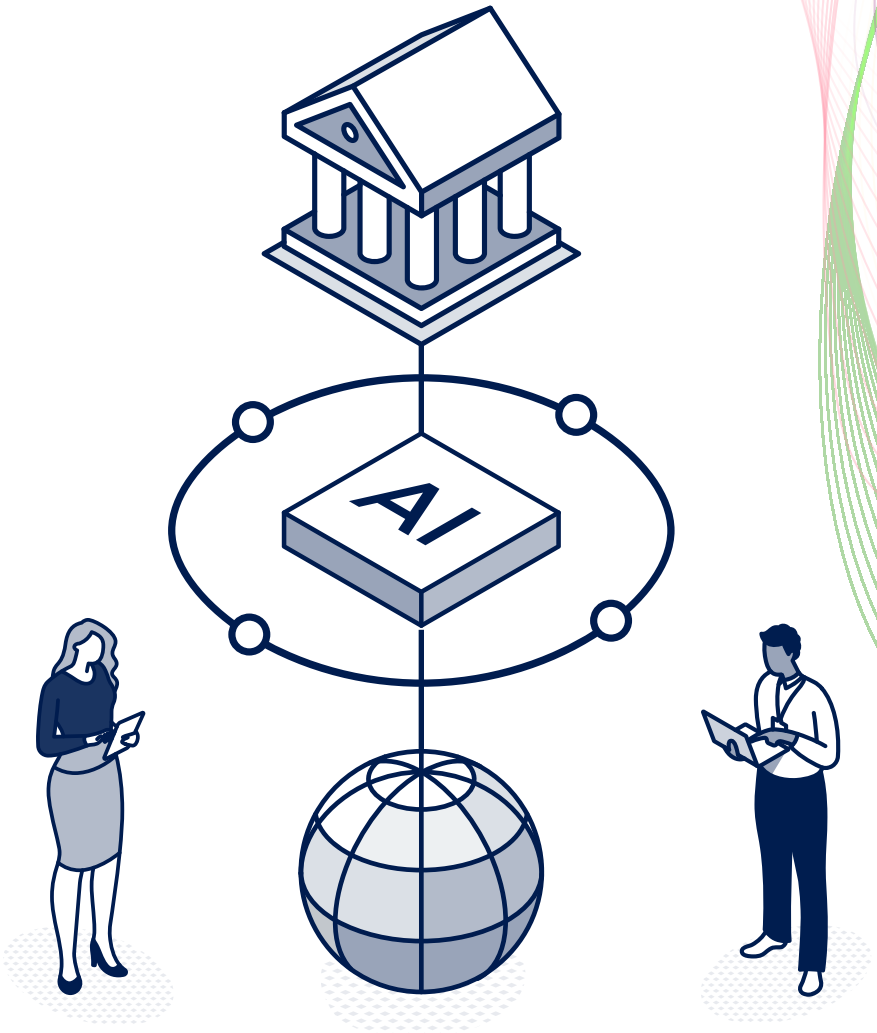


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## Authors

**Elsa Estevez**
UNESCO Chair on Knowledge Societies and Digital Governance
Universidad Nacional del Sur, Argentina
Consejo Nacional de Investigaciones
Científicas y Técnicas, Argentina
Universidad Nacional de La Plata, Argentina
ece@cs.uns.edu.ar

**Tomasz Janowski**
Gdańsk University of Technology, Poland
University for Continuing Education Krems, Austria
tomasz.janowski@pg.edu.pl

**Benjamin David Roseth**
Inter-American Development Bank, Washington, D.C.
broseth@iadb.org

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# ABOUT THE AUTHORS

**Elsa Estevez** is the chairholder of the UNESCO Chair on Knowledge Societies and Digital Governance at Universidad Nacional del Sur (UNS), Full Professor at UNS, Principal Researcher at the National Council of Scientific and Technical Research (CONICET), and Full Professor at the Universidad Nacional de La Plata, all in Argentina. Previously, she was Senior Academic Program Officer at the United Nations University (UNU) in Macao and Portugal; visiting professor at the National University of Rio Negro, Argentina, Gdańsk University of Technology, Poland, and the University of Minho, Portugal; and head of information technology departments in large financial and pharmaceutical organizations in Argentina. She conducts research, teaches students and managers, and consults for government and international organizations about digital government.

**Tomasz Janowski** is the Head of the Department of Informatics in Management, Gdańsk University of Technology, Poland; Invited Professor at the Department for E-Governance and Administration, University for Continuing Education Krems, Austria; and Co-Editor-in-Chief of *Government Information Quarterly*, Elsevier. Previously, he was Head of Unit and Senior Research Fellow at the United Nations University in Macao and Portugal. His research interests include digital government, sustainable digital transformation, and digital transformation for sustainability. He is an author or co-author of over 270 academic publications and analytical or policy reports. He served as an expert for various government and international organizations, including CTO, European Commission, IDB, IDRC, ITU, OSCE, UNDP, UNESCO, and the World Bank.

**Benjamin Roseth** is a Senior Specialist in Modernization of the State at the Inter-American Development Bank. He coordinates analytical work for the Digital Cluster of the Innovation in Citizen Services Division, including impact evaluations and other quantitative and qualitative research. Previously, as a Young Professional at the IDB, he worked in the Office of Evaluation and Oversight. Before coming to the IDB, he was a strategy consultant at Deloitte and a Junior Associate in the Public Management Unit of the World Bank.

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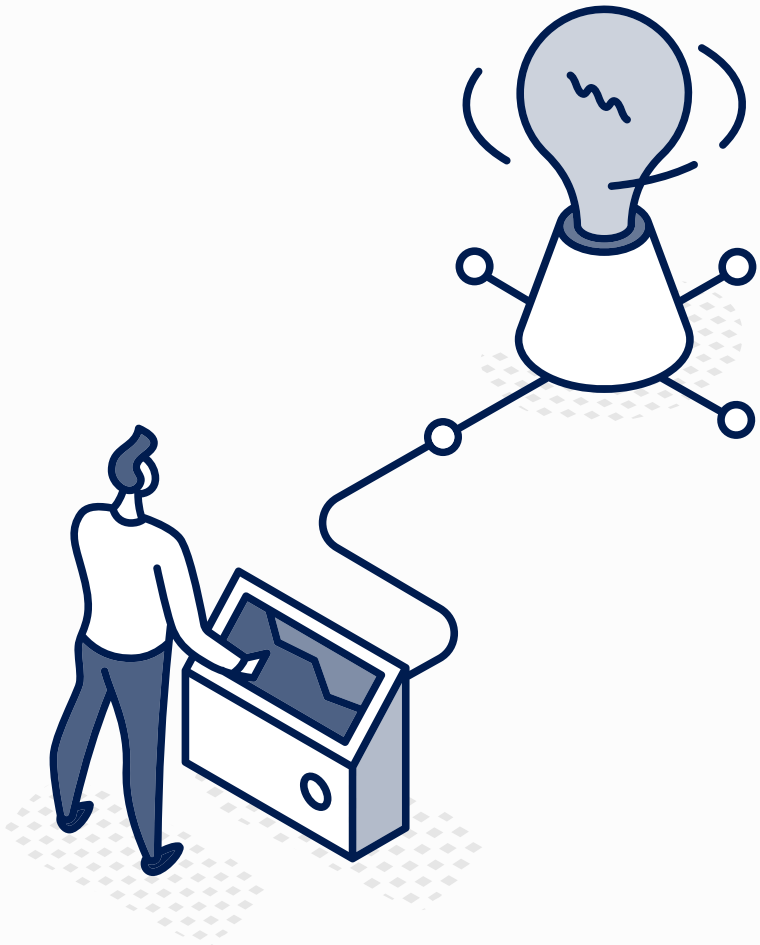


# A.

# CAN HUMANS AND MACHINES COLLABORATIVELY DELIVER PUBLIC SERVICES?

Government organizations worldwide are harvesting the transformative potential of digital technologies to automate internal processes and interactions with citizens, businesses, and each other. Automation can bring benefits, such as an increase in the efficiency of government operations, the quality of government decisions, and the convenience of government-citizen interactions, among other benefits. But it can also produce adverse outcomes, such as compromising social value for economic gains, misjudging citizen circumstances, having to compensate for the effects of algorithmic errors, and others.

Governments in the region and worldwide are generally uninformed about how to grasp the implications of automation and how prepared they are to implement automation initiatives that increase the benefits and manage the risks of automation. Specific questions include: a) how they should identify areas of public policy and public services that are most apt for automation; b) what questions, regarding potential benefits and costs, they should ask before embarking on a process of automation; c) how they should monitor the key benefits and costs in the process of automation and establish whether automation has had the desired impact; and d) how to organize and manage automation efforts. This report explores these issues through 12 case studies from nine countries and regions (Argentina, Chile, France, Norway, Paraguay, Singapore, Spain, Sweden, and the European Union) and seven government sectors (administration, border control, finance, justice, procurement, registry, and welfare). Each case study will identify the problem automation was designed to resolve or service it was designed to deliver; present the potential benefits and costs of automation that were relevant in each context, highlighting those that were surprising or counterintuitive; demonstrate how automation was implemented to reduce costs and monitored to ensure high impact and no unintended negative consequences; and end with a description of how the automation process was organized.

***This report explains the concept of government automation, provides a framework that exploits the potential of government automation to produce public value or risk creating public disvalue, and offers a model that delineates the scope of government automation efforts.***

The cases guide the formulation of a taxonomy of benefits and risks of government automation initiatives and the four broad factors that government organizations should consider when aiming to realize the benefits and manage the risks of such initiatives: institutional readiness, human capacity, process innovation, and whole-of-government. This report also presents and illustrates strategies for implementing the factors and discusses how they help produce public value, for example, by enabling the proactive delivery of public services, automatically determining service eligibility, and reducing the time for obtaining a service.

The target audience for the report includes policymakers, public managers, systems analysts, and technology specialists in charge of planning and implementing government automation initiatives and managing their impact on government organizations and their stakeholders. While the focus is on those who make, analyze, and implement decisions regarding automation on behalf of individual government organizations, the authors are particularly concerned about support, coordination, and guidance offered to such decisions by the higher authority. It is also aimed at academics, developers, and educators who advance and share knowledge about government automation. Finally, the report was prepared in the context of the Latin American public sector, but it can also be useful in other regions or sectors.

# B.

# THE NATURE OF GOVERNMENT AUTOMATION

Automation is the application of machines to tasks previously performed by humans or, increasingly, tasks that no human being can perform (Groover, 2020). It integrates machines and humans into self-governing systems, able to act with little or no human guidance, increasingly showing more autonomy and better performance.

By transferring control from humans to machines, automation is intrinsically related to digitalization which, in turn, supports the functioning of any modern government. Given the enormous volume of economic, social, political, and other activities taking place digitally, government organizations must be able to implement public policies and exercise their responsibilities in the digital world just as they do in the physical world. To this end, they are digitalizing their internal processes, digitalizing interactions with citizens and other organizations, acquiring digital capabilities, and transforming themselves and their relationships with citizens into "digital government." This transformation creates many opportunities for automation. When government seeks to maximize the potential of automation within digital government transformation efforts, combining tasks performed by algorithms and humans at scale, we call the result "automated government."

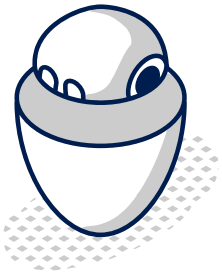
The three concepts—government, digital government, and automated government—are intertwined. That is, each is more specialized and has additional responsibilities, structures, capabilities, and relationships than the overall concept in which it is embedded (Section 1.1). For example, where traditional government delivers public services to citizens upon request, over the counter, and provided by a human caseworker, digital government delivers them through digital channels, upon request and provided by a human caseworker. In contrast, automated government delivers them proactively through digital channels, with an algorithm replacing or complementing the human caseworker. Thus, each concept brings more possibilities to government operations than the previous one.

The automation of government work naturally leads to human-machine and machine-machine collaboration. While in a traditional government workplace machines are treated merely as tools to enhance human performance, in an automated workplace they are treated as (intelligent) collaborators. This report presents eight scenarios for automating government work by breaking down complex tasks into simpler subtasks and gradually reassigning tasks and subtasks from human to machine operators (Section 1.2).

The implementation of government automation depends on the availability of mature technology that can automate part of government work in particular application areas. Government organizations must also be able, willing, and authorized to adopt this technology. Mature technology is typically built through incremental improvement by recombining existing technologies. For automation, four recombinant technologies give rise to four increasingly consequential types of automation, according to their ability to handle change, anomaly, and scale without human intervention.

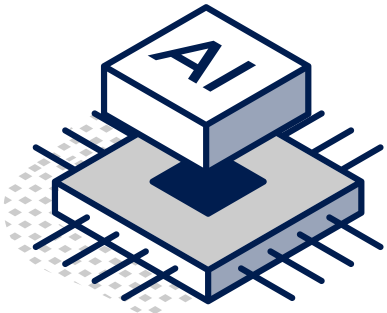
**Types of Automation (Section 1.3)**

1. **Rule-Based Automation (RBA)** – A system automates a set of human-made rules, applying them to data to make decisions and execute individual tasks.



2. **Robotic Process Automation (RPA)** – A system deploys software "bots" to observe how a human user behaves when executing tasks, derives the rules that govern such behavior, and then mimics such behavior by applying the rules, similar to RBA.

3. **Business Process Automation (BPA)** – A system automates the sequencing, coordination, and orchestration of tasks that compose a larger business process. It manages the flow of tasks, documents, and information between people, systems, and organizations, telling RBA or RPA when to start and stop processing individual tasks.



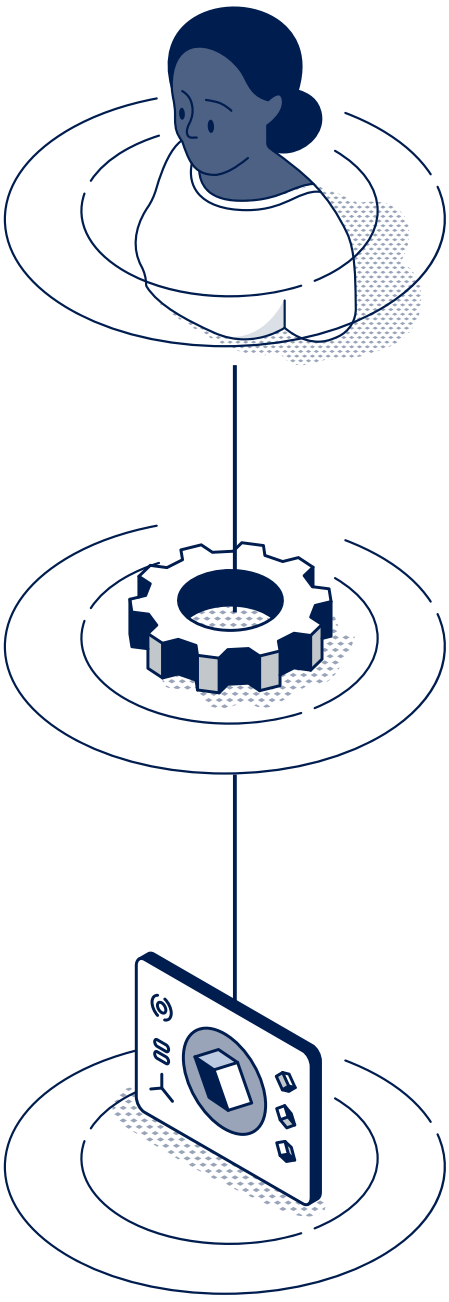

4. **Intelligent Automation (IA)** – A system integrates machine intelligence into RBA, RPA, or BPA, using data-based (machine learning) or logic-based (symbolic) techniques. The integration aims to equip automated systems with learning capabilities, reducing their dependence on human intervention when faced with anomalies, change, or scale-up operations.

# C.

# ASSESSMENT AND IMPLEMENTATION OF GOVERNMENT AUTOMATION

Any government initiative, including automation, must ultimately be assessed against the public value it is supposed to produce. Public value can include: community values delivered directly to citizens (e.g., inclusive public services); organizational values that strengthen government institutions to produce community values (e.g., empowered employees); and political values that enable public institutions to be trusted to work for society's benefit (e.g., transparency and accountability). Community values constitute first-order impact, organizational values second-order impact, and political values third-order impact. To assess the impact of government automation, this report introduces a public value framework (Section 1.4).

Public value is just one aspect of government automation. It is necessary but insufficient for implementing government automation. Another aspect is the operational capabilities that government organizations should possess to pursue automation. The third is the authorization granted to the government organization by higher authorities to pursue automation with the required technology. The three aspects—political (public value), operational (operational capabilities), and authorizing (strategic capabilities)—jointly establish an environment for deciding whether and how to introduce automation in government. Public managers must ensure that the political, authorizing, and operational environments are aligned, as determined by the strategic government triangle model (Section 1.5) and its connection to the public value framework (Section 1.4).



# D.

# WHERE GOVERNMENT AUTOMATION IS TAKING PLACE

Government automation follows a long tradition of automation in manufacturing, industrial, and, more recently, service processes. However, government automation is also emerging as sufficiently distinct from its industrial roots to build its own conceptual, technological, and methodological foundations. Today, such foundations are established by the collective experience of governments worldwide that invest money, time, effort, and authority into automation initiatives. This report documents some of these experiences and reflects on the factors behind their successes and failures using case studies.

Twelve cases of automation initiatives are presented in Chapter 2. They originate from nine countries and regions (Argentina, Chile, France, Norway, Paraguay, Singapore, Spain, Sweden, and the European Union) and seven sectors (administration, border control, finance, justice, procurement, registry, and welfare). They also follow different administrative traditions and technology choices.

The cases were selected to illustrate a clear public value purpose, not just an incremental technological improvement, to involve clear decisions on implementation and the technology used, to produce actual and possibly measurable impact, and to cover a variety of national and sectoral contexts. Finally, availability of information was a factor in the selection of cases.

**The cases presented in this document are the following:**

1. Public procurement in Paraguay
2. School transportation benefits in Spain
3. Child benefits in Norway
4. Sickness allowances in Norway
5. Social welfare in Sweden
6. Social security claims in Chile
7. Civil registry services in Spain
8. Judicial processes in Argentina
9. Law as Code in France
10. My Social Rights in France
11. Border control in the European Union
12. Service automation in Singapore

For each case, the report presents the context, aim, implementation, and impact. It also highlights one notable aspect or lesson learned.

# E.

# BENEFITS OF GOVERNMENT AUTOMATION

Given the cost and disruption caused by automation, government organizations should know what benefits they can realistically expect from such initiatives and under what conditions, and weigh them against expected costs and disruptions. Chapter 3 of this report presents four kinds of benefits expected from government automation:

1. Government automation can increase the efficiency of government operations.
2. Government automation can increase the productivity of public goods and services.
3. Government automation can improve the quality of government decisions.
4. Government automation can enhance citizen convenience.

Government efficiency is the ability to achieve objectives, that is, to produce public value with no (or minimal) waste of government resources such as time, effort, authority, and others. Automation can increase efficiency by reducing the government's operating costs, shortening decision times, simplifying processes, or reducing system development costs. In terms of the public value framework, such benefits produce organizational values such as financial gains or organization-technology alignment, as well as constituency values, such as reducing administrative burden and increasing user value (Section 3.1).

Government organizations produce public goods and services using labor, materials, energy, facilities, authority, and other inputs. Production is measured in terms of the volume, scope, and variety of goods and services. Government automation can increase production by releasing or complementing human resources or completing machine-only tasks. The former can deliver organizational values such as financial gains, empowered employees, or organization-technology alignment; the latter can include constituency values such as a reduced administrative burden, greater user value, or more inclusive public services (Section 3.2).

Many decisions made by government organizations have a direct impact on people's lives. Thus, the quality of such decisions, that is, whether they are aligned with the public policy's intentions and values, is of paramount importance. The quality of the processes through which such decisions are made is also extremely important. Government automation can ensure that such decisions are objective, evidence-based, reliable, and transparent when they are part of such processes. These benefits enhance organizational values like organization-technology alignment, constituency values like increased user value, and political values like openness and transparency (Section 3.3).

As part of the social contract, the government imposes various obligations on citizens, including paying taxes, protecting private property, applying for permits and licenses, and others. Discharging these obligations, including by interacting with government organizations, should be made as convenient as possible. To this end, government automation can reduce the administrative burden, facilitate personalized services, and enable inclusive and proactive services (Section 3.4).

# F.

# RISKS OF GOVERNMENT AUTOMATION

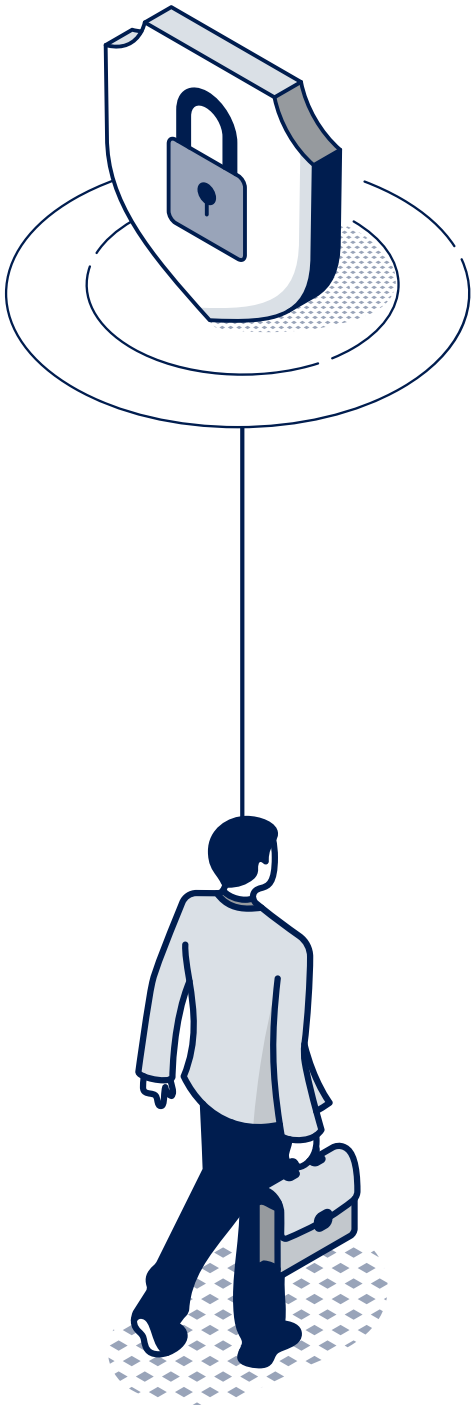
Government automation initiatives depend on various technical, legal, organizational, and human factors. Some of them are internal and within the government's control, while others are external and hard to predict, let alone under the control of government organizations. Thus, such initiatives naturally involve the risk of uncertainty and deviation from the unexpected. These risks should be balanced against the potential benefits of such initiatives. Chapter 4 of this report identifies four risks facing government automation initiatives:

1. Government automation may waste time, money, and capital.
2. Government automation may lower decision quality.
3. Government automation may fail to solve problems.
4. Government automation may undermine trust.

When government organizations lack the capacity to effectively execute and manage the impact (on themselves and their stakeholders) of automation projects but carry on with such projects regardless, this raises the prospect of project failure and wasting of time, money, and authority to embark on such projects in the future. Specific risks include the lack of political support, which may undermine stakeholder commitment; the lack of innovation capacity, which may lead to the use of ill-suited methods; the lack of stakeholder trust, which may limit successful adoption; and fragmented coordination, which may increase costs. Such risks produce organizational disvalue (that is, financial losses or disempowered employees) and political disvalue, such as citizen disengagement (Section 4.1).

Government automation can produce the opposite effects on the quality of government decisions. It can increase the quality by making government decisions more objective, evidence-based, reliable, and transparent. It can also lower the quality of the decisions. Specific risks include automated solutions misjudging citizen circumstances, producing suboptimal decisions for borderline cases, or or introducing bias or discrimination. Such risks produce constituency disvalues, like decreased user value or non-inclusive public services, and political disvalues, like the opacity of government functions (Section 4.2).

***A driver for many government automation initiatives is providing automated solutions to various policy problems, from welfare provision to fraud detection to border control.***



However, government automation may create problems of its own. Specific risks include problem-solution mismatch: offering the wrong solutions to a given problem, offering suboptimal solutions that are inferior to what exists or could exist, or offering solutions that generate additional costs, such as clean-up and compensation for the effects of algorithmic errors. These risks produce organizational disvalue, such as organization-technology misalignment, and constituency disvalue, such as decreased user value (Section 4.3).

The wide-scale deployment of new technology across government processes can affect the functioning of the entire government and its relationship with citizens. This is particularly true of automation technology, given its relative novelty and scale-up potential. In turn, replacing humans with machines in government processes may undermine trust in such processes, which is a foundation for effective public governance. Specific risks include displacing policy responsibility to those not authorized to make policy decisions, violating citizen privacy, and compromising social value for economic gain. The risks produce organizational disvalue, such as financial losses or organization-technology misalignment, and political disvalues, such as opacity and unaccountability (Section 4.4).

# G.

# FACTORS RELEVANT TO GOVERNMENT AUTOMATION

As with any government initiative, automation projects are established to achieve specific objectives in terms of timing, deliverables, and outcomes. A project is successful if it achieves its objectives. They may include providing specific benefits and overcoming specific risks of government automation, such as those in the respective typologies in Chapters 3 and 4.

While governments worldwide implement various automation projects, including those documented by the case studies in Chapter 2, they learn the lessons on how to design, implement, and manage them successfully. The report synthesizes such lessons by the factors of government automation, each helping to realize certain benefits and contain certain risks of government automation from the respective typologies. The factors are organized into four categories—institutional readiness, human capacity, process innovation and whole-of-government—which are explained below and covered in detail in Chapter 5.

## G.1. Institutional Readiness

Government automation is the responsibility of a government organization that owns the task, process, service, workflow, and office being automated. For automation to succeed, this organization must be automation-ready, technologically and organizationally. The former covers the provision of the digital infrastructure to host various elements—systems, services, networks, and capabilities—of automated solutions, with monitoring and control over infrastructure-related decisions to continue delivering value to the organization. As automated solutions are particulary sensitive to the quality of data used to make decisions, technological readiness also entails the provision of trusted data, that is, data produced, shared, applied, and discarded through a process governed by explicit standards and policies enacted by the organization. The adoption of such standards and policies, along with procedure simplification, business process redesign, building of human-machine collaboration skills, and others, leads to organizational readiness to support automation and manage the associated change. In summary:

> ***Government automation requires the organizations involved to provide access to a common digital infrastructure, practice information technology governance, provide trusted data and organizational support, and manage change.***

Four specific factors emerge from this formulation:

1. Automation is built on a digital infrastructure.
2. Automation requires information technology governance.
3. Automated decisions must rely on trusted, well-governed data.
4. Automation and the associated change require organizational readiness.

Each factor presents concrete benefits, risks, and implementation approaches, supported by evidence from the case studies or literature. The details are provided in Section 5.1.

## G.2. Human Capacity

Shifting the bulk of government work from humans to machines does not elimitate the need for human presence in government offices. More common than replacing human presence is complementing it through human-machine collaboration. Human capacity is also critical to pursuing and sustaining the benefits of automation. Because of the deep interactions between government goals, technological solutions, organizational processes, and legal requirements to be addressed when pursuing automation, such capacity should not be delegated outside government, but maintained within it. Managing such interactions requires in-depth understanding of the government rules, tasks, and processes to be automated, what technology and data are available for such automation, how to ensure that the automated solutions conform to the legal requirements, and how to protect users from possible adverse effects. It also requires technology experts who can design, implement, and manage such solutions in collaboration with government and legal experts. In summary:

> ***Government automation needs in-house expertise in technological, legal, and governmental domains as well as empowered teams able to link such domains, driven by public mission and seeking to maximize human-machine complementarity.***

Four specific factors emerge from this formulation:

1. Automation needs human capacity in-house.
2. Automation needs competent and empowered staff.
3. Automation relies on government-technology collaboration.
4. Automation maximizes human-machine complementarity.

Each factor presents concrete benefits, risks, and implementation approaches, supported by evidence from the case studies or literature. The details are provided in Section 5.2.

## G.3. Process Innovation

To achieve the best possible effect from digital transformation, the process or other entity being digitalized should be analyzed, rethought, and improved before transforming it. The improvement can concern efficiency, effectiveness, or transparency and entail various forms of innovation. In the absence of such innovation, digitalization will tend to preserve in the digitally transformed process all deficiencies present in the original process—inefficiency, ineffectiveness, opacity, and others. As a particular form of digitalization, automation should be naturally accompanied by innovation,

but innovation is especially important for it. First, the nature of automation, its speed, replication, and limited human control amplify the costs of compensating for the adverse effects of inefficiency, ineffectiveness, opacity, and any other digitally preserved deficiencies. Second, while most human-executed processes can rely on estimates, projections, interpretations, flexibility, and other forms of human intelligence, none of these forms is accessible to machine-executed processes. They must be first made ready for automation. Third, the consequential nature of many automated decisions requires a human to make the final decisions and take responsibility for them. Deliberately introducing such decision points also requires process innovation. In summary:

> ***Government automation requires making the process automation-ready through simplification, incrementality, reviewability, trust-building, problem orientation, and other forms of process innovation.***

Five specific factors emerge from this formulation:

1. Automation is about solving problems.
2. Automation should be preceded by simplification.
3. Automation should be introduced incrementally.
4. Automation outcomes must be subject to human review.
5. Automation needs a paradigm shift towards trusted partners.

Each factor presents concrete benefits, risks, and implementation approaches, supported by evidence from the case studies or literature. The details are provided in Section 5.3.

## G.4. Whole-of-Government

Public institutions typically operate within well-defined operational and legal borders. Such borders help establish the limits of institutional authority, define who is responsible, manage dependencies with other institutions, and reduce operational complexity, among others. However, delivering public services or implementing public policies requires deploying such capabilities across such borders.This cross-border execution and the linking of government capabilities and citizen needs is facilitated by the whole-of-government approach, which is in turn enabled by digitalization and automation. The latter is particularly susceptible to networking, linking of multiple data sources, and scaling up results across government, made possible in the digital whole-of-government environment. The approach helps enlist public support for automation initiatives, puts them in the context of and within support from the government-wide digital strategy, sensitizes the stakeholders across government about the importance of working together on automation, and integrates different resources and capabilities to facilitate and scale up automation. In summary:

> ***Government automation should be supported and legitimized by the public and driven by an overarching digital strategy, and there should be collaboration between government organizations and integration of capabilities across government.***

Four specific factors emerge from this formulation:

1. Automation needs public support.
2. Automation is enabled by digital strategy.
3. Automation calls for collaboration but fails in isolation.
4. Automation benefits from integrating capabilities across government.

Each factor presents concrete benefits, risks, and implementation approaches, supported by evidence from the case studies or literature. The details are provided in Section 5.4.

**Table 1.** Factors Relevant to Government Automation

| | | |
|---|---|---|
| **1.** Institutional Readiness | Government automation requires the organizations involved to provide access to a common digital infrastructure, practice information technology governance, provide trusted data and organizational support, and manage change. | |
| | **1.1** | Automation is built on a digital infrastructure. |
| | **1.2** | Automation requires information technology governance. |
| | **1.3** | Automated decisions must rely on trusted, well-governed data. |
| | **1.4** | Automation and the associated change require organizational readiness. |
| **2.** Human Capacity | Government automation needs in-house expertise in technological, legal, and governmental domains, and empowered teams able to link such domains, driven by public mission and seeking to maximize human-machine complementarity. | |
| | **2.1** | Automation needs human capacity in-house. |
| | **2.2** | Automation needs competent and empowered staff. |
| | **2.3** | Automation relies on government-technology collaboration. |
| | **2.4** | Automation maximizes human-machine complementarity. |
| **3.** Process Innovation | Government automation requires making the process automation-ready through simplification, incrementality, reviewability, trust-building, problem orientation, and other forms of process innovation. | |
| | **3.1** | Automation is about solving problems. |
| | **3.2** | Automation should be preceded by simplification. |
| | **3.3** | Automation should be introduced incrementally. |
| | **3.4** | Automation outcomes must be subject to human review. |
| | **3.5** | Automation needs a paradigm shift towards trusted partners. |
| **4.** Whole-of-Government | This cross-border execution and the linking of government capabilities and citizens' needs is facilitated by the whole-of-government approach, which is, in turn, enabled by digitalization and automation. | |
| | **4.1** | Automation needs public support. |
| | **4.2** | Automation is enabled by digital strategy. |
| | **4.3** | Automation calls for collaboration but fails in isolation. |
| | **4.4** | Automation benefits from integrating capabilities across government. |

## G.5.
## Benefits and Risks Addressed by the Factors

Advancing the success of government automation initiatives means that the factors from Chapter 5 helped realize the benefits and tackle the risks of government automation, at least according to the benefit and risk typologies in Chapters 3 and 4, respectively. The evidence linking the factors, benefits, and risks is drawn from the case studies in Chapter 2 or the literature. Detailed evidence, referring to specific case studies or literature, is provided in Chapter 5.

The absence of the specific factor-benefit or factor-risk connections does not mean that a given factor is not contributing to realizing a given benefit or tackling a given risk. It only means that no evidence was found to confirm this connection among the case studies developed and the literature examined for this report. It is also possible that the factors help bring about other benefits and address other risks than those mentioned in the respective typologies. If so, the report is not making any claims about such connections.

***As new insights are drawn on existing government automation case studies, as new case studies document the forthcoming automation initiatives, and as new literature on government automation appears, the emerging findings may extend those documented in this report.***

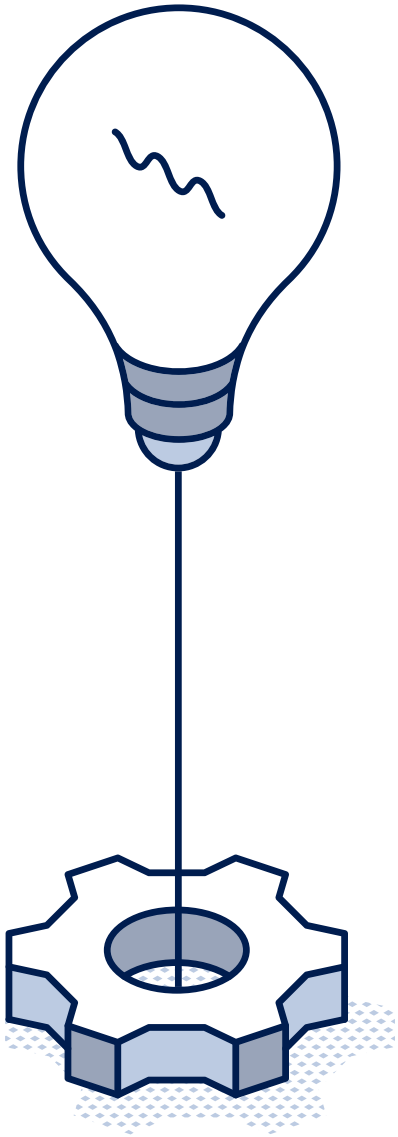
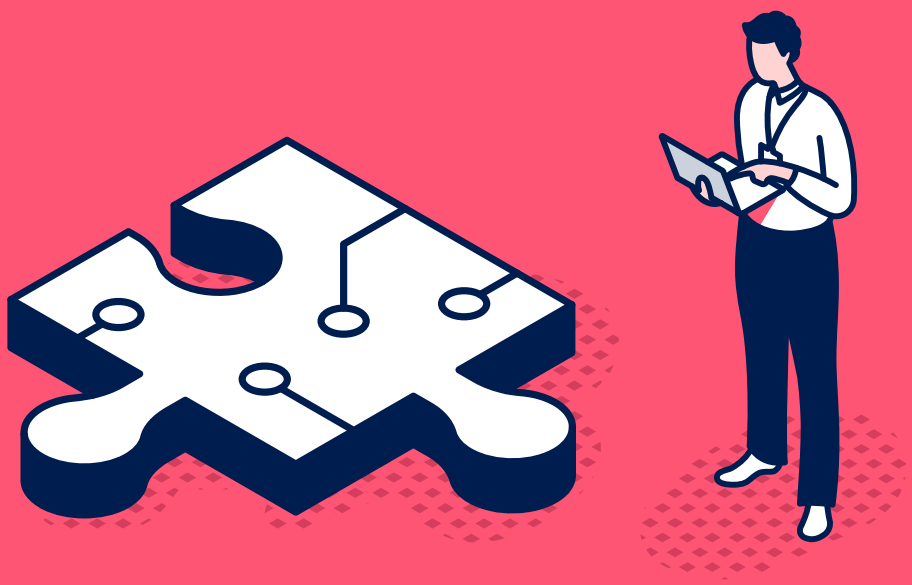


**Table 2.** Automation Factors versus Automation Benefits and Risks

| | FACTORS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Institutional readiness | | | | Human capacity | | | | Process innovation | | | | | Whole-of-government | | | |
| | Digital infrastructure | IT governance | Data governance | Organizational readiness | In-house human capacity | Government-technology collaboration | Competent and empowered staff | Human-machine complementarity | Problem orientation | Simplification | Incrementality | Reviewability | Trust-related paradigm shift | Public support | Digital strategy | Integration imperative | Collaboration imperative |
| **BENEFITS** | | | | | | | | | | | | | | | | | |
| Increasing efficiency | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x |
| Increasing productivity | x | | | x | | | | x | | | | | x | | | x | |
| Increasing decision quality | | x | x | | x | x | | | | x | x | x | | x | | | x |
| Increasing citizen convenience | | | x | x | x | x | x | x | x | x | | | | | x | x | x |
| **RISKS** | | | | | | | | | | | | | | | | | |
| Wasting time, money, and capital | x | x | x | x | x | | x | | | | x | x | x | x | x | x | x |
| Lowering decision quality | | | | | | x | | | | x | x | x | | | | | |
| Failing to solve problems | | | x | x | x | x | x | | x | | | | | | | | x |
| Undermining trust | | | x | | | | | | | | | | | | | | |

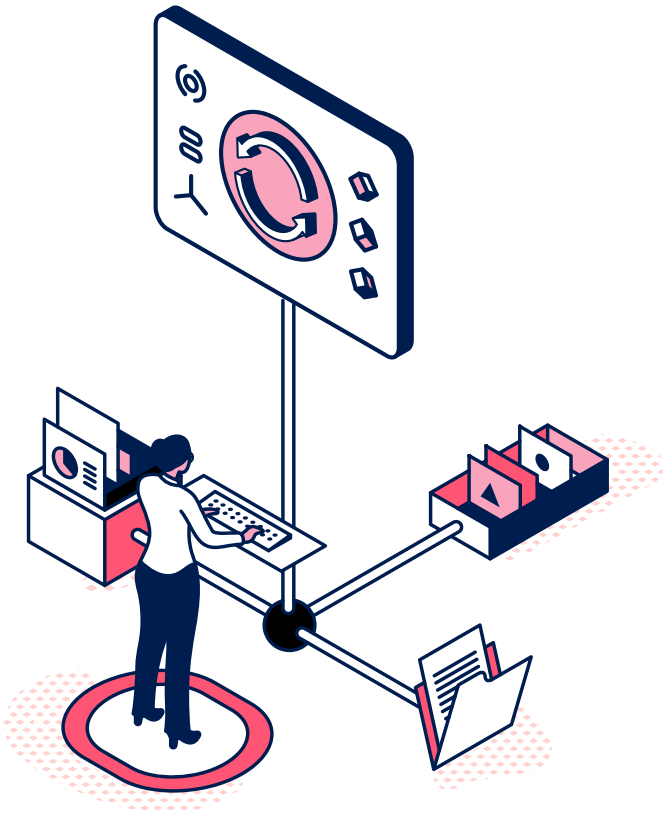
# 1.

# THE CONCEPT OF GOVERNMENT AUTOMATION



Pursuing automation is a complex endeavor for any government organization. It raises various technological, organizational, regulatory, cultural, and even political issues, some common to any government innovation, others familiar to digital government innovation, and still others specific to government automation. This report focuses on the last one.

This chapter aims to define the concept of government automation and highlight how it gives rise to government practice, shaped by technological dynamics, organizational capabilities, and the public value system. The definition presented in Section 1.1 relies upon the evolutionary path from traditional to digital to automated government. Scenarios for automating government work by introducing machines and human-machine collaboration into government offices are outlined in Section 1.2. The typology of government automation and technologies enabling those types are introduced in Section 1.3. How to assess the benefits and risks of government automation using a public value framework is presented in Section 1.4. How to implement government automation strategies against the requirements set forth by their technological, institutional, and political environments is introduced in Section 1.5. Finally, Section 1.6 presents the structure of the report.



# 1.1

# FROM TRADITIONAL TO DIGITAL TO AUTOMATED GOVERNMENT

Automation is the application of machines to tasks previously performed by humans or, increasingly, tasks that no human being can perform (Groover, 2020). Unlike mechanization, which merely replaces human labor with machines, automation integrates machines and humans into self-governing systems. Due to their capacity to operate with little or no human intervention, such systems rely on digital technology for sensing, processing, control, and feedback. In addition, with more human labor moving from physical to digital forms, automation increasingly concerns the performance of entirely digital tasks. The developments in automated systems generally lead to more autonomy—acting without human guidance, more agility—working in different conditions, and better performance—producing more with less.

Governments must serve large populations in cities, provinces, and countries while complying with formal rules and regulations and upholding public values such as efficiency, effectiveness, inclusiveness, accountability, and others. As such, the government's work includes the provision of infrastructure, services, and other public goods to citizens and businesses; passing laws, enforcing rules and resolving conflicts; engaging the public through crowdsourcing and co-decision making; and performing administrative action reactively or proactively to respond to specific public needs and aspirations. The latter comprises a large volume of information- and communication-intensive tasks that join institutions and roles, public and non-public, in producing data-based decisions.

Given the large volume of social, economic, and political activities taking place digitally, governments must be able to implement public policies and exercise their governance responsibilities in the digital world to the same extent as in the physical world. This includes the provision of digital public infrastructure, digital public services and digital public goods, interaction with citizens through digital, physical, and hybrid digital-physical channels, and ensuring direction and oversight over the digital development of entire countries, territories, and sectors. To this end, governments must be able to digitalize their internal processes, digitalize interactions between organizations, acquire digital capabilities, and transform themselves and their relationships into "digital government."

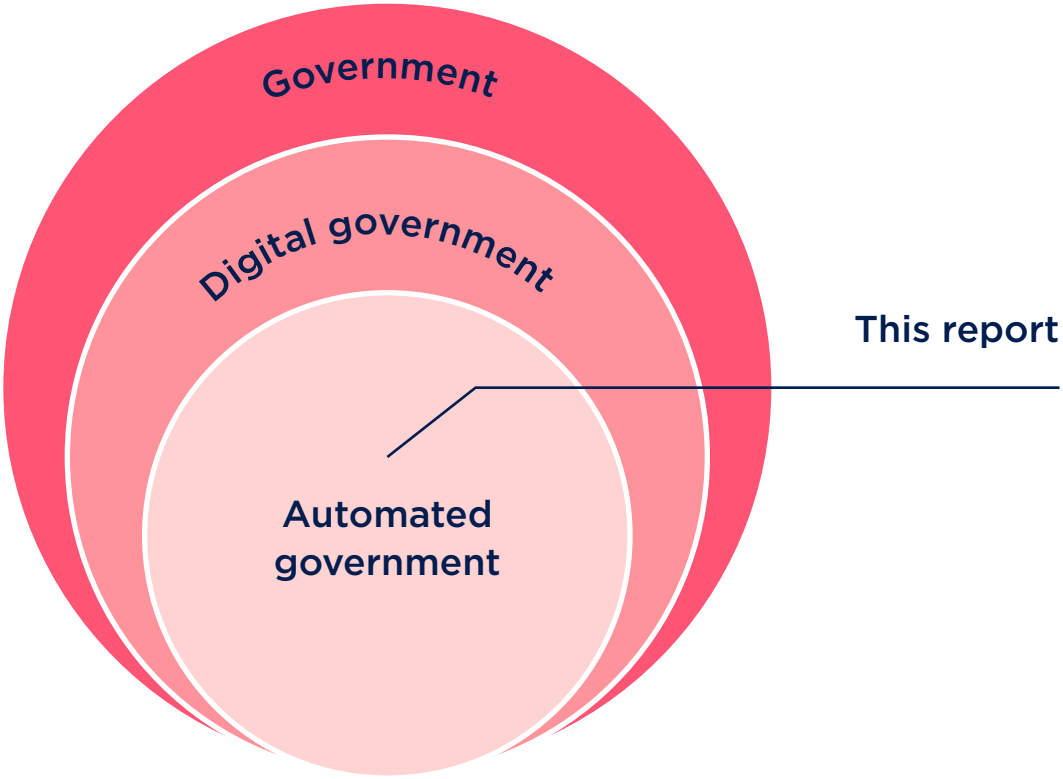
The combined nature of government work and its transformation into digital government create many opportunities for automation. The automation potential varies across a broad spectrum of work activities, from high potential in "administration," "information and data processing," or "complex and technical activities" categories to low potential in "reasoning and decision making" or "coordinating, developing, managing, and advising" categories (Duckworth et al., 2019). When government seeks to maximize the automation potential within digital government transformation, the result is called "automated government." Automated government relies upon the digital infrastructure, services, and capabilities built within and across government agencies by digital government transformation.

Traditional, digital and automated government are each embedded in the previous concept, as depicted in Figure 1. Thus the responsibilities, structures, capabilities, and relationships that hold for traditional government also hold for digital and automated government. Likewise, the responsibilities, structures, capabilities, and relationships that hold for digital government also hold for automated government. However, as digital

government is more specialized than traditional government and automated government is more specialized than digital government, they also have additional responsibilities, structures, capabilities, and relationships than the concept in which they are embedded. For example, digital government allows public services to be delivered online, which is not generally the case for traditional government. Automated government enables such services to be provided fully, automatically, and proactively, which is not generally the case for digital government. Therefore, each concept brings more possibilities and risks to government operations. For this reason, each one merits examination on its own.

Automated government is also reinventing traditional government concepts. One example is street-level bureaucrats, or government representatives that directly interact with citizens and make on-the-ground decisions concerning them (Lipsky, 1980), versus street-level algorithms, or automated systems that interact with citizens and make decisions about them (Alkhatib and Bernstein, 2019). Both street-level bureaucrats and street-level algorithms apply government policies to various decision situations before them. They translate "defined policies" into "effective policies." Examples include when a police officer issues a speeding ticket to a driver, a teacher agrees to waive course prerequisites for a student, a doctor prescribes follow-up examinations, or a judge decides to keep a defendant in jail without bail. In such cases, the decisions directly impact people's lives, but street-level bureaucrats and street-level algorithms approach them differently and with different outcomes. While street-level bureaucrats apply discretion to decide on the cases using their experience, insight, and context-awareness, street-level algorithms lack human reflection. They typically make decisions by applying previously defined rules.

**Figure 1.** Traditional, Digital, and Automated Government Are Embedded in Each Other



# 1.2

# AUTOMATION SCENARIOS FOR GOVERNMENT WORK

While automating entire government jobs is occasionally possible, the true potential of government automation exists in automating tasks that make up such jobs. This is particularly the case when the tasks are laborious (requiring considerable time and effort), routine (performed through routine, standardized activities), and repeatable (performed in continuous sequences and stable conditions), and informational (involving data, information, and communication, typically in digital form). The digital capabilities built and maintained by digital government make it possible to automate these tasks. This report focuses on using such provisions to automate government.

The automation of government work naturally leads to human-machine and even intelligent human-machine collaboration. In a traditional government workplace, machines are treated merely as tools that enhance human performance. In an automated workplace, they are treated as collaborators. The prospects of collaboration arise when performing a job requires a variety of tasks, some fully automated, some partly automated, and others performed manually. The collaboration requires reorganizing the workplace that consists of humans and machines, each employed to perform the tasks most suited to them but having to interact to achieve joint objectives and goals. With machines taking on more complex tasks, machine-machine collaboration is also occurring. When machines are equipped with learning capabilities, the resulting "collaborative intelligence" ensures that "humans and machines can enhance each other's strengths" (James Wilson and Daugherty, 2018).

Automation of government work can be modeled in various ways. For example, Janssen and Kuk (2016) identify four types of algorithms: a simple manually operated algorithm, like a public employee checking a citizen's ID; a simple automated algorithm, like the calculation of a social benefit; a complex and manual algorithm, such as admissions of immigrants at a border control point; and complex and automated algorithms, like determining if a person might represent a security threat (Janssen and Kuk, 2016).

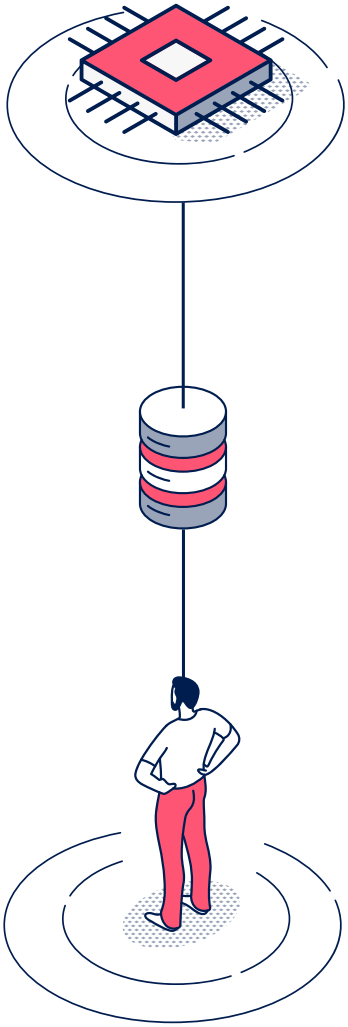


Figure 2 depicts eight automation scenarios using the notation explained on the left-hand side of the figure:

1. The automation of a single human-performed task into a machine-performed task
2. The automation of a task that no human could perform
3. The full automation of a complex human-performed task into the same task performed by a machine
4. The full automation of a complex human-performed task into two constituent tasks performed by different machines
5. The partial automation of a complex human-performed task with one constituent task performed by a human and another by a machine
6. The full automation of two simple tasks performed by different humans into a complex task performed by a machine
7. The full automation of two simple tasks performed by different humans into the same tasks performed by different machines
8. The partial automation of two simple tasks by different humans into the same tasks, one by a human and another by a machine

As can be seen, the of number possible automation scenarios grows exponentially with more participating human and machine operators and more complex tasks. When automating government work, the scenarios can be dynamic, with tasks added, eliminated, or changed. The process is embedded in a larger organizational context.

**Figure 2.** Scenarios for Automating Government Work

### Notation

***An operator performs a task:***

$work = \frac{task}{operator}$

***An operator is a human or machine:***

$operator = human \mid machine$

***Two simple tasks are combined into a complex task:***

$task = task\ 1 + task\ 2$

***Different operators perform different tasks:***

$work = work\ 1 \mid work\ 2$

***Human-performed tasks are refined into machine-performed tasks:***

$work\ 1 \Longrightarrow work\ 2$

### Scenarios

(1) $\frac{task}{human} \Longrightarrow \frac{task}{machine}$

(2) $\frac{task}{?} \Longrightarrow \frac{task}{machine}$

(3) $\frac{task\ 1 + task\ 2}{human} \Longrightarrow \frac{task\ 1 + task\ 2}{machine}$

(4) $\frac{task\ 1 + task\ 2}{human} \Longrightarrow \frac{task\ 1}{machine\ 1} \mid \frac{task\ 2}{machine\ 2}$

(5) $\frac{task\ 1 + task\ 2}{human} \Longrightarrow \frac{task\ 1}{human} \mid \frac{task\ 2}{machine}$

(6) $\frac{task\ 1}{human\ 1} \mid \frac{task\ 2}{human\ 2} \Longrightarrow \frac{task\ 1 + task\ 2}{human}$

(7) $\frac{task\ 1}{human\ 1} \mid \frac{task\ 2}{human\ 2} \Longrightarrow \frac{task\ 1}{machine\ 1} \mid \frac{task\ 2}{machine\ 2}$

(8) $\frac{task\ 1}{human\ 1} \mid \frac{task\ 2}{human\ 2} \Longrightarrow \frac{task\ 1}{human\ 1} \mid \frac{task\ 2}{machine}$

# 1.3

# TECHNOLOGIES AND TYPES OF GOVERNMENT AUTOMATION

The automation potential of government work can only be realized when the right technology is available and when the organization performing such work is willing, able, and authorized to introduce such technology. Technology and organization are two critical aspects of automation. Both are dynamic (i.e., the availability of technological and organizational capabilities varies over time), created (i.e., they require conscious planning, development, and maintenance), and interrelated (i.e., when introducing technology into an organization and searching for the best organization-technology fit, both will change). This report is not about developing automation technologies. It is a guide for government organizations on how to automate using technologies that exist at a given time, even technologies that do not exist at the time the report was written. Nonetheless, considering the current technological baseline of government automation is essential.

The technology used for automating government work must be available at a given time and sufficiently mature. Mature technology is technology used long enough to discover and correct errors, such as rule-based programming, or more recent technology based on well-researched scientific foundations, such as applied machine learning. Mature technology is built incrementally through gradual improvement, often by recombining existing technologies, rather than through radical change. It can be used by non-technology experts. The technological building blocks for recombined innovation include foundational technologies such as digital identity, cybersecurity, or cloud computing; communication technologies such as 5G networks, Internet of Things, or social media; thinking technologies such as big data, behavioral design, or predictive analytics; or exponential technologies such as artificial intelligence, augmented reality, or blockchain (Canning et al., 2020). In principle, mature technology is reliable, predictable, and scalable.

The availability of mature technology determines what type of government automation can achieve various goals. Accordingly, we can identify four generic automation types organized in the pyramid depicted in Figure 3. The types build upon increasingly sophisticated recombinant technology and on each other. The pyramid shows how automation types build upon each other and the foundations of the traditional, digital, and automated government, embedded in each other (Figure 1).

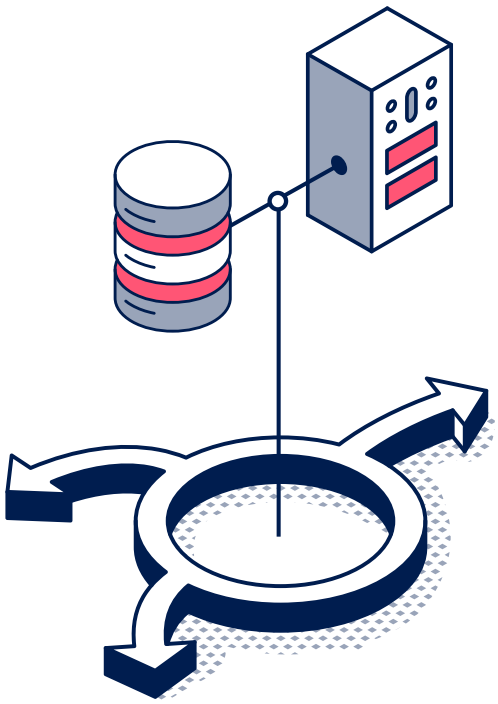
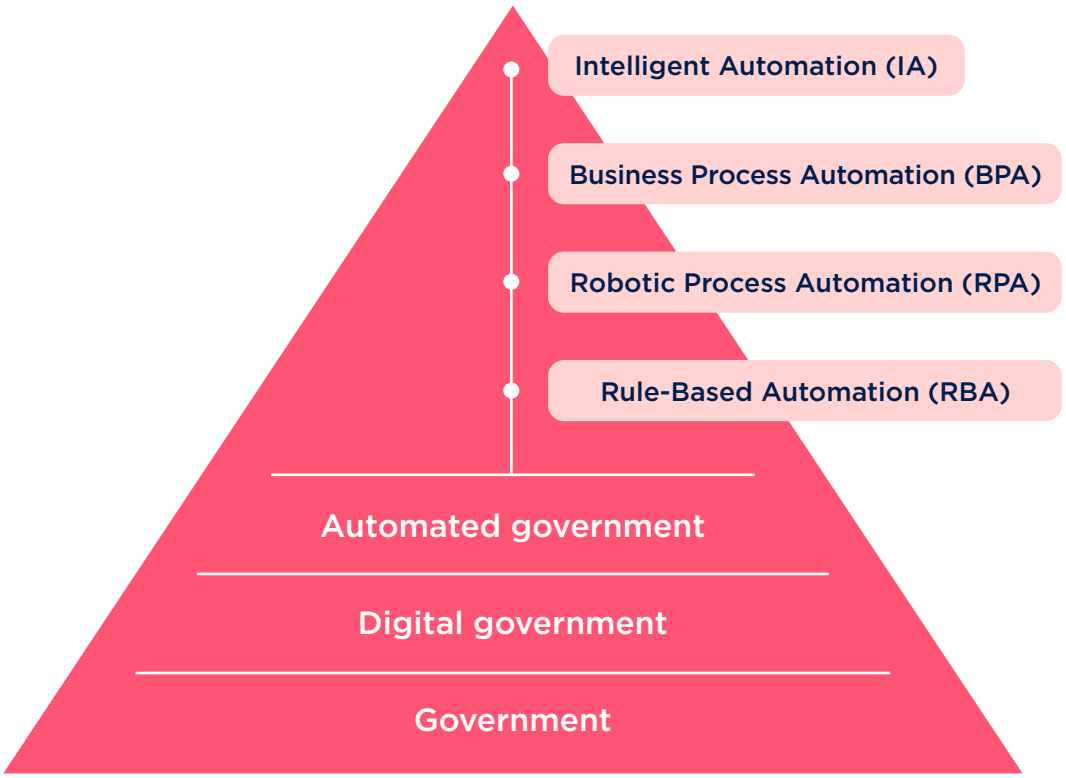
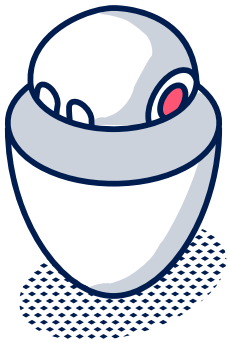


**Figure 3.** A Hierarchy of Types of Government Automation

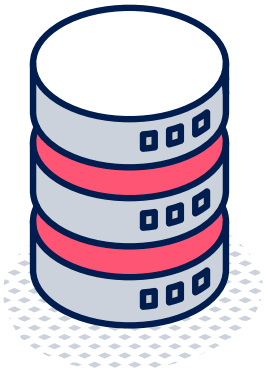



**The types are as follows:**

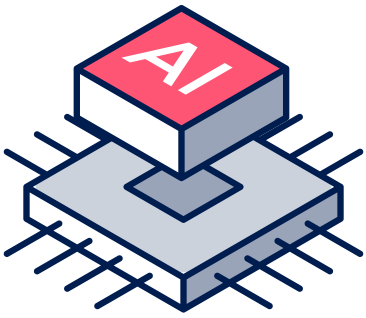
**Rule-Based Automation (RBA**) – RBA is a traditonal but prominent type of automation today. A system is given a data source and a set of human-made rules and applies such rules to data to make decisions and execute tasks. The rules formalize the expert knowledge, thus called "expert-based systems"; originate from organizational policy, work practice, or legal regulations; and are executed through the rules engines, which also apply facts, priorities, calculations, logical deductions, and others. RBA is constrained by having to define all rules for a given task manually and a priori. It also lacks flexibility in responding to changes in tasks.



**Robotic Process Automation (RPA)** – Unlike RBA, RPA does not require logical rules that automate a task to be defined and formalized manually and a priori. Instead, it learns the rules during execution by deploying software "bots" that observe how a user behaves when executing a task and then mimic such behavior. The task is broken down into small steps. Different automation techniques are applied to each step. Then all steps are executed in a sequence, occasionally pausing to receive human feedback. RPA can work by handling data within and across different software applications such as browsers, spreadsheets, mail, and others. Like RBA, RPA can only work on rule-based tasks, lacking provisions for systemic improvements, leading to complex solutions that can break easily when faced with change or anomalies.



**Business Process Automation (BPA)** – While RBA and RPA automate individual tasks, BPA automates the sequencing, coordination, and orchestration of tasks that comprise a larger business process. BPA is supported by business process management systems that manage the flow of tasks, documents, and information between people, systems, and organizations. This includes assigning tasks to the right person or system for execution, triggering execution, managing execution schedules, sending reminders and notifications, sourcing and routing data between applications, connecting workflows, identifying bottlenecks, and others. BPA can also tell RBA or RPA when to start and stop, which subsequent steps to trigger, and how to follow through. Like RBA and RPA, BPA is based on rules and suffers from inflexibility amid situations of anomaly or change and human bottlenecks when faced with scale-up.




**Intelligent Automation (IA)** – IA represents an integration of machine intelligence (thus the word "intelligent" in IA) and automated systems like RBA, RPA, or BPA. Machine intelligence may rely on machine learning or symbolic learning, and the integration aims at equipping automated systems with learning capabilities. Machine intelligence allows automated systems to process unstructured or semi-structured data, monitor and optimize operations, determine patterns, make predictions, and sense and respond to the environment. Consequently, IA systems are less dependent on human interventions when faced with anomaly or change and, therefore, more autonomous and adaptable. With less demand for human intervention, IA can help organizations scale up their operations.

# 1.4

# ASSESSING THE PUBLIC VALUE OF GOVERNMENT AUTOMATION

The resulting automated systems are increasingly complex and need a safe environment where they can be tested and run before they are ready for wide-scale deployment in the public sector. Creating this safe environment could follow the "sandbox" approach, common in software development, where new or experimental elements are tested in isolation from their production environment and mission-critical systems to avoid causing damage or exposure to them. The approach could utilize academic labs for prototype and proof-of-concept development and private sector partners for scaling up such prototypes. This is in line with leading-edge and high-risk technological innovation being piloted by private enterprises, which are generally more nimble and less politically exposed than their public sector counterparts.

However, the transition of an automated system from academic labs and private businesses to the public sector environment may be difficult due to the high dependency of such systems on their organizational and regulatory environment and the different value structures that characterize those sectors. While the advancement and dissemination of knowledge primarily drive academia, and businesses are focused on achieving, sustaining, and increasing profits for shareholders, governments seek to contribute to the common good through "public value." Public value is operationalized in many ways. One of them is depicted in Figure 4.

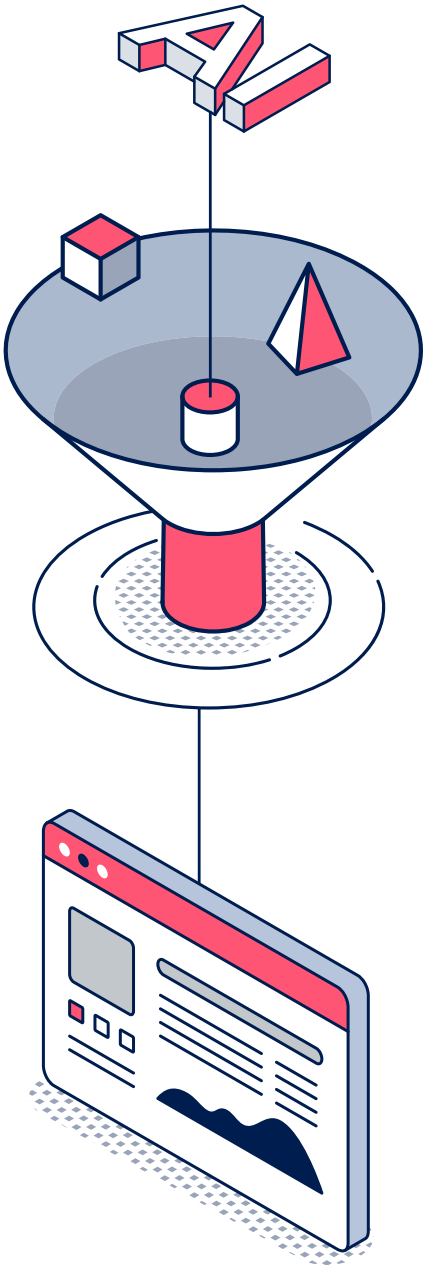
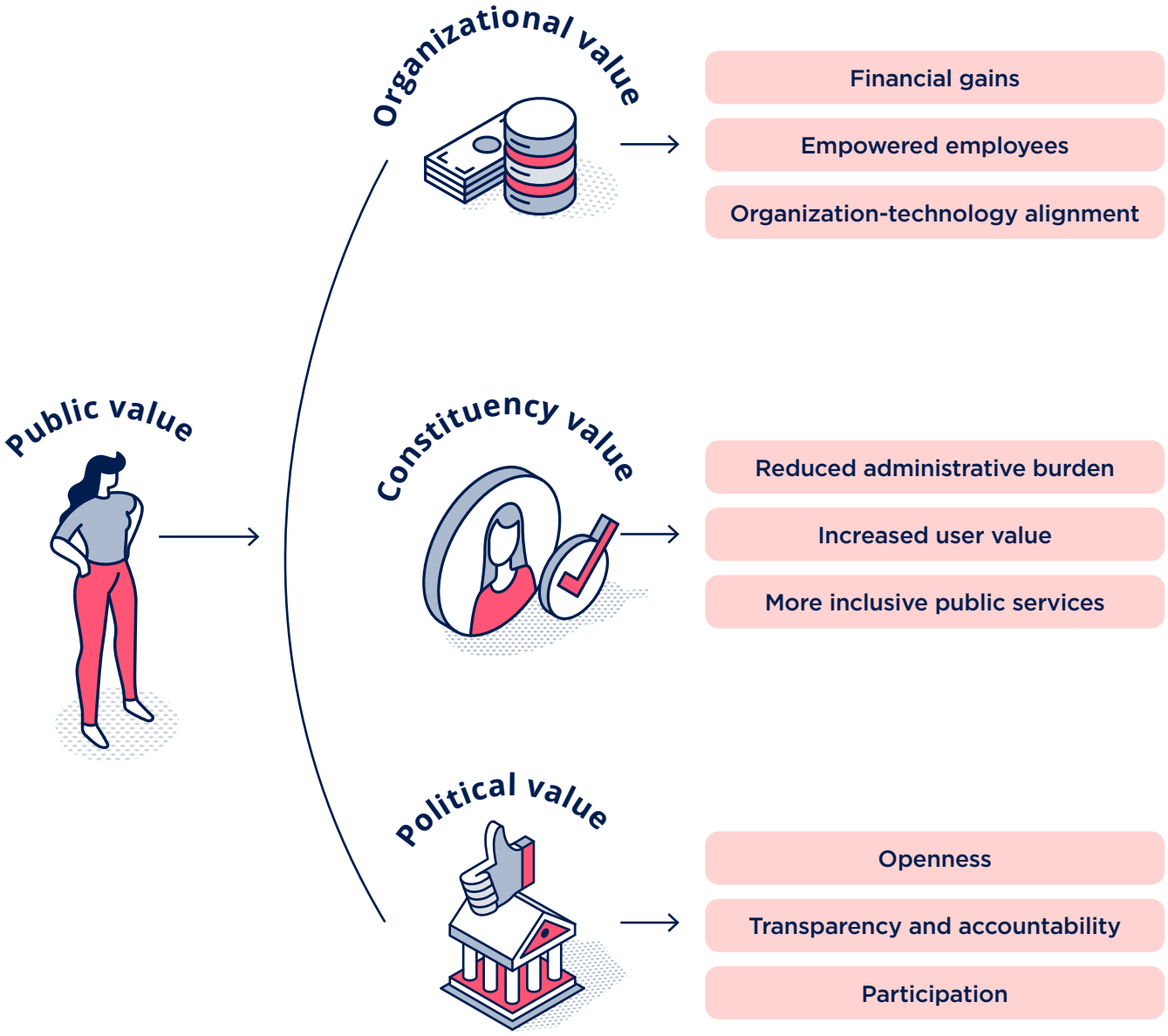


**Figure 4.** Assessing Government Automation: Public Value Framework




The figure includes constituency values (reduced administrative burden, increased user value, more inclusive public services, etc.); organizational values (financial gains, employee empowerment, better organization-technology alignment, etc.); and political values (openness, transparency, accountability, participation, etc.) (Codagnone and Boccardelli, 2006). While any government should ultimately aim at producing community values for its citizens (first-order impact), it should deliver organizational values to strengthen its institutions to produce community values (second-order impact). It should also deliver political values so that its institutions are trusted to work for society's benefit (third-order impact). Any government initiative, including automation, is ultimately assessed against such values.

# 1.5

# IMPLEMENTING GOVERNMENT AUTOMATION

The presence of suitable automation technology and the potential for creating public value when automating part of the government using this technology are necessary but insufficient conditions for government automation. As governments operate in a political rather than an economic marketplace, any strategy pursued by them must simultaneously deliver public value; receive authorization, support, and resources from the higher management or administrative authority; and take place within an operating environment capable of implementing this strategy (Moore, 1995). This is as true for government automation as it is for any other government strategy.

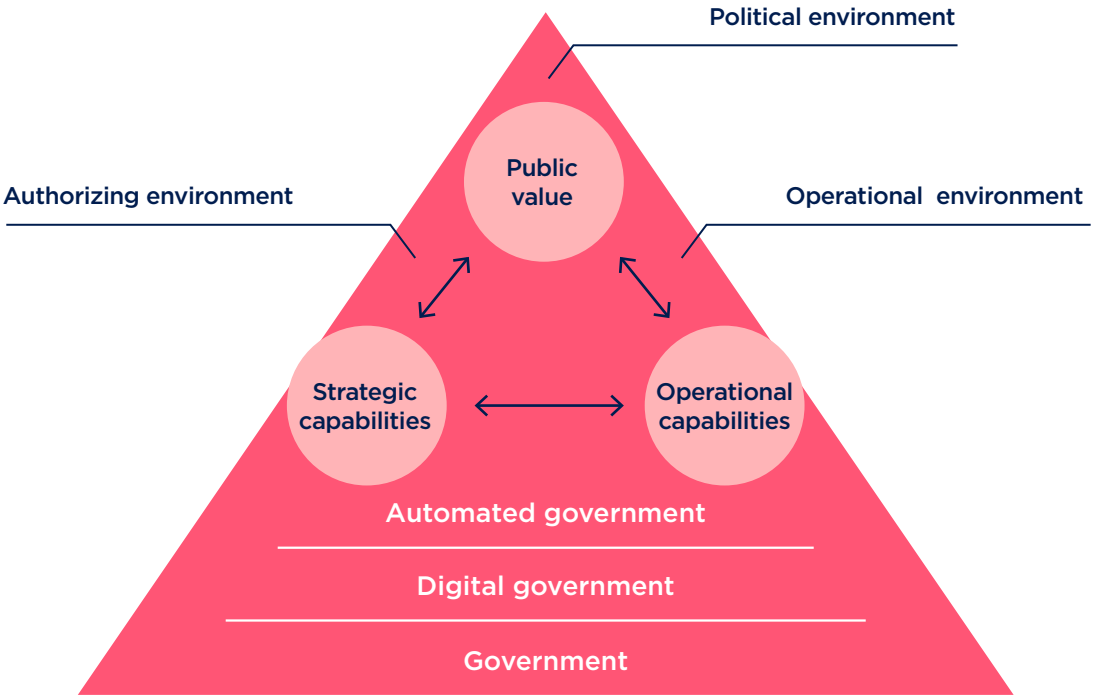
Public managers must ensure that these elements align when formulating and implementing government strategy, including automation. For instance, when the authorizing environment is unwilling to support the public value proposition, public managers may try to convince them to change their position or upgrade the value proposition and renegotiate. Public managers may want to develop the required capabilities or downgrade the value proposition if the operating environment cannot fully implement the value proposition. If the operating environment is unwilling to implement the value proposition given the level of support granted by the authorizing environment, public managers may want to renegotiate the level of support against downgrading the value proposition.

The framework for implementing government strategies, particularly automation strategies, set against specific political, authorizing, and operating requirements, is depicted in Figure 5. The figure relies on the strategic triangle first introduced by Moore (1995), which links public value (political environment), legitimacy and support (authorizing environment), and operational capabilities (operating environment) necessary for implementing government strategies. In turn, the public value connects to the framework in Figure 4. The framework could be used to plan and implement government automation strategies.

The importance of the strategic government triangle is due to the fundamental nature of the change required by government automation. Government automation is not just about implementing digital technology in government organizations. It requires rethinking the overall administrative processes and solutions. The work cannot be automated unless estimates and exceptions are replaced by algorithms. This cannot happen unless the legislation is conceived differently in the formulation stages, which requires algorithmic thinking and redefinition of the entire administrative work. Thus technology, work, and legislation cannot be seen as separate entities, while the tasks, identities, and other organizational elements change due to automation (Justesen and Plesner, 2018).

For instance, with casework automation, caseworkers' roles fundamentally change. Previously, they had "their cases" and "their citizens," which they got to know, understand their circumstances, and make decisions about (Justesen and Plesner, 2018). With automation, however, the caseworkers only solve sub-elements of a case and only come in contact with complete cases when these are unique and complex. Without owning their case files or citizens, they assume supportive and supervisory roles: helping citizens navigate government websites, explaining self-service modes, providing the background to administrative decisions, and essentially becoming call center operators (Justesen and Plesner, 2018).

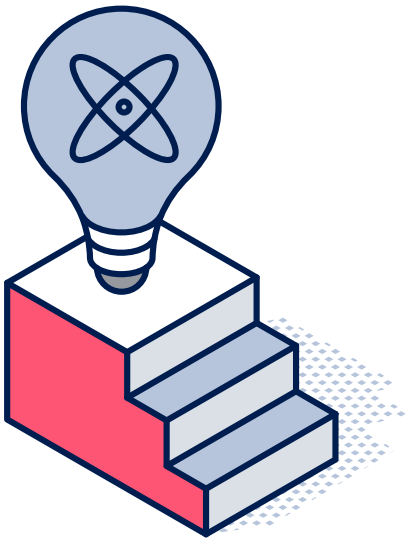
**Figure 5.** Implementing Government Automation: Strategic Government Triangle




# 1.6

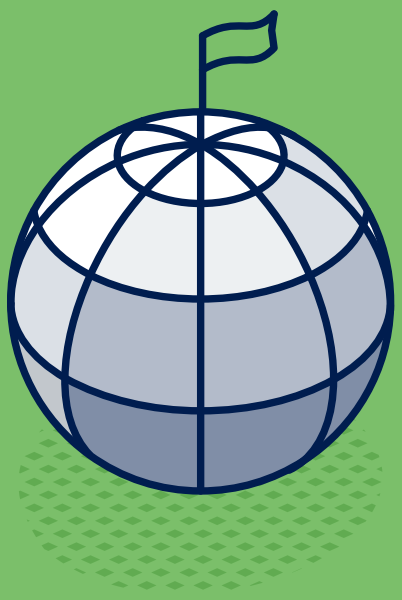
# STRUCTURE OF THE REPORT

The government automation concepts introduced in this chapter are applied rhetorically and analytically in subsequent chapters. In particular, Chapter 2 presents a set of real-life cases of government automation initiatives that took place (or are currently taking place) in different countries and sectors worldwide. Drawing upon such cases and the specialized literature, the benefits and risks of government automation are discussed in Chapters 3 and 4, respectively. The benefits and risks describe different ways government automation can produce or deny public value, as expressed in the public value framework. Chapter 5 provides a set of factors—that the circumstances purposefully established within government organizations or their automation processes—to produce the expected benefits and reduce the risks associated with government automation.

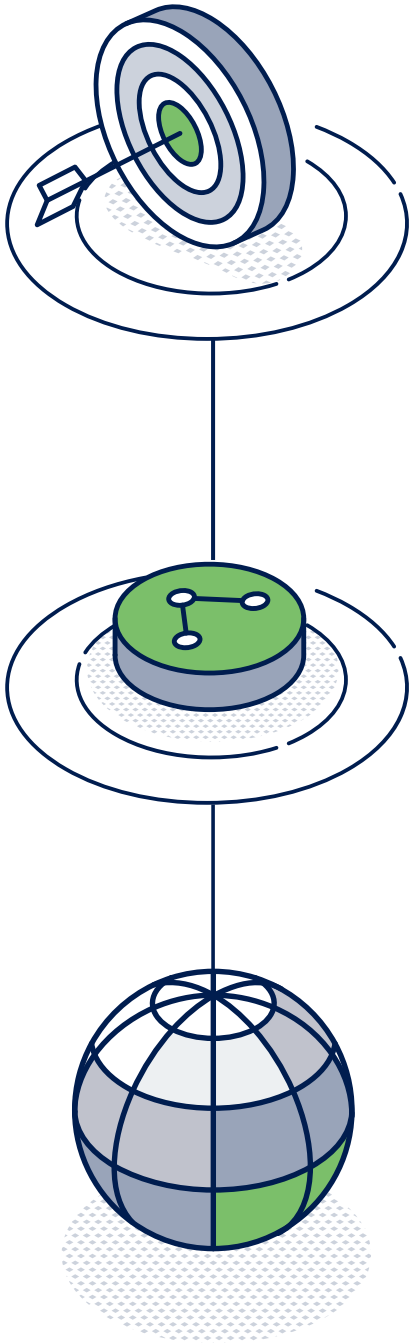


# 2.

# GOVERNMENT AUTOMATION CASE STUDIES



The automation of government work is a relatively recent phenomenon, made possible by the availability of mature automation technologies and the willingness of government organizations to incorporate these technologies and regulate their use in their operations and policies.



The government automation trend follows the long history of automation in manufacturing and industrial processes and, more recently, the growing evidence from around the world on how government organizations should implement automation. This chapter describes the evidence that underpins the insights and guidance offered in subsequent chapters of this report.

The evidence has been collected from 12 case studies of government automation initiatives specially developed for this report (Table 2). The cases originate from Argentina, Chile, France, Norway, Paraguay, Singapore, Spain, and Sweden, and the European Union and concern seven government sectors—administration, border control, finance, justice, procurement, registry, and welfare. The cases are summarized in Table 3 and elaborated in subsequent sections. Each section introduces the context, aim, solution, and impact of an automation initiative and highlights one aspect of the initiative that provides a valuable lesson.

**Table 3.** Government Automation Case Studies

| ID | CASE | COUNTRY/ REGION | AUTOMATION TYPES | | | | SECTION | REFERENCE |
|---|---|---|---|---|---|---|---|---|
| | | | RBA | RPA | BPA | IA | | |
| 1 | Public procurement | Paraguay | x | | | x | 2.1 | (Ardissone et al., 2020) |
| 2 | School transportation benefits | Spain | x | | | | 2.2 | (Navarro et al., 2020) |
| 3 | Delivery of child benefits | Norway | x | | | | 2.3 | (K. Larsson et al., 2020) |
| 4 | Delivery of sickness allowances | Norway | x | | | | 2.4 | (Arnesen et al., 2020) |
| 5 | Delivery of social welfare | Sweden | x | x | | | 2.5 | (E. Larsson et al., 2020) |
| 6 | Managing social security claims | Chile | x | | x | | 2.6 | (Moya et al., 2020) |
| 7 | Seamless civil registry services | Spain | x | | x | | 2.7 | (Marimón et al., 2020) |
| 8 | Judicial processes | Argentina | x | | | x | 2.8 | (Corvalán et al., 2020) |
| 9 | Law as code | France | x | | | | 2.9 | (Quiroga et al., 2020a) |
| 10 | My Social Rights | France | x | | x | | 2.10 | (Quiroga et al., 2020b) |
| 11 | Automation of border control | EU | x | | | x | 2.11 | (Racz et al., 2021) |
| 12 | Service automation | Singapore | | x | | x | 2.12 | (Lui et al., 2021) |

# 2.1

# CASE 1 - PUBLIC PROCUREMENT IN PARAGUAY

Paraguay's National Directorate of Public Procurement (NDPP) applies intelligent and rule-based automation services to support human-made public procurement management decisions. NDPP is responsible for regulating and publishing tenders related to the public procurement of goods, services, and works for all central and local government institutions in Paraguay.

To benefit from new technologies, a multidisciplinary team of NDPP staff received training on AI and machine learning over one and a half months. To strengthen the institutional capacities of NDPP to face this type of project, it established collaboration with the Data Science for Social Good program,[1] with mentors from the University of Warwick and the Alan Turing Institute in the UK, and later with the German Research Center for Artificial Intelligence (DFKI). Through these partnerships, it implemented pilot projects providing new controls for public procurement management. In particular, it applied AI to alert verifiers about bid anomalies and rule-based automation to implement a new type of controls.

1. Data Science for Social Good, https://www.dssgfellowship.org/.

**Intelligent Automation assists with four main functions.**

**First,** it predicts claims and anomalies in public procurement by analyzing the history of public purchases. It acts like a traffic light, highlighting in red the procurements that are likely to be problematic.

**Second,** it analyzes behaviors in procurement detecting a group of suppliers submitting bids together, suppliers only selling to one public agency, and public entities only buying from one supplier.

**Third,** it identifies possible suppliers that could provide the items requested by a given procurement, solving problems such as always inviting the same providers and not knowing which providers to invite.

**Fourth,** it predicts the timeframe in which the public entity will pay, that is, the probability that the payment will be made in a given number of days, and it provides this information to the suppliers, which enables them to adjust the price accordingly. The latter function is under development.

Rule-based automation implements two types of controls. First, it compares the publication date of the calls against the dates of the publication of results and the signing of the contracts. Second, it calculates the average price of the items included in the procurement based on the historical data of the same procured article and compares it with the price set by the entity. Both controls act as an alert service for the verifiers.

NDPP implemented the automated solutions as pilot projects in 2020. As of November 2021, the integrated system was being implemented.

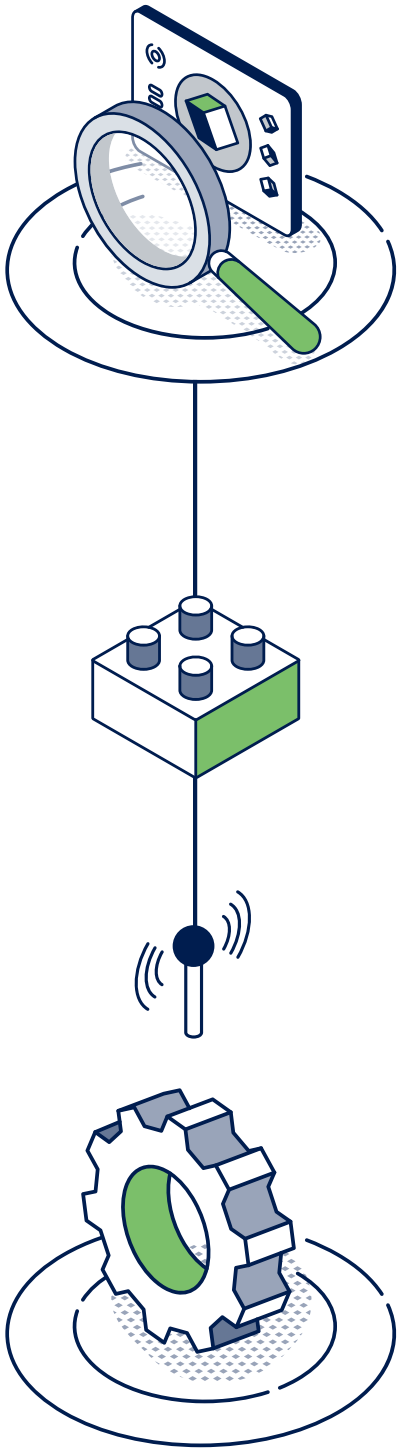
Qualitatively, the solutions enhance the manual verification of public procurements by signaling potential problems in the procurement to the verifier. The alert services compensate for the lack of human capacity of the verifiers by controlling a wide range of procured products and increasing the efficiency of controls. The automation enables to easily, rapidly, and accurately detect anomalies in procurements and identifies more providers who can participate in public tenders. However, according to NDPP, the final procurement approval decision must still be made by a person.

**Box 1.**

**Collaboration Can Overcome the Scarcity of Automation Know-How**

To overcome the lack of qualified personnel, NDPP established collaboration with the Data Science for Social Good program at Carnegie Mellon University and with the Alan Turing Institute to provide international academics and master's students to work with the NDPP core team to study procurement problems and outline possible solutions. This collaboration enabled the implementation of AI-based automated alert services.

The primary source for this case was Ardissone et al. (2020).



# 2.2

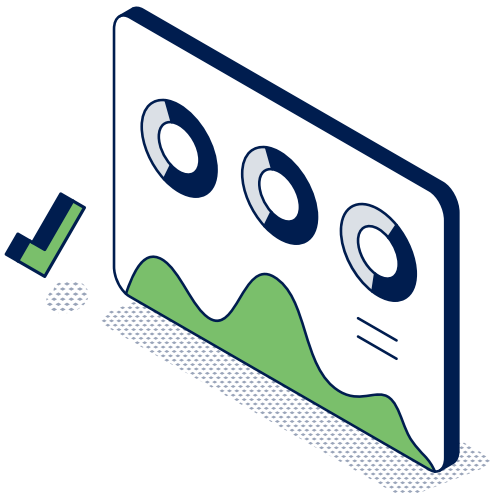
# CASE 2 – SCHOOL TRANSPORTATION BENEFITS IN SPAIN

The government of the province of Albacete, Spain, proactively provides school transportation benefits to parents of children attending public schools. The service is implemented through rule-based automation, which relies on the integration of data from all public institutions and the use of common tools.

The objective of the initiative was to simplify interactions with citizens and avoid the hassle of having to go to another city to apply for a public service by making better use of shared government information and demonstrating examples of proactive delivery of public services. Before implementing the system, parents had to travel to the provincial capital to apply for the benefit in-person, presenting all of the required supporting documents in hard copy. The new service simplifies the application process. Citizens can apply online using their digital signatures or by visiting their city hall and presenting biometric identification. Based on the citizen's request, the system pulls all of the necessary data and automatically identifies the school where the child is registered, calculates the distance from the child's home to the school, determines eligibility based on the child's age and the distance to commute to the school, notifies the parents that the child meets the criteria, and issues the payment. The only legal prerequisite for the service is the citizen's expression of intent to receive the benefit.

The initiative was facilitated by prior efforts to implement and adopt a software platform and common tools that enable interoperability, information exchange, and data reuse. The solution relies on a technical platform and common tools developed since 2014. It was made available for proactive delivery of the school transportation benefits in 2020.

The main impacts of automating this benefit include simplifying the application process, eliminating the requirement to provide supporting documents in hard copy, and eliminating the need for citizens to travel to the provincial capital to apply. The module responsible for managing the eligibility criteria has been used for five years and has processed data on about 30,000 citizens. Since 2020 and until November 2021, around 800 citizens have received the benefit in this way.



**Box 2.**

**Facilitating Automation through Data Reuse and Common Software Tools**

**Proactive delivery of the benefit relies on two main initiatives:**

**1**

The Spanish Data Intermediary Platform, a national organization that supports public entities responsible for managing the core state information, such as making the central registries available to the rest of the public administration.

**2**

A technical platform, SEDIPUALB@, which provides interoperability, authentication, and payment services. Besides Albacete, the platform is used by other provincial councils, like Burgos and Valencia, the Parliament of Castilla-La Mancha, Municipalities of Valencia, León, and Cuenca, institutions in Cantabria, and several universities in Spain. In 2017 SEDIPUALB@ received the Share&Reuse Awards.

Specifically, the Data Intermediary Platform enables the sharing of data between the national government (keeping state records, like citizens' IDs and children at school, among others) and local governments (responsible for providing many public services, like subsidies for school transport). SEDIPUALB@ can easily automate the service by relying on existing functionality, such as authentication and payment services. Thus, the development efforts for service automation, mainly cost and time, are significantly reduced, and the service is delivered in a standard way for citizens from different cities.

**The proactive delivery of the benefit depends on the government's capacity to access and integrate government data and provide shared services.**

The primary source for this case was Navarro et al. (2020).

# 2.3

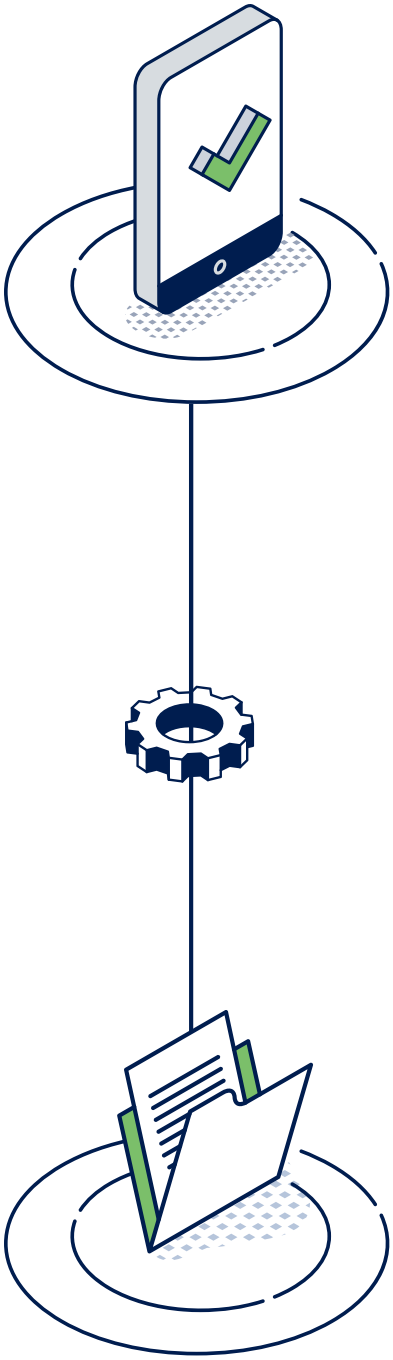
# CASE 3 – DELIVERY OF CHILD BENEFITS IN NORWAY

The Norwegian Labour and Welfare Organization (NAV) automatically and proactively awards child benefits to parents when they are recorded in the agency's registry. The delivery of such benefits relies on rule-based automation.

Two factors drove the development of the initiative. First, enacted in 1946, the benefit grew over time to become a universal government program. Second, the benefit is entirely right-based and specifies minimum requirements regarding the parents' conditions for meeting the eligibility criteria. Thus, eligibility rules are straightforward.

The process of applying for and receiving the benefit was automated in 1998. The system checks the parents' eligibility when a child is registered in the national registry. If the person qualifies, a benefit claim is automatically generated in the case handling system on behalf of the potential beneficiary. After the manual approval, the rest of the process is entirely automated, including the notification to the parents and the monthly payments. The caseworkers regularly review the automatically generated benefits. Citizens not automatically considered by the system need to apply manually, but they can do so entirely online.

The main impact of this initiative is enhancing the service through proactive and efficient delivery. Out of the total number of cases handled in 2018, 97.3 percent received the benefit without any review or appeal, and 64.8 percent were handled entirely automatically, removing the administrative burden.

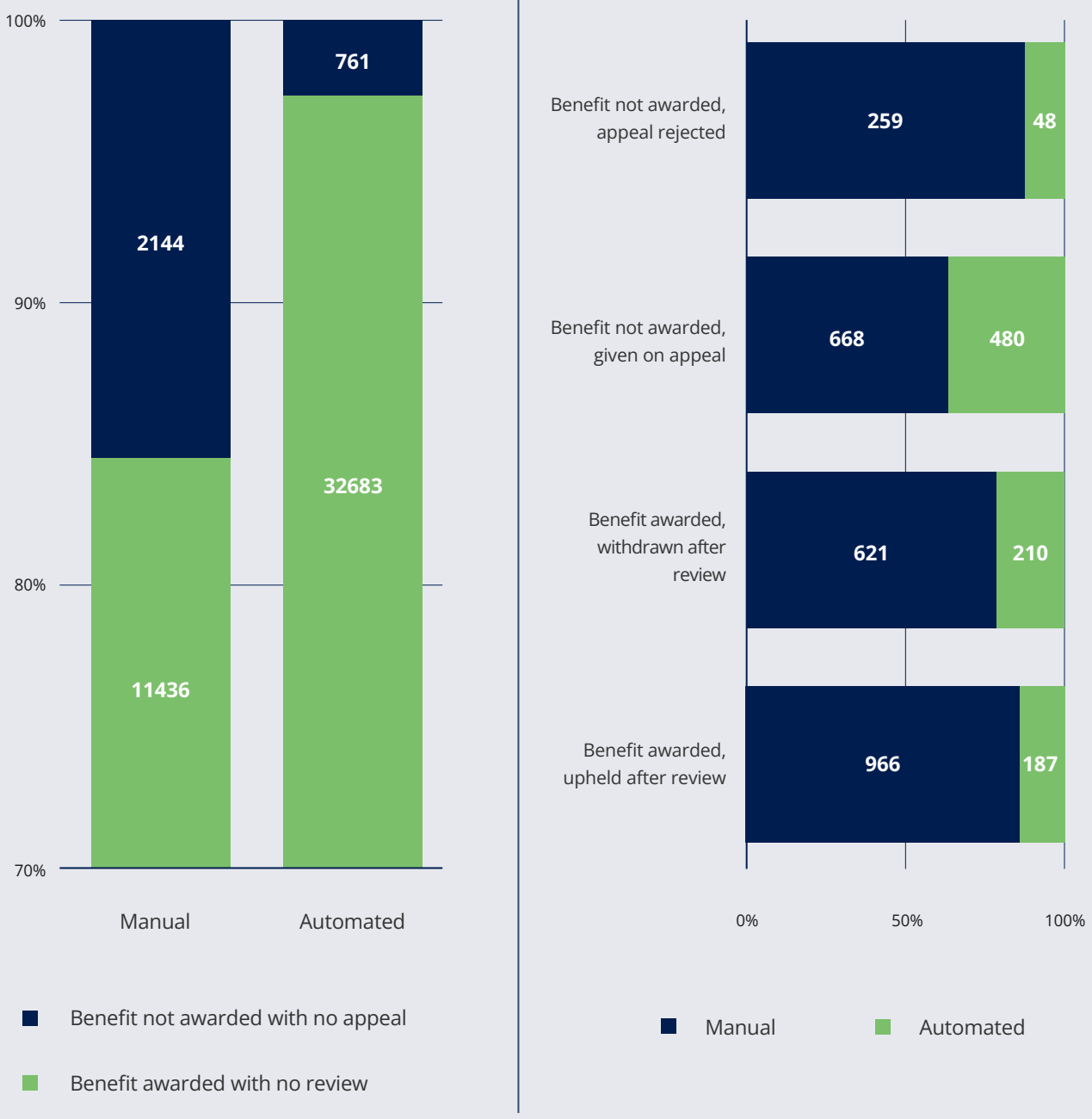


**Box 3.**

**Automated Solutions Can Produce Significant Efficiency Gains**

The eligibility criteria are checked at the counter during the manual processing of applications. Many applications are rejected, and citizens' appeals require several application reviews. Every time citizens appeal, they spend more time interacting with the government. The automated solution significantly reduced the appeal rate, saving time for citizens and government officials serving at the counter. The table below compares the results of processing 50,463 application claims—16,094 processed manually and 34,369 processed by the system (Larsson, 2020).

| Type of case | Manual processing | | Automated processing | |
|---|---|---|---|---|
| | Cases | % | Cases | % |
| Applications with no reviews or appeals | | | | |
| Benefit awarded with no review | **11,436** | **71.1** | **32,683** | **95.1** |
| Benefit not awarded with no appeal | **2,144** | **13.3** | **761** | **2.2** |
| Applications with reviews or appeals | | | | |
| Benefit awarded, upheld after review | **966** | **6.0** | **187** | **0.5** |
| Benefit awarded, withdrawn after review | **621** | **3.9** | **210** | **0.6** |
| Benefit not awarded, given on appeal | **668** | **4.2** | **480** | **1.4** |
| Benefit not awarded, appeal rejected | **259** | **1.6** | **48** | **0.1** |




The primary sources for this case were K. Larsson et al. (2020) and Arnesen et al. (2020).

# 2.4

# CASE 4 – DELIVERY OF SICKNESS ALLOWANCES IN NORWAY

The Norwegian Welfare Organization (NAV) integrates structured information from various trusted sources to automatically deliver the sickness allowance benefits through rule-based automation.

Given the importance the Norwegian Government accords to citizen welfare, the main driver for this initiative is to efficiently and correctly pay the benefit to citizens who are ill or unable to obtain their salary. The rationale for this service is that if a person has no salary or income, they will be unable to focus on finding a new job or getting back to work if they are ill.

Before it was automated, the process was manual and comprised several control steps. Initially, the project devoted significant effort to structuring the data, cleaning the data, and simplifying the procedures. The process first established the presence of the doctor's confirmation that the person was sick. Then, it collected information about the citizens and their work history to determine their eligibility and the amount that they should receive. The solution development followed a step-wise approach considering the most uncomplicated cases first, that is, people who work for only one organization and new applications for sickness benefits.

NAV has been working on automating this service for the last three years, relying on services already being implemented, such as profiling or segmentation. The benefit was launched in October 2020 and by November 2021 had processed 15 percent of all submitted cases automatically. As a check of its accuracy, the automated process includes various checkpoints to verify manually what the algorithm computes automatically. NAV realized that some checkpoints were left unchecked when verifiers tried to accelerate the process.

The main impact of the initiative is ensuring that benefits are paid correctly. Despite the speed of computer processing, efficiency gains were not visible at the beginning since the employees did not trust the algorithm and manually double-checked computed results. To increase trust in the algorithm, a high-level authority of the agency had to step in to confirm that the algorithm was performing correctly. Service performance improvement is an ongoing process.

**Box 4.**

**Reduction of Workforce Demand by Automation Is Gradual**

By January 2022, one-fourth of the cases were automated, meaning that no person was involved in the case. Of the cases processed automatically, a caseworker checked one or more alerts before the payment was sent to the beneficiary. The trust in automated solutions is earned gradually, as is the reduction in workforce demand.

The primary source for this case was Arnesen et al. (2020).

# 2.5

# CASE 5 – DELIVERY OF SOCIAL WELFARE IN SWEDEN

The Trelleborg Municipal Government's Department of Welfare and Labour automated its social welfare benefits. The current solution is the second phase of the automation efforts. It is based on robotic process automation, building on the rule-based automation process that began in 2015.

The main driver for automation was the department's vision to introduce changes to the benefits process because of the increasing cost of welfare support and the growing number of people requesting such support. Another driver was the top managers' training in the "extraordinary goals" methodology.

Before 2015, the benefits process was entirely manual; supporting documents were requested by mail, and the whole process lasted three weeks on average. In 2015, the department implemented rule-based automation, which reduced the service delivery time to eight days. The current version relies on software robots integrated with the case management system, and the process is fully automated and paperless. Nevertheless, due to legal requirements, the applicants must meet with an employee responsible for case handling in person. The capacity of data integration with the Tax Agency and the Social Service Agency greatly facilitated the automation.

The municipality has engaged in automation efforts for at least six years. The most recent automation efforts, initiated in 2017, focused on simplifying the business process and procedures and followed small, incremental steps. The calculations were done manually, checking to ensure that all steps were performed correctly. Only when all steps were determined to have been completed accurately, the department enabled the software robots to make decisions automatically.

The service is currently delivered to about 400 applicants and reaches 700 to 800 individuals monthly, with about 87 percent applying online. The remaining 13 percent apply in person, mainly because they lack ID cards. They are usually migrants. The time for manually making positive decisions was 3 to 7 minutes, and 5 to 17 minutes for negative decisions. The automation enabled the decision to be made in less than a minute. The whole process was reduced from eight days to one. In 2013-2014, there were eight case handlers employed; now, there are four. In addition, the cost of delivering welfare support was reduced by between 10 and 15 percent. Thus, the most significant impact of automation is process efficiency.

**Box 5.**

**Automation Delivers Public Value and Efficiency**

The department's primary goal is to serve those who need welfare support: "It is not about saving money. It is about doing the right thing." Its guiding principle is that people should be self-sufficient. Thanks to the automation initiative, the municipality pursued its primary goal while realizing cost savings of between 10 and 15 percent. Before automation, eight staff members were needed to resolve the cases, and now it takes only four.

The primary source for this case was E. Larsson et al. (2020).

# 2.6

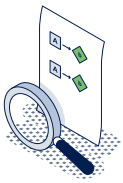
# CASE 6 – MANAGING SOCIAL SECURITY CLAIMS IN CHILE

The Superintendence of Social Security (SUSESO) conducted a project to modernize and automate business processes related to managing claims for social security services. It employed rule-based automation while relying on data exchange and process integration.

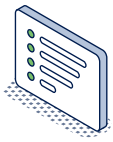
The overall objective of the initiative was to modernize the citizen service processes provided by SUSESO, reducing response times for complaints received, giving users access to complete and accurate information, and increasing the coverage provided by the institution. Given this, the main driver of the initiative was to improve user satisfaction by focusing on resolving problems faced by citizens and leveraging the adoption of new technologies.

**The automation comprises six stages of the claim management process:**

**1) Application** – Claims can be submitted online through citizen authentication, with most cases no longer requiring the submission of documentation thanks to data integration. In addition, a rule-based predictive model is used to identify about 85 percent of submitted cases. Although the module has been completed and tested, it is not yet operational due to legal constraints.



**2) Tracking** – Enabled through a case management system that involves creating the case, creating the online request for all the background information and documents to complete the file (either to SUSESO internal systems or to the audited entities, also integrated), and automatically reviewing all submitted documents to detect completeness and eligibility.



**3) Assignment** – Involves case assignment based on business rules and automatic retrieval of medical history when appropriate.

**4) Analysis** – Includes a procedure to prepare the proposed decision based on all the information that is part of the file.

**5) Resolution** – The system automatically assembles the final document based on templates.

**6) Notification and Dispatch** – The automated service electronically notifies applicants and involved parties, then records and archives the case.

SUSESO started planning the initiative in 2015, implemented it during 2016-2018, and launched the solution in 2019. Except for the case prediction module, the rest of the system is fully operational.

The main impact of the initiative is improving the efficiency and productivity of social security claim management. With respect to efficiency, in 2015, the average time for resolving claims was 120 days; currently, it is roughly 30 days. With respect to productivity, 6,000 cases were processed monthly at the beginning of the initiative, and 15,000 cases are processed monthly today.

**Box 6.**

**Measurable Improvements Make the Best Business Case for Automation**

**The automation of the social security claims management achieved measurable improvements in efficiency and productivity:**

1. Over 20 information systems exchange data with the SUSESO system.
2. Over 60 agencies interoperate and respond to requests in 3.8 days on average.
3. In four years of operation, more than 600,000 documents were requested from collaborating parties online.
4. 630,000 procedures have been processed automatically.
5. 99 percent of claims were submitted automatically.
6. More than 600,000 claims were resolved electronically.
7. Over 85 percent of the notifications were sent electronically.
8. The number of claims processed has almost tripled, from 70,000 the year prior to the implementation of the project to 200,000 in 2022.
9. 35 percent of the procedures were managed through the "ultra-fast track" (less than 15 days).
10. The maximum response time for all types of claims was 39 working days (before, 120 days).
11. The medical license claims were resolved in 31 working days, down from 94 days in 2015.
12. 15,000 cases were processed monthly in 2022, more than twice the 6,000 processed in 2015.

The primary source for this case was Moya et al. (2020), updated with data from 2022.

# 2.7

# CASE 7 – SEAMLESS CIVIL REGISTRY SERVICES IN SPAIN

The Spanish Ministry of Justice is modernizing the country's civil registry by implementing various automation projects. The civil registry—one of the centers of public administration—is a master database that must be consistent with other core repositories: the national ID database used for citizen identification purposes and maintained by the General Directorate of Police, under the Ministry of Interior; the electoral census registry managed by the National Institute of Statistics, under the Ministry of Economic Affairs and Digital Transformation; and others. Thus, the project has a significant impact on the whole public administration. The project relies on the maturity of the organizations involved and previous digitalization and automation efforts that enable data exchange and interoperability among them. The result involves both rule-based and business process automation.

The driver for automating the civil registry was Law 20/2011,[2] and the plan for book digitalization and office computerization defined in 2006 and developed between 2007 and 2011. The efforts were suspended in 2012 and resumed in 2017 for the implementation of the new registry model enacted in Law 20/2011, which was reformed by Law 6/2021, being able to enter into force in April 2021.

***The first efforts included the creation of a computer application for the introduction of registration data through standardized forms and the printing of these registrations while maintaining the generation of the physical registry books on which the registered facts are attested by holographic signatures of public officials.***

The civil registry began to be computerized at the end of the 1990s. In 2006, the Ministry of Justice launched the Online Civil Registry program, which was part of the Digital Public Services action included in the Plan Avanza of the Ministry of Industry, Tourism and Commerce, and in the Master Plan for the Technological Modernization of the Justice Administration, prepared in 2002 by the Ministry of Justice with the aim of promoting the incorporation of new technologies in the field of justice. One of the actions carried out within this project was the digitalization and recording of the registry books of the civil registries and Justice of the Peace Courts for their subsequent uploading to the application called INFOREG, which manages registrations and certifications of the civil registry. Through this project, about 3,900 civil registry offices were computerized, covering 95 percent of the Spanish population, and more than 100 million registrations made since 1950 were incorporated into INFOREG.

Already in 2015, through the Law 19/2015, the entry into force of several articles of Law 20/2011 was anticipated, which allowed the electronic communication of births from the health centers where they took place. Automation, in this case, involved carefully studying and simplifying the business rules of the wide casuistry that affects the determination of the filiation of those registered. It also involved the development of a form with 12 fields so that, based on this small amount of data, the computer system could decide whether a case can be submitted electronically to the civil registry or whether

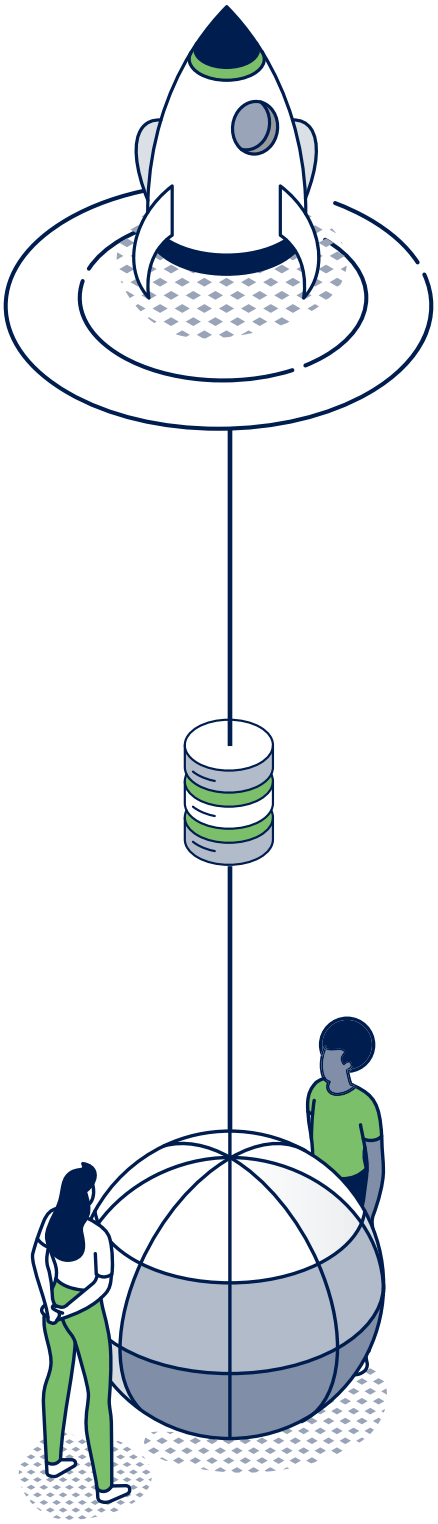
2. Jefatura del Estado, BOE nro. 175 del 22 de julio de 2011, Referencia BOE-A-2011-12628, https://boe.es/buscar/pdf/2011/BOE-A-2011-12628-consolidado.pdf.

the declarant must go to an office because additional formalities must be carried out face-to-face with the Registrar—for example, in the case of minors or when it is complex to determine the nationality of a child and therefore identify the name and surname that affects him/her, among others. In the first case, the staff of the health center collects the required data and documents from the parents and electronically communicates them to the competent civil registry office for the registration of the birth. The certification of the birth registration will be sent to the declarant by the means of communication he/she has chosen without the need to go to any civil registry office.

The main impact of the project was to avoid the need for parents to travel and wait in queues at the civil registry offices and to speed up the birth registration process by receiving all the data and documents preloaded into the system. In most of the registries of important towns, births are registered within 24–48 hours. Considering that there are about 1,000 births per day in Spain, online registration at the place of birth represents a significant efficiency improvement. Now, 100 percent of public maternity hospitals and around 30 percent of private hospitals report births digitally.

With the implementation of the new registry model of Law 20/2011, the current stage of automation involves the transformation of the organization and business processes.

The new model of civil registry is characterized by being completely electronic: the physical books disappear and the focus is on people and the relations between them. A univocal and non-transferable personal code is assigned with the practice of the first inscription and with it the Personal Register is created in which any fact or act related to the civil status that affects this person will be successively recorded.



The civil registry will be unique and will be totally interconnected so that the citizens will be able to go to any of its offices to carry out any procedure. These procedures can also be carried out telematically through the Electronic Headquarters of the Ministry of Justice.

In the year 2022, more than two million requests for registration certificates have been made through the electronic headquarters of the Ministry of Justice, and the catalog of electronic services to the citizen has been extended with the possibility of obtaining online death certificates requested by relatives of the deceased, and registrations made in the Books of Spanish Consulates.

The automation is based on a new computer system, called DICIREG, which provides all the tools for an entirely electronic processing, from the entry of the file to the signing of the entry or resolution and its notification to the interested party. The system is oriented on data processing and handles a wide catalog of structured electronic documents (XML) for the exchange of information with the administrative or judicial bodies, promoters or collaborators, without human intervention. The computer system offers a simple graphical user interface in which you can work on an administrative file in an intuitive way where you can see all the documents of the case, the people involved in it and perform all the operations and procedures required (correcting documents, requesting reports, capturing background information from physical books, generating documents and resolutions, generating personal codes, issuing certifications, etc.).

One distinguished feature of the new model is the focus on people and their relationships. When one person's life event is recorded, it can affect other people. For example, when a married man dies, his wife's marital status will change in her record. The whole system deals with events that happen to one person and affect others.

The new civil registry model is currently implemented in several judicial districts that cover 10 percent of the Spanish population. A plan for the deployment of offices has been agreed between the competent administrations to achieve the complete transformation of the 431 judicial districts of Spain before the end of 2025. Since September 2021, about 300,000 electronic registrations have been made and more than 400,000 files have been processed.

**Box 7.**

**Automation Requires Business-Technology Collaboration**

Automation projects require both business and technology experts. Technology experts should know the organization, process, service, or procedure to be automated, and business experts should know how to manage the impact of technology on their organizations. For example, the Ministry of Justice through the operation of the INFOREG and DICIREG computer systems allows technology experts to manage incidents daily, be in contact with the offices, and receive complaints from users. In the Ministry of Justice, they even contact citizens to learn about their problems with digital services. This way, they see citizens' real problems with their services and understand the business. According to the Ministry, "If you do not know what the problem is, you will not be able to solve it."

The primary source for this case was Marimón et al. (2020).

# 2.8

# CASE 8 – JUDICIAL PROCESSES IN ARGENTINA

The Public Prosecutor's Office of the City of Buenos Aires automated significant processes related to the work of the prosecutors through a solution called PROMETEA. The automation applies algorithms to predict the prosecutor's recommendations and automatically prepare the document to be submitted to the court (Estevez et al., 2020). The result implements both rule-based automation and intelligent automation.

The main driver of the initiative was a vision to innovate the work of the prosecutors through the use of new technologies, motivated by the obsolescence of the business processes, the repetitive nature of the tasks performed, and the lack of an innovation culture.

The solution includes three main components. One looks for the case document, identifies the keywords, and automatically searches for laws related to the case. Another component predicts the prosecutor's decision based on existing laws and in previous decisions on cases similar to the one at hand, taken by judges of different instances, essentially those belonging to the higher instances of the City of Buenos Aires. The third component automatically prepares the document that the prosecutor needs to submit to the court, including the data of all underpinning laws justifying the recommendation and the final recommendation of the prosecutor. Through a series of questions, the system allows the prosecutor to complete the specific data of the case under analysis. The automation relies on the full assessment and understanding of the business processes. It was conceived for those cases that represent most of the prosecutors' workload. PROMETEA serves as a tool assisting a prosecutor in making decisions but does not replace the person in the final decision-making process since an exhaustive control of the results produced by the system is carried out (Estevez et al., 2020).

The automation process took two years, starting in 2017. Significant efforts were devoted to data governance, diagnosis and assessment of business processes, business process reengineering, defining business process models using decision trees, building templates for the prosecutor's recommendation documents, and defining keywords for typifying cases. The main reason to devote efforts to data governance and business process diagnosis was to produce a clear image of the current situation in the organization. Both involve standardization of the vocabulary and semantics, identification and measurement of business processes, business process reengineering, the definition of business process models, and keywords for each process type. A quantitative analysis of the information collected through such efforts on the type of tasks conducted and the cases dealt with helped to measure the organization's workload and determine the processes that constitute bottlenecks. The solution was deployed by the end of 2018 and is fully operational.

The significant impact of the initiative refers to efficiency gains. For example, the prosecutor's recommendation for managing a case on housing protection for persons with disabilities was shortened from 174 to 38 days (76 percent improvement). While previously the office could process 127 cases monthly, with PROMETEA this number increased to 493 (289 percent improvement). For the case of housing protection involving third parties, PROMETEA helped shorten the process from 190 to 42 days (78 percent improvement) and increased the number of cases handled monthly from 116 to 528 (357 percent improvement).

**Box 8.**

**Efficiency and Productivity Gains Due to Automation**

**PROMETEA contributed to significantly reducing the case processing time.** The Public Prosecutor's Office gained in efficiency and productivity. Examples of time reduction and increased capacity for issuing the prosecutor's decisions on cases related to citizens' claims on housing requests are shown below.

| Type of case | Manual processing | | Automated processing | | Increased efficiency | Improved productivity |
|---|---|---|---|---|---|---|
| | Time | Cases p/ month | Time | Cases p/ month | | |
| Person with disabilities | **174 days** | **127** | **45 days** | **493** | **74%** | **289%** |
| Person alone | **164 days** | **134** | **45 days** | **486** | **73%** | **263%** |
| Third-party summons | **190 days** | **116** | **42 days** | **528** | **78%** | **357%** |

The primary sources for this case were the IDB publication "PROMETEA: Transformando la administración de justicia con herramientas de inteligencia artificial" ( Estevez et al., 2020) and information provided by Corvalán et al. (2020).

# 2.9

# CASE 9 – LAW AS CODE IN FRANCE

OpenFisca (OpenFisca, n.d.) is a software engine that allows laws to be written as computer code, in order to simulate the impact of tax reforms and social benefits, on individuals, on groups to which they belong, on social justice (redistributive impact, winners and losers), and on the state budget. The engine includes software for calculating the impact of the rules of law from different data sources, which, used in various fields of application, allows the automation of certain calculations and certain features based on these rules, such as, for example, the widespread implementation of a universal activity income with or without income conditions.

The software was developed by Direction Interministérielle du Numérique (DINUM) (DINUM, n.d.), an autonomous institution under the Services of the Prime Minister, along with the network of researchers associated with the Aix-Marseille University, the Institute of Public Policies[3] (Institut des Politiques Publiques, n.d.), the National Agency for Territorial Development (ANCT), the interministerial incubator program Beta Gouv, and Etalab (Etalab, n.d.).

There are two main drivers for the development of OpenFisca. One is to simulate the impact of legal and regulatory reforms, for example, how much a new budget or a social security bill will cost. Another is to allow citizens to improve their understanding of the law with respect to their particular cases, whether it is constant legislation, for example to know what social benefits they could access given their current situation, as well as on the impacts that the reforms could have on such situations.

OpenFisca serves four main users: citizens, businesses, legislators and regulators, and researchers. For citizens, it serves as an advisory tool on the taxes persons must pay and the benefits they are entitled to receive. For companies, it serves as a tool to facilitate respect to and automatic monitoring of the regulations of each sector. For legislators, regulators, and the government in general, it is used to estimate the impact of new laws on the population, the economy, and the public budget; to contribute positively to parliamentary debate; and to improve the capacity of public services to respond to public policy objectives and, at the same time, to users' needs. Finally, OpenFisca allows researchers to model laws and regulations.

In a broader vision, OpenFisca is a rule processing software engine that can enable various automation initiatives in different government areas, in particular regarding interoperability between public and private infrastructures, the implementation of the principle to tell the data only once, and to redistribution programs to the source (e.g., solidarité à la source, among others).

**3.** The Institute of Public Policies (IPP) was created by Paris School of Economics (PSE) and is developed in the framework of a scientific partnership between PSE and the Groupe des écoles nationales d'économie et de statistique (GENES), https://www.ipp.eu/.

**Some examples of government uses of OpenFisca in France include:**

**LexImpact, a public service managed by the National Assembly.** The service helps deputies to quantify their amendments and proposals on taxation, public finance, and social affairs. LexImpact makes it possible to quickly simulate the impact of parametric reforms on legal texts related to these areas (Assemblée Nationale, n.d.).

**1 Jeune 1 Solution (1 Youth 1 Solution)**, a digital public service thanks to which, in 2022, nearly 700,000 simulations allowed young people to assess their right to more than 600 social benefits.

**Estime (Estimate), Pôle Emploi's public service**, which allows jobseekers to quickly calculate the evolution of their unemployment rights in the event that they return to work.

**The Withholding Income Tax at the Source (Prélèvement à la Source, PAS).** This automated public service makes it possible to deduct income taxes at the source: an employer deducts the tax from salaries, the pension fund from pensions, the Employment Center from welfare benefits for the unemployed, and the Tax Department from independent workers' incomes through their bank accounts. The service also provides a simple interface for citizens to see the estimated deduction of the income tax and the changes in such deductions depending on the citizens' various life events (Government of France Taxes, 2021).

**Yet another public service from Pôle Emploi** helps people who are looking for employment trends, looking for jobs and want to receive training, or searching for benefits from the state to try to get a new job (Pôle Emploi, n.d.).

A group of researchers started the development of OpenFisca in 2011. The objective was to develop a rule automation engine to simulate the impact of tax reforms regardless of the source and format of the data (administrative data, statistics, surveys, etc.), in order to be able to cross different databases and, over time, progressively improve the quality of the simulation results. OpenFisca began receiving government sponsorship during 2012–2014 as a key piece of an ambitious tax reform. This reform was suspended in 2014. However, starting in 2015, OpenFisca gained renewed importance, this time to help reduce the non-adoption of social benefits, within the framework of the then newly born beta.gouv.fr program (see Case 10). According to the expert interviewed, "improving the quality of public services needs missionaries, not mercenaries." This means, marking a clear difference with the practices at that time, they pursued mission-oriented teams, "multidisciplinary, made up of people from the public and private sectors, but committed to serving the general interest." These teams include "intrapreneurs," who are public officials "promoted to act to improve public service from within."[4]

OpenFisca is maintained by the Agence Nationale pour la Cohésion des Territoires, which tries to maintain the project by promoting the adoption and continuous development of the software by the international community, as well as by a community of about 50 benevolent collaborators around the world.

**4.** https://beta.gouv.fr/approche/

The main impact of OpenFisca is the provision through the digital commons model of a shared and open infrastructure to model sociofiscal systems around the world and the development of a global community interested in its continuous development and governance. So far, France, the Ivory Coast, Italy, Mali, New Zealand, Senegal, Tunisia, and the United Kingdom have developed software based on OpenFisca (OpenFisca, n.d.) as illustrated in Box 9.

**Box 9.**

**Automation Can Benefit from Cross-Border Technology Transfer**

OpenFisca is the most used free and open engine in the world to transform the law into computer code and calculate its application to individual situations and to local and national populations. Developed in France since 2011, it has been used in production since 2014 by DINUM, awarded by the European Commission in 2019 and by the OECD in 2020, and deployed on four continents in 2022.

In New Zealand, a prototype service based on OpenFisca allows low-income homeowners and senior users to understand their entitlement and apply for the rate rebate subsidies. The service was created by the Service Innovation Lab and tested in collaboration with the Department of Internal Affairs (DIA), Tauranga City Council, and Auckland Council. The service is a subsidy delivered by local councils and administered centrally by the national government through DIA. The solution was proposed by the Service Innovation Working Group, part of the Digital Government Partnership, supported by the Government Chief Digital Officer of the New Zealand Government, who approved an initiative to explore the delivery of proactive, automated services.

A minimum viable product was developed between March and May 2018 and tested in Tauranga City Council from May to September 2018. Significant benefits of the service include:

1. Providing an online application – possibly increasing the uptake of the service
2. Decreasing the cost of processing applications for DIA and local governments
3. Improving customer experience and satisfaction levels
4. Enhancing the ability of local governments to deliver services digitally
5. Reducing the time for service application from 25 minutes for completing the paper form to 4 minutes for the online form (84 percent improved efficiency)

Here are other examples of governmental and government-related uses of OpenFisca in the world: Barcelona, Spain, uses OpenFisca to calculate the social benefits of its residents; the United Kingdom uses OpenFisca for modeling British legislation, assessing the impact studies of the Universal Basic Income; Australia uses OpenFisca to calculate eligibility for plans such as energy savings and for work activities with Community Gaming Check; Tunisia, Mali, the Ivory Coast, Senegal, and the United Arab Emirates have carried out calculation prototypes with OpenFisca; and New Zealand uses OpenFisca Aotearoa to inform citizens about their right to take advantage of schemes such as the Tax Discount or SmartStart.

The primary source for this case was Quiroga et al. (2020a).

# 2.10

# CASE 10 – MY SOCIAL RIGHTS IN FRANCE

One application of OpenFisca is the My Social Rights (Mes Droits Sociaux) service, previously known as My Aids (Mes Aides) (Ministère des Solidarités et de la Santé, n.d.). A rule-based one-stop public service, My Social Rights enables citizens to assess their eligibility for 58 national social benefits in a couple of minutes.

The main reason behind the creation of MesAides is how difficult it is for people to discover, learn about, and assess their eligibility for 30–40 different social benefits, provided by several different agencies, with little or no coordination. Citizens need to know if they can opt for them, where and how to request them, and they must enter the same data repeatedly. One of the design principles of My Social Rights is that the role of the state is not to require citizens to know how it works in order to access and exercise their rights, but rather, on the contrary, to better understand the context in which people seek access to them and the limitations and barriers they must face, in order to find ways to provide them with a better experience and interaction. Given the established social contract, this is the foundation of their existence.

The team responsible for the initiative recognized that projects to modernize public services in the digital era, including automation, must always work on people's real problems, with solutions being useful and adapted only to the extent that they are able to satisfactorily and verifiably resolve such problems. Thus the automation projects need to address problems, and solutions are by-products of this work. The main goal is, therefore, to solve well-identified social and economic problems that impact people, not to digitalize a service just for the sake of doing so. All solutions are built in free and open-source software, so problems can be solved incrementally and iteratively following a frugal and disciplined approach somewhat comparable to the scientific method: hypothesis elaboration, qualitative validation, and quantitative verification.

The service, developed using OpenFisca, offers a new communication channel between social protection organizations and individuals. The person is asked to connect through the public digital identity service France Connect and to enter their social security number. Once recognized by the system, the person can select one of six insurance areas—illness, family, retirement, employment, solidarity, and housing—and access the pre-filled multi-benefit simulator to identify the benefits to which he or she may be entitled. If so, a link is offered to redirect the person to the responsible agency and make a request. The result implements, for the moment and in a partial way, rule-based automation and business process automation.

An impact of this service is providing a seamless interface for citizens to 28 government agencies in the social protection, employment, and other government areas. Another service, called My Local Social Rights, is also available to smooth relations with local governments.

**Box 10.**

### Automated Services Can Be Offered Based on Life Events

My Social Rights allows citizens to consult all their social rights, resources, and data related to their professional activity and to simulate their assistance. In addition and illustrating how they work on problems, the My Social Rights platform offers services based on life events according to the following categories:

1. Expecting a child/childbirth
2. Dealing with the death of a person
3. Being a disabled person
4. Looking for a job
5. Needing childcare
6. Having a disabled child
7. Preparing your retirement
8. Being separated from your spouse
9. Moving abroad
10. Moving to live in France
11. Leaving your home
12. Leaving your parents' home
13. Being a foreigner and living in France

**References:**

- https://www.mesdroitssociaux.gouv.fr/accueil/vos-services
- https://www.mesdroitssociaux.gouv.fr/vos-evenements-de-vie/accueil

The primary source for this case was Quiroga et al. (2020b).

# 2.11

# CASE 11 – AUTOMATION OF BORDER CONTROL IN THE EUROPEAN UNION

The European Union Agency for the Operational Management of Large-Scale IT Systems in the Area of Freedom, Security and Justice (eu-LISA) is in charge of automating various border control services. Most services apply rule-based automation and some intelligent automation through machine learning. RBA is used at the infrastructure level to increase system resilience by removing single points of failure of various system components. For example, when components fail to communicate, the rules allow system recovery by pushing control flow to another state. Such automation is used in the Entry/Exit System (EES)[5] and the European Travel Information Authorisation System (ETIAS).[6] Another example is the Shared Biometrics Management Service (sBMS), which applies intelligent automation through machine learning for facial and fingerprint recognition. Solutions such as EES, ETIAS, or sBMS are part of the automation of border control system in the European Union.

One of the drivers for the automation of border control in the European Union was how to leverage the information stored in existing government databases to prevent terrorists from attempting to enter the European zone by exploiting the untapped potential of available data.

Automation based on machine learning, the sBMS enables updating biometric data in the central European systems, complementing personal data written in text and document information (e.g., passports). Following the EES regulation,[7] the system manages a hit list for identifying a face in the list. The required accuracy (i.e., biometric performance) varies according to the legislation and the business processes in which it is applied. The user, who can be a policeman, border guard, or someone else, can pick a face from those recommended from the list and inform about the match. The user makes the final decision about how to resolve each case.

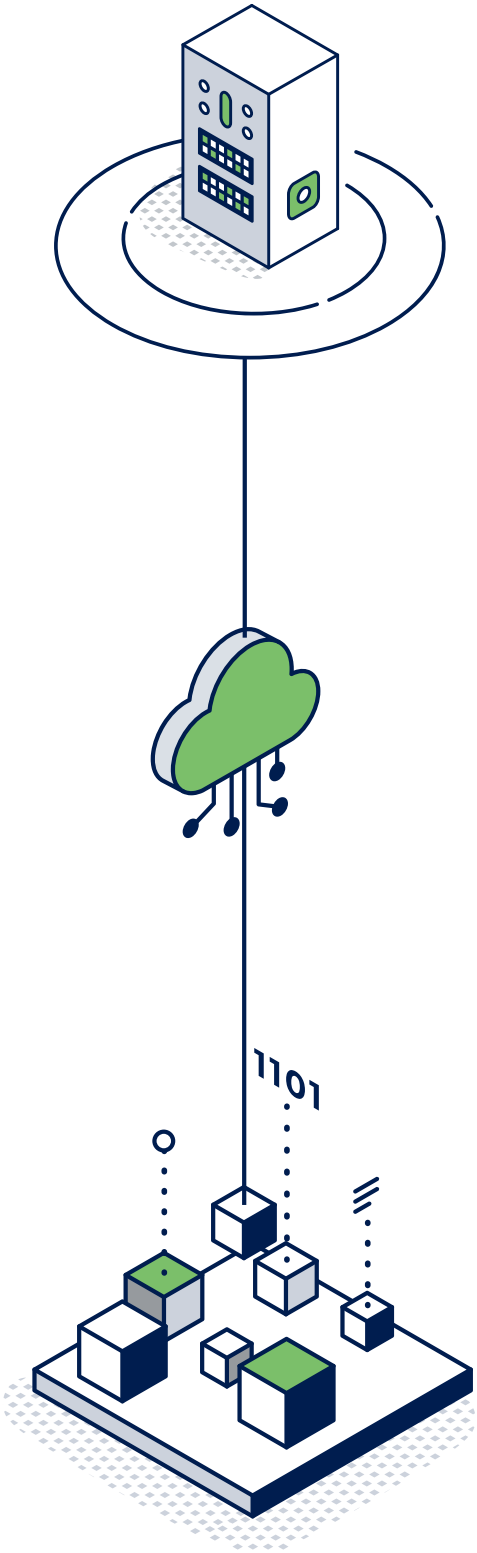
The functionality enabled by RBA enhances system resilience. It builds active redundancy in the systems at the infrastructure level and facilitates dynamic recovery from incidents by automated decision making based on predefined rules. The components are used in ETIAS, a system the European Commission proposed to create in November 2016 and engaged an Expert Group to define the requirements. Based on their inputs, a team of experts documented the system specification and handed it to the contractor responsible for system implementation. ETIAS is expected to be operational by the end of 2023. The planned impact includes saving travelers time and hassle.

5. EES, https://www.eulisa.europa.eu/Activities/Large-Scale-It-Systems/EES.

6. ETIAS, https://www.eulisa.europa.eu/Activities/Large-Scale-It-Systems/Etias.

7. EES Regulation, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0329&from=EN.

For example, the online travel authorization request process is expected to last 10 minutes. The planned impact also includes improving border management, complementing the European Union's visa liberalization policy, preventing irregular migration, and reinforcing the fight against terrorism and crime.[8]




**Box 11.**

**Developing and Maintaining In-House Automation Capacity Is Vital**

An organization responsible for automation is interested in keeping the expertise in-house. A typical example is enterprise architecture, providing common components for automation. In eu-LISA, a team is responsible for mastering the backbone of the future enterprise architecture. They define high-level issues down to low-level details, including standards, methodologies, and architecture-related requirements, for contractors to ensure that the systems achieve the common principles and standards defined by the organization. eu-LISA engages large teams of experts in different domains to ensure that the organization is leading the contractors and that the system is fully aligned with the organizational interests and needs.

The primary source for this case was Racz et al. (2021).

8. ETIAS Leaflet, https://ec.europa.eu/home-affairs/sites/homeaffairs/files/what-we-do/policies/european-agenda-security/20180425_etias_en.pdf.

# 2.12

# CASE 12 – SERVICE AUTOMATION IN SINGAPORE

The Government of Singapore established VITAL, the Public Service's Shared Services Centre under its Ministry of Finances in 2006 to be responsible for aggregating common corporate services within the public sector, such as those related to human resources, payroll, finance, training, and travel and procurement. VITAL aims to provide government agencies with common financial, human resources, payroll, and procurement services. Its 495 employees serve 110,000 public servants across over 100 government agencies, processing about 1,500,000 transactions annually. Whole-of-government intelligent automation, mainly based on RPA, is at the core of VITAL's digitalization roadmap.

The driver for creating VITAL was to improve efficiency, enhance service quality, and leverage economies of scale. Regarding automation, the main driver was to gain a competitive advantage following a multi-pronged approach to spur RPA adoption in the government and building the RPA community.

The VITAL automation strategy is currently in the third phase. The first phase, conducted during 2017-2018, was dedicated to establishing the automation business cases; identifying financial and human resources, and payroll and procurement processes suitable for "attended automation"; and building internal capabilities, including training officers to develop RPA scripts. The second phase, conducted in 2019, focused on implementing unattended automation,[9] particularly for financial processes; creating the internal automation Centre of Excellence (COE) to drive RPA adoption across government; building automation capabilities through job shadowing vendors to learn and co-develop unattended automation scripts; and launching the whole-of-government bot library. The third phase, lasting from 2020 and beyond, includes the appointment of VITAL as the unit responsible for leading the whole-of-government robotics and automation (R&A) area and experimenting with and scaling up suitable R&A solutions in administrative and corporate services domains across the public service. The third phase also includes experimenting with no- or low-code solutions to enable more business users and citizen developers to build their RPA scripts within VITAL and other agencies.

The automation effort produced 86 trained users, 46 attended or unattended automated processes and tasks, and a whole-of-government bot library. The latter comprises 14 shared RPA scripts for compressing and uncompressing files, verifying file types, validating the National Registration Identity Card (NRIC), opening the Internet Explorer browser, and triggering weekly e-invoice emails, among others. Examples of attended automation processes in human resources include updating deployment and leave transactions; in the payroll area, updating timesheets and creating personnel details records; and in the capacity area, updating learning history records. Examples of unattended automation processes in finance include creating deposit records and monitoring the late e-invoice payments weekly. After process streamlining and standardization, the impact consists of 30 to 80 percent efficiency gains in the deployed processes.

**9.** Unattended automation is based on "unattended robots," those that can self-trigger work based on a pre-defined schedule. Such robots enable processes to be operated with minimal human intervention. Attended automation requires a human officer to trigger the robots and to interact with the process at certain points. In this latter case, there is a person supervising the execution of the automated process.

**Box 12.**

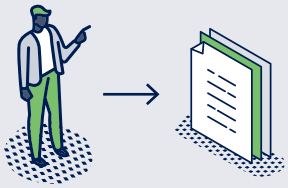
**Unattended Automation Example and Automation Benefits**

The deposit record creation process is a financial service that VITAL provides to more than 30 government agencies, processing about 30,000 transactions annually. The distinguishing feature of automation is that the process is used by multiple agencies and requires interaction with the central financial system. Mainly, it entails operationalizing robot access to perform transactions for various agencies while addressing concerns about the impact on existing controls, roles, and responsibilities governing central systems.

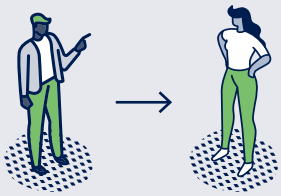
The manual and automated process flows are shown below.

### MANUAL PROCESS

Officer retrieves Deposit Record Form and supporting document from the Case Management System



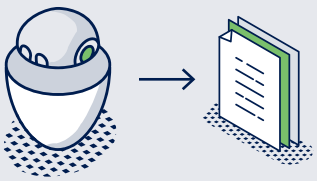
Officer uses a checklist to verify completeness of details in the form and matches the data against data requested in the financial system transaction



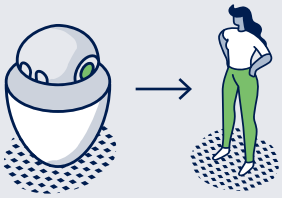
Officer creates/amends the deposit record in the financial system and forwards it to the Approving Officer for approval

### AUTOMATED PROCESS

Bot retrieves Deposit Record Form and supporting document from the Case Management System



Bot uses a checklist to verify completeness of details in the form and matches the data against data requested in the financial system transaction



Bot creates/amends the deposit record in the financial system and forwards it to the Approving Officer for approval

**The benefits of the automated solutions include:**

**Process improvements** – Automation eliminated the need for hard-copy forms and printed supporting documents for the Deposit Record Creation Process as the bot will save and route the digital forms and documents.

**Better quality of data input** – The template design of the Deposit Record Form was improved due to standardization and accurate data input.

**More digitally skilled workforce** – More officers are trained and equipped with digital and automation capabilities.

**Higher value-added work** performed by government officers – With the free time, they only need to handle exception cases notified by the bots instead of processing all transactions manually.

**Better process control** – The bot's actions and results within the scripts are logged for performance monitoring and audit trail.

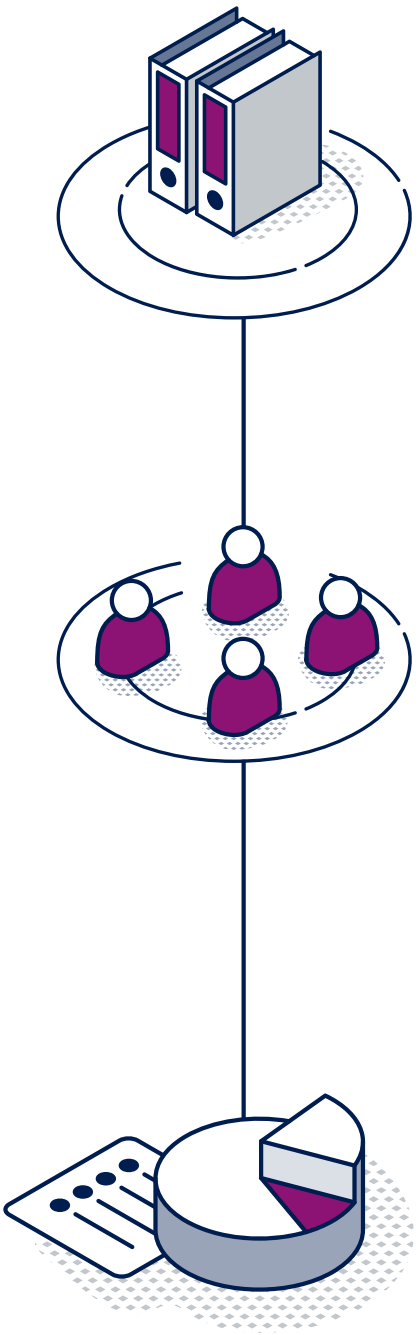
**Enhanced efficiency** – Depending on the business process, 30 to 80 percent efficiency gains were achieved through automation.

The primary source for this case was Lui et al. (2021).

# 3.

# BENEFITS OF GOVERNMENT AUTOMATION

The government automation initiatives can offer a wide range of design and implementation options, all with different outcomes. They can be costly and disruptive, at least in the short term, for the implementing organizations and their partners.



To properly decide and plan for such initiatives, knowing what benefits could be produced and under what conditions and weighing them against the expected costs and disruption are crucial.

This chapter aims to provide a typology of benefits that government and society may reap from government automation initiatives. The benefits were identified and substantiated with the evidence drawn primarily from the case studies and secondly from the literature. It is thus limited to the body of evidence available for the report. Beyond this evidence, other benefits than those captured under the typology are undoubtedly possible. In addition, the typology highlights specific benefits produced by government automation rather than the benefits delivered by digital government in general. Symmetrically and following similar criteria, Chapter 4 will provide a typology of government automation risks.

The benefits of government automation initiatives are organized into four distinct types: 1) government automation can increase efficiency, 2) government automation can increase productivity, 3) government automation can increase decision quality, and 4) government automation can increase citizen convenience.

Each type is listed in Table 4. Subsequent sections provide the benefits of each type and explain the nature, impact, and evidence for each benefit. The impact refers to the public value framework in Figure 4, and the evidence is drawn from the case studies in Chapter 2 or literature.

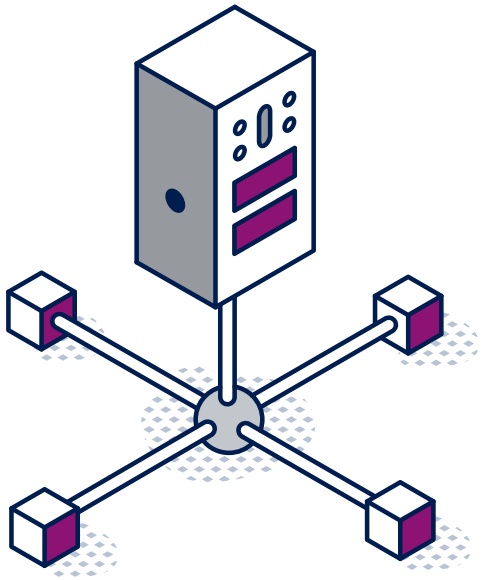
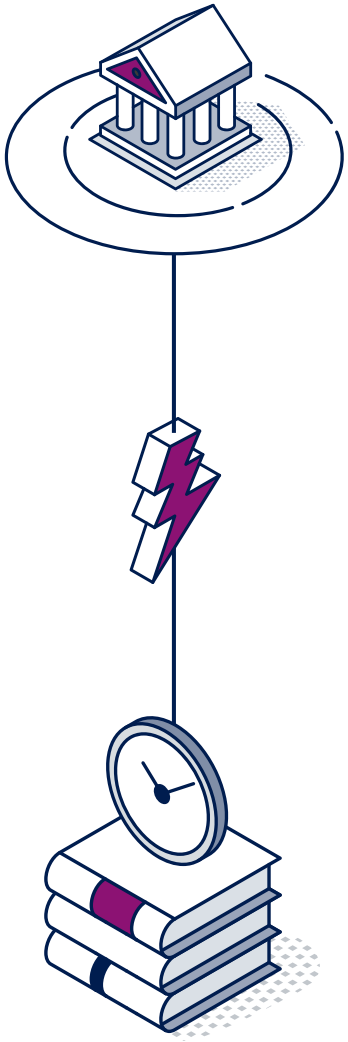


**Table 4.** Types of Government Automation Benefits

| ID | BENEFIT TYPE | SECTION |
|---|---|---|
| **B1** | Government automation can increase efficiency | **3.1** |
| **B2** | Government automation can increase productivity | **3.2** |
| **B3** | Government automation can increase decision quality | **3.3** |
| **B4** | Government automation can increase citizen convenience | **3.4** |

# 3.1

# GOVERNMENT AUTOMATION CAN INCREASE EFFICIENCY



In this case "efficiency" means, in general, the ability to achieve objectives with no (or minimal) waste of resources such as time, effort, institutional capital, and others. In government, efficiency is set against the objectives to produce public value—constituency, organizational, or political—and constitutes public value by itself.

Besides eliminating waste and duplication, government efficiency also entails rational spending and a balanced budget.

The literature and case studies developed for this report confirm that government automation can generate four efficiency-related benefits: 1) reduce operating costs, 2) shorten decision times, 3) simplify processes, and 4) reduce development costs. The following sections explain and provide evidence supporting all four benefits.

## 3.1.1. Government automation can reduce operating costs

An essential element of government efficiency is covering the costs of daily government operations. The government's operating costs include the costs of personnel, goods and services, rental and insurance, infrastructure maintenance, and social and economic programs. Automation can help reduce operating costs, as shown below.

In Sweden, the automation of social welfare benefits by the Trelleborg Department of Welfare and Labour (Case 5) reduced operating costs by between 10 and 15 percent. In particular, the number of case handlers fell from 8 to 4. In Chile, the automated handling of social security claims (Case 6) showed its capacity to increase digital exchange between government, citizens, businesses, and other collaborating parties. The efficiency and scale-up potential of the digital channels also allowed the government to reduce its operating costs. Finally, by minimizing judicial involvement, automation implemented by online courts can reduce operating costs in the justice sector (Palmgren, 2018).

### 3.1.2. Government automation can shorten decision times

Making decisions is a central task of any government. Government decisions can concern establishing eligibility for services and subsidies, granting permits and licenses, procuring goods and services, financing social programs, investing in infrastructure, adjudicating conflicts, enacting policies, and others.

> ***A measure of government efficiency is how fast such decisions can be made.***

As shown below, automation can accelerate government decisions.

In Sweden, the automation of the social welfare benefit processing (Case 5) reduced decision times from between 3 and 7 minutes for positive decisions and between 5 and 17 minutes for negative decisions to less than 1 minute for all decisions, while the whole process was reduced from 8 days to 1 day. In Chile, the automation of social security claims (Case 6) reduced the average time required for resolving such claims from 120 to 39 days. In particular, resolving medical license claims took 94 working days before and 31.1 days after automation. In Spain, the birth registrations initiated in the health centers were reduced to take at most 24–48 hours from the time of birth (Case 7). In Argentina, issuing recommendations on housing protection for persons with disabilities, part of prosecutorial processes (Case 8), was reduced from 174 to 38 days, and housing protection involving third parties from 190 to 42 days. In Singapore, VITAL automated 46 processes and tasks across the financial, human resource, payroll, and procurement areas (Case 12), reducing case processing times between 30 and 80 percent.

### 3.1.3. Government automation can simplify processes

To be effective, government automation must go beyond individual tasks or workstations, as in RBA or RPA; it must impact entire workflows and processes that span different functions and levels of government, as in BPA. To this end, simplifying the underlying processes and regulations to bring them to the level understandable by machines is needed, as well as relying on machine processing to make such simplifications feasible. Thus, automation is both a policy driver and a technical condition for simplification. The evidence is below.

In Norway, the automation of child benefits (Case 3) took advantage of the simplification of the eligibility rules already introduced by NAV. In Spain, the automation of the civil registry services (Case 7) was accompanied by simplifying the registry's business rules. In Argentina, the automation of prosecutorial processes (Case 8) was preceded by the diagnosis, assessment, reengineering, and general quality improvements in the underlying business processes. Finally, in Jordan, the automation of the entire financial life cycle, from budget preparation, through budget execution, to financial reporting, was shown to improve fiscal management in government (Alsharari and Youssef, 2017).

### 3.1.4. Government automation can reduce development costs

Any administrative or institutional reform in government requires a combination of technological, organizational, and regulatory development and change. Such development can be costly and disruptive. Government organizations must establish their readiness to host it and undergo the necessary changes to produce the expected benefits. As shown below, automation can lower development costs and the associated change in government.

In Singapore, the whole-of-government approach to service automation (Case 12) was shown to drive the adoption of automation solutions across government and rely on economies of scale to lower development costs. In Denmark, the evidence from cross-organizational, local government process automation confirmed that automation requires few organizational changes compared to other technological developments in government (Pedersen, 2017). Thus, automation is a valuable option for organizations with low capabilities for "organizational development, process reengineering and collaboration" (Pedersen, 2017). In Serbia, automation reduced the time it took to model, test, and integrate government information systems, as demonstrated by the automatic generation of the government information system's components from the semantic representation of administrative procedures (Arsovski et al., 2014).

The benefits in the four efficiency-related scenarios and the public value produced by each of them according to the public value framework are described in Table 5.

**Table 5.** Government Automation Can Increase Efficiency – Benefits

| ID | BENEFIT | PUBLIC VALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial gains | Empowered employees | Organization-technology alignment | Reduced administrative burden | Increased user value | More inclusive public services | Openness and transparency | Accountability | Participation |
| 1.1 | Government automation can reduce operating costs | x | | | | | | | | |
| 1.2 | Government automation can shorten decision times | | | | x | | | | | |
| 1.3 | Government automation can simplify processes | | | | x | x | x | | | |
| 1.4 | Government automation can reduce development costs | | x | | | | | | | |

# 3.2

# GOVERNMENT AUTOMATION CAN INCREASE PRODUCTIVITY

Production is the act of combining various inputs to create an output—product, service, capability, and so on—that can deliver some value to its users. Government organizations are involved in producing public goods and services using labor, materials, energy, facilities, legitimacy, and other inputs. The increase in government production is mainly in the volume, scope, and variety of services delivered.

Automation offers various productivity-related benefits including 1) replacing humans with machines and thus freeing the resources to be used elsewhere, 2) complementing humans with machines and performing more work through human-machine collaboration, and 3) putting machines to perform tasks that no human could complete.

## 3.2.1. Government automation can release human resources

Automating entire government jobs can lead to machines releasing human resources that can then be used to perform entirely new tasks, increasing government production. This scenario is only possible for jobs that perform automatable tasks, leaving little room and the need for human-machine collaboration.

In Sweden, the automation of social welfare delivery by the Trelleborg Municipal Government's Department of Welfare and Labour (Case 5) reduced the number of case handlers from eight to four. In Chile, the automated handling of social security claims by the Superintendence of Social Security (Case 6) doubled the number of cases processed monthly from 6,000 to 12,000. In Argentina, the automation of prosecutorial processes by the Public Prosecutor's Office (Case 8) increased the number of cases handled by the office monthly from 116 to 528. In Chile and Argentina, automation released human resources from working on simple, routine cases so that they could devote themselves to handling complex, unique cases.

## 3.2.2. Government automation can complement human resources

While the automation of entire government jobs is relatively rare, the automation of tasks that comprise such jobs is more likely. It is also increasingly likely to see government work and entire offices organizing human-machine and machine-machine collaboration to carry out various tasks and processes, increasing overall work and office productivity.

In Paraguay, the automation of public procurement (Case 1) helps to address the inefficiency of performing manual controls on the large volume of procurement processes that must be controlled. Automation increases the capacity of human verifiers to detect anomalies and improve the effectiveness of controls. In the European Union, the European border control (Case 11) performs human-machine collaboration. The process depends on the type of case. For EU citizens returning from outside the Schengen zone, full automation through border gates without a manual stop is allowed by the legislations and more and more used by member states. For third-country nationals entering the Schengen zone, pre-enrollment can be done in an automated way but there is always a stop in front of the border guard who may interview the person and, based on the background check results provided by the systems built by eu-LISA, make a final entry decision. The outcome is improving border management and preventing irregular migration.

### 3.2.3. Government automation can complete machine-only tasks

The ultimate case of automation-enabled production increases is enabling the performance of tasks that only machines but no humans can perform. This can happen in various circumstances, for example, the delivery of personalized services to the entire population, reaching out to hard-to-reach vulnerable groups with the specially customized service offering, analyzing thousands of social media posts with feedback to legislative or policy drafts, reacting in real time to thousands of calls arriving at once during emergencies, and others.

In Singapore, the whole-of-government automation efforts (Case 12) carried out by VITAL include implementing unattended automation in various financial processes. Two such processes are deposit record creation and weekly e-invoice late payment monitoring. In Argentina, Boti—the chatbot run by Buenos Aires city, is responding through WhatsApp and other channels to millions of queries about COVID every month (Government of the City of Buenos Aires, 2021), embodying personality attributes such as honesty, decisiveness, pedagogy, and service orientation.

The benefits of government automation in the three production-related scenarios and the public value produced by each are described in Table 6.

**Table 6.** Government Automation Can Increase Productivity – Benefits

| ID | BENEFIT | PUBLIC VALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial gains | Empowered employees | Organization-technology alignment | Reduced administrative burden | Increased user value | More inclusive public services | Openness and transparency | Accountability | Participation |
| 2.1 | Government automation can release human resources | x | | | | | | | | |
| 2.2 | Government automation can complement human resources | | x | x | | | | | | |
| 2.3 | Government automation can complete machine-only tasks | | | | x | x | x | | | |

# 3.3

# GOVERNMENT AUTOMATION CAN INCREASE DECISION QUALITY

Due to their impact on the whole population, a wide spectrum of issues and circumstances encountered, and the consequential nature of government decisions on people's lives, the quality of such decisions is paramount. Such quality concerns decisions made at a given time, with available information, not determined by the outcomes of such decisions, which depend on the circumstances that are external and dynamic. Quality decisions are decisions aligned with the decision-maker's intentions and values. At the same time, government decision making is subject to influence from political or business actors who stand to gain from them. Thus the quality of the decision process, which guarantees quality decisions, is also paramount. When it is part of this process, automation can influence such quality.

The literature and case studies confirm that government automation can generate benefits that collectively increase the quality of government decisions, making sure that such decisions are: 1) objective, 2) evidenced, 3) reliable, and 4) transparent.

### 3.3.1. Government automation can ensure that decisions are objective

Objectivity, that is, the lack of bias or favor for either side, is an imperative feature of government decision making. Digitalization and automation support decision objectivity by formalizing decision making in terms of rules, implementing them in software, and executing them by machines. In general, by reducing direct human influence on individual decisions and making decision making rational and impartial, automation is a powerful tool to ensure objectivity. However, this is only possible if decisions are expressed in rules that machines can execute, that is, when the regulations behind decisions are automation-ready.

In Denmark, applications for economic support for the unemployed are processed using automatically initiated controls and legislation embedded in the system logic, resulting in objective decisions and reducing the risk of fraud (Pedersen, 2017). Still, within Denmark, the experience with digitalization-ready legislation shows that automation makes case processing more objective and predictable (Justesen and Plesner, 2018).

### 3.3.2. Government automation can ensure that decisions are evidenced

Evidence-based decision making, another required feature of government decision making, is about making decisions based on the best available evidence. Depending on the nature of the decisions, the evidence may have to be preserved for future inspection or audit. Automating government decisions naturally supports evidence-based decision making, with data used by the decision-making system serving as evidence. Increasingly, such evidence is available in the digital form, ready for digital storage, processing, and preservation, for example, to respond to any legal process contesting decision outcomes.

In Paraguay, the case of public procurement (Case 1) demonstrates that automated controls can signal problems and accurately detect anomalies in

procurement. They can provide evidence for further manual verification and help identify more providers to participate in public tenders, enlarging the base for procurement decisions and increasing their quality. In Spain, the proactive delivery of school transport subsidies to parents (Case 2) relies on the system pulling all required data automatically, which can also serve as evidence for the decisions. In Argentina, the rule-based system that predicts the prosecutor's recommendations and automatically prepares the documents to be submitted to judges (Case 8) depends on case documents, current laws, and previous decisions by the judge as sources of evidence. In France, the OpenFisca engine, which enables the simulation of the impact of the tax and social benefit reforms on the government budget and the population (Case 9), is a major provider of evidence for policy decisions. In the European Union, the border control system applies machine learning to utilize biometric data, , and to recommend decisions to the end-used, serving as inputs to actual decisions made by border guards and police (Case 11). Similarly, the use of facial recognition technology can control access to school and university campuses, serving as a source of evidence for both attendance and academic decisions (Andrejevic and Selwyn, 2020).

### 3.3.3. Government automation can ensure that decisions are reliable

The reliability of government decisions refers to the extent to which such decisions are consistent and trustworthy. Objectivity and evidence do not automatically deliver reliability as decisions may not take into consideration (or underplay the consideration of) the context, circumstances, and perceptions of those affected by the decision, the impact of the decision on the society at large, or nuanced legal interpretations. Automation can enhance the reliability of the decisions by: extra scrutiny directed at decisions delegated to machines, at least initially; gaining confidence in the repeated application of the automated procedures and their correct outcomes over time; reducing the possibility of human error when the procedures are operated manually; scaling up the testing of the automated procedures to entire public administration systems; crowdsourcing error-correction of such procedures; and others.

In Norway, child benefits are first checked manually, and only if confirmed the rest of the process is automated (Case 3). Also, in Norway, delivering sickness allowances through rule-based automation helps ensure that ill citizens who cannot obtain their salary are paid correctly according to the rules applicable to them (Case 4). In addition, the correct processing of such allowances leads to trust in automated decision making within the Norwegian Welfare Organization (NAV) over time. In Spain, the automation of the civil registry updates guards the consistency and integrity of the registry, increasing trust in the registry and registry-based decisions (Case 7). In Argentina, PROMETEA's combined prediction and automation represents a qualitative change in decision making, as they contribute to improving the quality of work (Case 8). In the European Union, automation removes a single point of failure from the border control system, allowing it to automatically recover from failure and increasing its resilience (Case 11). In Singapore, automating services across government carried out by VITAL allows for testing and correcting such services at scale, thus increasing the reliability of the automated decisions made by them (Case 12). In Canada and the United Kingdom, one form of automation in the justice sector—online courts—was shown to help protect the integrity and increase trust in the public justice system (Palmgren, 2018). In the Netherlands, using expert systems by municipalities led to fewer errors in handling complex administrative tasks and improved the quality of juridical decisions (Groothuis and Svensson, 2000).

### 3.3.4. Government automation can ensure that decisions are transparent

Transparency is the principle of allowing those affected by decisions to know the outcome of such decisions and the process that led to them. The latter includes knowing: who made the decision, how the decision was made, why a particular outcome was reached, and how to appeal the decision. Transparency is essential for government decision making as it is key to building trust between the governing and the governed, itself a foundation for effective public policy and management. Government automation can further transparency by automatic disclosure of information of public interest as soon as it becomes available, automatic publication of case-related information for individual knowledge and inspection, and automatic publication of the evidence used to support decisions.

In Paraguay, the National Directorate of Public Procurement furthers transparency in public procurement (Case 1) by using AI-based intelligent automation to calculate predicted times when public entities will pay for the goods and services they procure. The objective is to be able to reduce the information asymmetries faced by public sector providers. In Denmark, municipal job centers enhance government transparency by automatically publishing information related to citizen cases online, allowing them to access and check such information (Pedersen, 2017). In Jordan, the adoption of the government financial management information system by the Jordanian Customs Organization to automate budget preparation, budget execution, and financial reporting "delivered transparency and accountability in all public resources transactions" (Alsharari and Youssef, 2017). In public places, facial recognition technology makes it more difficult for individuals to hide and delivers greater transparency and accountability for their actions (Andrejevic and Selwyn, 2020).

The four benefits of government automation to increase the quality of government decisions and the public value produced by each are described in Table 7.

**Table 7.** Government Automation Can Increase Decision Quality – Benefits

| ID | BENEFIT | PUBLIC VALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial gains | Empowered employees | Organization-technology alignment | Reduced administrative burden | Increased user value | More inclusive public services | Openness and transparency | Accountability | Participation |
| 3.1 | Government automation can ensure that decisions are objective | | | x | | x | | | | |
| 3.2 | Government automation can ensure that decisions are evidenced | | | x | | x | | | | |
| 3.3 | Government automation can ensure that decisions are reliable | | | x | | x | | | | |
| 3.4 | Government automation can ensure that decisions are transparent | | | | | | | x | | |

# 3.4

# GOVERNMENT AUTOMATION CAN INCREASE CITIZEN CONVENIENCE

The state imposes various obligations on its citizens, including paying taxes, obeying the laws, protecting public property, participating in political processes, and others. In return, it should not impose an undue administrative burden on citizens and should generally seek to make it more convenient for them to discharge their obligations, including interacting with the government. Government automation is one of the means to achieve this end. It can ensure that public services are available non-stop, consulting individual circumstances is possible continuously, agencies can coordinate their real-time response to citizen requests in the background, citizens are offered services that are personalized to their circumstances, citizens are offered services according to their circumstances proactively, the same public services are offered through multiple channels that respect individual preferences, and others.

The literature and case studies confirm that government automation can generate four benefits that increase citizen convenience: 1) reducing administrative burden, 2) enabling personalized services, 3) enabling inclusive services, and 4) enabling proactive services.

## 3.4.1. Government automation can reduce the administrative burden

Administrative burden refers to the costs imposed on citizens for interacting with the state and discharging their civil obligations. It includes learning costs such as determining one's eligibility, compliance costs such as fulfilling complicated paperwork and documentation, and psychological costs such as the stress of interacting with the government bureaucracy. Government automation can reduce administrative burden in various ways, such as determining eligibility for an applicant from existing records, pre-filling the applicant's forms, offering personalized consultation through a friendly chatbot, and many others.

In Spain, automatic and proactive delivery of the school transport benefits was accompanied by eliminating the supporting documents required from the applicants and, in general, simplifying the application procedures (Case 2). Automation and simplification are mutually dependant: automation needs simplification, and simplification needs automation. In Norway, the automatic delivery of child welfare benefits required simplifying the eligibility rules, which allowed the vast majority of the cases to be processed automatically without burdening citizens (Case 3). In France, the rule-based one-stop service integrator, My Social Rights, facilitates the interaction between citizens and 28 agencies that provide social protection, employment, and other government services, and the coordination of service provision between them (Case 10). The service reduces the burden on citizens of discovering which agency offers relevant services, the eligibility criteria, and how to interpret them against their circumstances.

In the European Union, automatic border gates provide clear savings in time and hassle for the travelers that cross its borders (Case 11). Automation often results in better quality mediation, and not disintermediation, as is often the preconceived idea about it (Quiroga, 2020a).

### 3.4.2. Government automation can enable personalized services

Personalized service refers to a service that delivers a customer experience tailored to the customer's needs, preferences, and circumstances. Given the authority to maintain and manage citizen records over their entire lifetimes, the government is in the best position to offer personalized public services. The main challenge is offering services to the population that cover all possible needs, preferences, and circumstances. Automation is necessary to carry out the wide-scale delivery of personalized public services, provided it can access citizen records and update them with the outcome of these services. However, the following evidence only provides examples of automation releasing human resources to make them available for manually delivering personalized services.

In Denmark, municipal job centers use automation to free case workers to work on more complex, human-facing cases (Pedersen, 2017). In Singapore, delegating robots and autonomous systems to conduct routine tasks releases healthcare workers from performing such tasks, allowing them to devote more time to personalized services and serving the emotional needs of their patients (Tan and Taeihagh, 2020). In Canada and the United Kingdom, the evidence from the justice sector demonstrates that online courts help redirect judicial officers' time to offer personalized handling of complex, non-routine cases (Palmgren, 2018).

### 3.4.3. Government automation can enable inclusive services

By definition, public services should be offered equally to the entire population, without prejudice or favor provided to individuals or groups. In reality, the vulnerable groups who, because of their circumstances, are particularly susceptible to detriment and uncertainty are often excluded or offered fewer services than others. Automation makes it possible for public services to reach more citizens, including the vulnerable, to make them inclusive. To this end, automation can replicate the delivery of public services over multiple channels preferred by different groups.

It can shape the delivery format to make it more accessible to people with disabilities. It can hide the complexity of inter-agency coordination behind a simple user interface. It can facilitate machine-machine collaboration between government systems, users' digital assistants, and others.

In Spain, the automatic delivery of the school transport benefits allows citizens to register their intent to receive the benefit online or in a town hall in person—two options appealing to different groups, triggering the fully automatic process (Case 2). In France, My Social Rights enables citizens to assess their tax bill and which benefits they are entitled to, extending such information and services to all citizens regardless of their knowledge and the time needed to learn it (Case 9). In Canada, integrating online dispute resolution with the public justice system is helping resolve "small claim disputes without the need to physically come to court" (Palmgren, 2018). Online dispute resolution can include automated negotiation between parties and automated responses to them.

### 3.4.4. Government automation can enable proactive services

In addition to citizens requesting services when needed, they could be offered services as soon as they are eligible, without having to ask. The latter—proactive services—are well suited to public services provided by the government, which has the authority to manage citizen records and, knowing the circumstances of individual citizens, can determine automatically which services they are eligible to receive. Because personal circumstances change all the time and eligibility rules change occasionally, automation is necessary to determine eligibility and create service offerings in real time.

In Spain, following the citizen's expression of interest in receiving school transport benefits, the system performs all checks and calculations and proactively and automatically offers the periodic benefit (Case 2). In Norway, once a child is registered in the national registry, the system automatically checks the parents' eligibility to receive child benefits and, if they are eligible, automatically and proactively generates the benefits claim on their behalf (Case 3).

The four benefits of government automation to increase citizen convenience and the public value produced by each are described in Table 8.

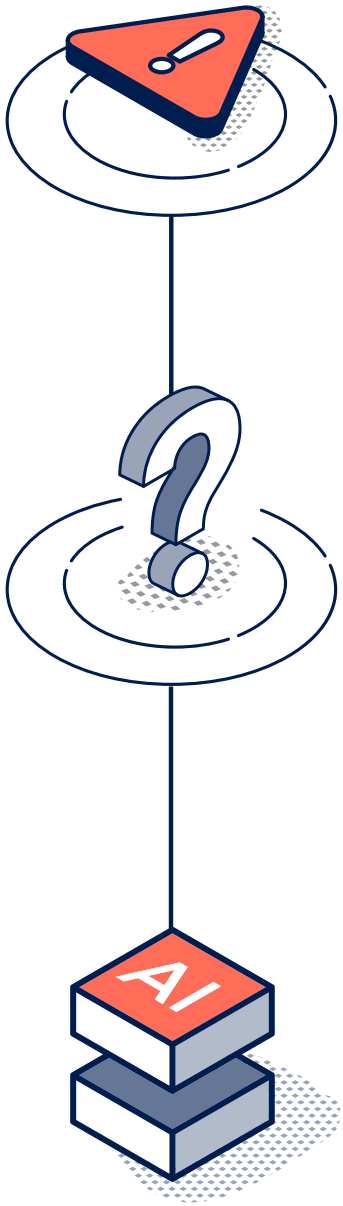
**Table 8.** Government Automation Can Increase Citizen Convenience – Benefits

| ID | BENEFIT | PUBLIC VALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial gains | Empowered employees | Organization-technology alignment | Reduced administrative burden | Increased user value | More inclusive public services | Openness and transparency | Accountability | Participation |
| 4.1 | Government automation can reduce the administrative burden | | | | x | x | | | | |
| 4.2 | Government automation can enable personalized services | | | | | x | x | | | |
| 4.3 | Government automation can enable inclusive services | | | | | x | x | | | |
| 4.4 | Government automation can enable proactive services | | | | x | x | | | | |

# 4.

# RISKS OF GOVERNMENT AUTOMATION


## The realization of benefits outlined in the previous chapter is a possibility but not a guarantee for government automation initiatives.




As such initiatives depend on a host of technical, legal, organizational, and human factors, many of them not controlled by the implementing organization, they naturally face uncertainty and deviation from the expected. The government automation risks describe such uncertainty and deviation.

Besides the risks involved with the failed implementation of the automation initiatives, even successful implementation may produce negative outcomes due to the risks of automation itself. Symmetrically to the typology of government automation benefits introduced in Chapter 3, this chapter aims to provide a typology of government automation risk. And like the benefits, the risk typology is limited to the body of evidence available for the report, other risks being certainly possible if one goes beyond this body of evidence.

The risks of government automation initiatives are organized into four types: 1) government automation may waste time, money, and capital, 2) government automation may lower decision quality, 3) government automation may fail to solve problems, and 4) government automation may undermine trust (Table 9). Subsequent sections describe the risks that belong to each type, their nature, impact, and evidence. The impact refers to the public value framework in Figure 4 regarding the negative public values or disvalues. The evidence is drawn from the case studies in Chapter 2 or literature.

**Table 9.** Types of Government Automation Risks

| ID | RISK TYPE | SECTION |
|---|---|---|
| **R1** | Government automation may waste time, money, and capital | **4.1** |
| **R2** | Government automation may lower decision quality | **4.2** |
| **R3** | Government automation may fail to solve problems | **4.3** |
| **R4** | Government automation may undermine trust | **4.4** |

# 4.1

# GOVERNMENT AUTOMATION MAY WASTE TIME, MONEY, AND INSTITUTIONAL CAPITAL

The enthusiasm for automation projects, particularly those involving AI, often outstrips the capacity of government organizations for effective project design, execution, and management. This can lead them to embark on energy- and money-consuming projects that never come to fruition, thus wasting public resources and the institutional capital that would enable them to embark on automation projects in the future.

Specific risks that could lead agencies to waste time, money, and institutional capital through automation projects include: 1) lack of political support that may undermine stakeholder commitment, 2) lack of innovation capacity that may increase the likelihood of project failure, 3) lack of stakeholder trust that may limit successful completion and adoption, and 4) fragmented coordination arrangements that may increase automation costs.

## 4.1.1. Lack of political support may undermine stakeholder commitment

Authorities in public agencies may be skeptical about the automation projects' outcomes and anxious about publishing or using information produced by the automated tools. Such an attitude, when the authorities also lack understanding of the benefits and risks of government automation, may cause the withdrawal of political support, compromising the mobilization of resources needed for project execution and undermining the stakeholders' commitment to automation. Concrete examples of this risk are shown below.

When staff does not perceive that there is political support for pursuing automation, they feel unmotivated and unable to identify new opportunities like opportunities to collaborate with other stakeholders (Case 1). The lack of political support is also an obstacle to breaking with the status quo. Many agencies keep doing the same work for years without questioning their mission. For example, many Swedish municipalities requested help replicating the Trelleborg experience (Case 5). The Trelleborg government responded with a project to build capacity among 15 other municipalities. However, five municipalities abandoned the project within three months because they lacked commitment to the process, resulting in wasted time and money for the governments involved (Case 5). Frequently, the lack of support from high-level officials is due to the still fragmented knowledge of the opportunities that new technologies can generate and the possibility of exploiting data collected and managed by the government as a whole (Case 9).

## 4.1.2. Lack of innovation capacity may increase the likelihood of project failure

Automation projects require new types of innovation, for example, having to do with how data is collected and used, how decisions are made, how tasks are performed, and others. Many government agencies are risk averse and lack the capacity and will to engage in innovation, particularly in their internal organization and work processes. This lack of innovation capacity also results in agencies applying traditional, incremental methods to automation projects, which may increase the probability of project failure and underutilization of project results.

One example of the lack of innovation capacity is when technology staff are asked to drive automation projects, which they are generally unable to do due to the lack of understanding of business needs, challenges and requirements. The main driver for such projects is business experts who know how new technologies can support value creation. Another example is applying traditional funding arrangements for automation projects, expecting payments upon the delivery of the promised value (Velsberg et al., 2020). Due to the agencies' lack of awareness or capacity to innovate, applying such arrangements increases the probability of project failure. Instead, when agencies are aware that such projects may fail, they want guarantees that the final product is feasible, preferring flexible funding first to procure a software prototype or proof of concept.

### 4.1.3. Lack of stakeholder trust may limit successful completion and adoption

Lack of trust in the capacity of project teams and the automated solutions they produce heightens the risk that the project will not be completed successfully. It can also undermine the engagement of stakeholders in adopting the solutions. Examples are shown below.

In traditional technology projects, the scope and what they can achieve are primarily a function of the wishes expressed and resources committed by government leaders. In automation projects, however, achievements are primarily due to the efforts of the project teams (Case 4). As automation introduces new ways of working at all organizational levels, it is not only a problem solver but a challenge. The teams responsible for automation projects are under pressure to deliver but frequently must ask government leaders for more time for testing, checking, and correcting errors. Moreover, due to the lack of trust in automated solutions, they are subject to more extensive controls than manual solutions, which may impact their timely completion (Case 4).

### 4.1.4. Fragmented coordination arrangements may increase automation costs

One responsibility of the central authority vis-à-vis automation projects is providing whole-of-government arrangements for sharing government data and feeding it into automated solutions. Failing to deliver on this responsibility may lead to bilateral agreements, project delays, and increased costs of automation.

Many automation projects aim at simplifying interactions with citizens. These include the delivery of school transport benefits in Spain (Case 2), managing social security claims in Chile (Case 6), and implementing the My Social Rights program in France (Case 10). Citizens provide data only once, then the data are shared between government agencies using automated solutions that access and integrate information from various agencies.

> ***To this end, it would be extremely costly and time consuming to rely on negotiated data-sharing arrangements between individual agencies rather than whole-of-government arrangements.***

In the Chilean case (Case 6), the lack of the pre-defined standard data sharing agreement caused SUSESO to waste about two years negotiating ad hoc arrangements with other agencies needed to integrate data.

The four risks causing government automation to waste time, money, and institutional capital are described in Table 9. Since these risks negatively impact the project, the government, and stakeholders, they produce the opposite of public value: public disvalue. Table 10 also shows the public disvalue produced by each risk.

**Table 10.** Government Automation May Waste Time, Money, and Capital – Risks

| ID | RISK | PUBLIC DISVALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial loss | Disempowered employees | Organization-technology misalignment | Increased administrative burden | Decreased user value | Non-inclusive public services | Closeness and opacity | Unaccountability | Disengagement |
| 1.1 | Lack of political support may undermine stakeholder commitment | | x | | | | | | | x |
| 1.2 | Lack of innovation capacity may increase the likelihood of project failure | x | | | | | | | | |
| 1.3 | Lack of stakeholder trust may limit successful completion and adoption | | | | | | | | | x |
| 1.4 | Fragmented coordination arrangements may increase automation costs | x | | | | | | | | |

# 4.2

# GOVERNMENT AUTOMATION MAY LOWER DECISION QUALITY

One of the benefits of government automation documented in Section 3.3 was increasing the quality of government decisions by ensuring that they are objective, evidenced, reliable, and transparent. However, government automation may also produce the opposite effect and lower the quality of government decisions. Neither is inherent, and whether automation produces public value or public disvalue depends on the context.

Specific risks that could lead government automation to lower the quality of government decisions include: 1) automated solutions may misjudge citizen circumstances, 2) street-level algorithms may produce suboptimal decisions for borderline cases, and 3) automated solutions may lead to opaque decisions.

## 4.2.1. Automated solutions may misjudge citizen circumstances

One risk of automated decision making is misjudging the circumstances, particularly of citizens and their socioeconomic conditions. This misjudgment may happen due to the lack of data, low data quality, embedded bias, design-reality mismatch, oversimplification, displacement of human judgment, or a combination of these factors. In particular, when data is gathered from human decision-making and then used to train machine learning algorithms, it transfers human bias into algorithmic bias.

A concrete example is deciding about citizens' eligibility for receiving social benefits. When eligibility is determined manually, caseworkers make decisions based on the available data, additional data they can request from citizens, and knowledge about their circumstances. In automated systems, the logic goes from automated information collection to information processing on large databases to automated decision making (Andrejevic and Selwyn, 2020). The replacement of human judgment in this process may misdiagnose citizens' circumstances, confirm eligibility when it is not warranted, or deny it when it is. In addition, when discretion may help the caseworkers optimize the provision of individual services based on the citizen's needs and circumstances, this optimizing effect is unachievable by automation, which only applies standardized rules and disregards individual circumstances and cases by design.

Another aspect of automation is offering self-service and self-help options to citizens, reducing the need for them to explain the circumstances of their case to caseworkers face-to-face. This changes the roles, work, and relationships between the caseworkers and citizens (Justesen and Plesner, 2018). Case workers are no longer responsible for ensuring that their decision is based on the assessment of the entire situation, as they can only access elements of a case and lose the whole picture of the person under consideration. Also, not considering citizens' unique needs and circumstances may result in decisions that are considered illegitimate and unfair (Justesen and Plesner, 2018).

## 4.2.2. Street-level algorithms may produce suboptimal decisions for borderline cases

Due to their standardized treatment, street-level algorithms may not consider borderline cases, resulting in suboptimal decisions for them. This is because business rules in automation-ready regulations are simplified and stimates or exceptions are removed to force binary decisions. These simplified rules are "ill-equipped

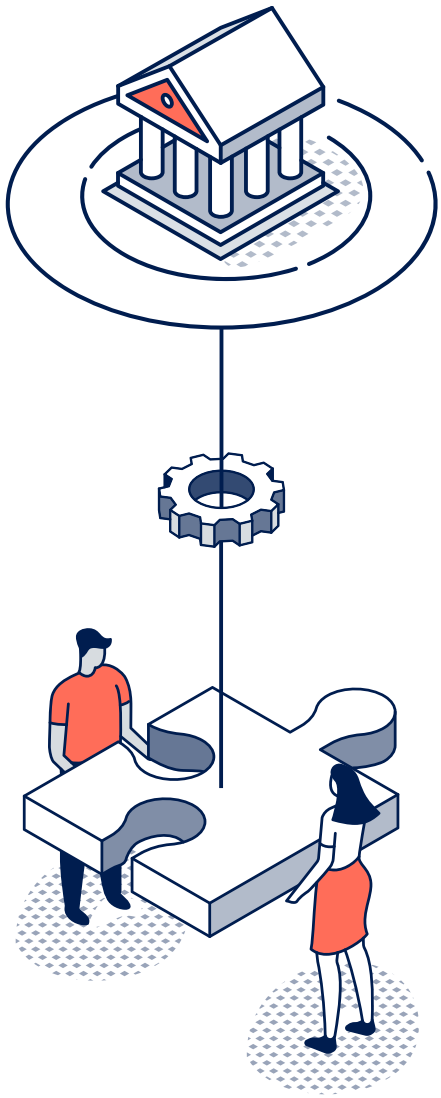
to deal with the complexities involved in social workers' decision making since they mainly tell what needs to be addressed and rarely how" (Petersen et al., 2020).

In addition, automation-ready rules capture relatively static and ignore case-specific factors. This may result in loss of awareness of the situation of the person under consideration and difficulty matching this person with the information required by the rules (Petersen et al., 2020). While reducing uncertainty, automation may fail to address the complexity of borderline cases. In contrast, discretion allows case workers to "interpret and modify formal rules concerning which activities to inspect, which evidence to examine, which inferences to draw and which actions to take" and "negotiate with various stakeholders in reaching decisions that best serve the circumstances of the individual case and the interests of those involved" (Varavithya and Esichaikul, 2003).

For example, the delivery of child benefits in Norway (Case 3) highlights the limitations of automated solutions for handling complex cases. As rule-based automation requires binary decisions and access to accurate and complete data, some citizens are served proactively and automatically. In contrast, others must apply in person since the system fails to process their cases automatically. Another example, the Danish digitalization-ready legislation (Justesen and Plesner, 2018), highlights that automated processes may produce unreasonable results if asked to provide strict yes/no answers. The reason is that exceptions and estimates are meant to address borderline or marginal cases. Thus, the legal certainty that was to be gained through automation can be lost due to automation in such cases (ibid.).

### 4.2.3. Automated solutions may lead to opaque decisions

Integrating government data and applying new developments in AI and machine learning make it possible to apply automated solutions to parts of business processes. Unfortunately, these solutions offer predictive accuracy at the expense of accessing "the knowledge within the machine" (London, 2019). While domain experts may understand the mathematical and logical principles of the underlying models, they lack explicit declarative knowledge (Holzinger, 2018) to justify their behavior. Despite the efficiency and convenience of the automated solutions, a lack of understanding of how the algorithm arrived at specific results may breed distrust (Holzinger et al., 2020). When they are not properly justified, citizens may challenges these decisions.



An example is the use of machine learning for automated facial recognition. This may present many risks for democratic societies, such as large-scale misrecognition and misidentification of individuals, machine bias due to the racially skewed data-sets used to train such algorithms, overreach of such technologies when used by authoritarian governments or commercial interests, or normalizing the tracking of people in public spaces (Andrejevic and Selwyn, 2020). For the European Union and the development of the ETIAS system (Case 11), the recognition of individuals is a major concern. One risk is a wrongful association of persons with terrorist records at border controls. While facial and fingerprint recognition techniques have advanced significantly in recent years and can identify people with a high degree of certainty, the production of fake facial and fingerprint records is also moving forward. Another source of wrongful identification is GDPR compliance, which rules out using actual personal data to train the algorithms. Thus for ETIAS, a consensus is emerging that fully automated identification is risky and cannot replace human decision making (Case 11) , ruling out the use of biometrics to make fully automated decisions.

The three risks mentioned above that may cause government automation to lower the quality of decisions, and the public disvalue produced by each, are described in Table 11.

**Table 11.** Government Automation May Lower Decision Quality – Risks

| ID | RISK | PUBLIC DISVALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial loss | Disempowered employees | Organization-technology misalignment | Increased administrative burden | Decreased user value | Non-inclusive public services | Closeness and opacity | Unaccountability | Disengagement |
| 2.1 | Automated solutions may misjudge citizen circumstances | | | | | x | x | | | |
| 2.2 | Street-level algorithms may produce suboptimal decisions for borderline cases | x | | | | x | x | | | |
| 2.3 | Automated solutions may lead to opaque decisions | | | | | | | x | x | |

# 4.3

# GOVERNMENT AUTOMATION MAY FAIL TO SOLVE PROBLEMS

Like other public sector initiatives, government automation is expected to deliver tangible value to both government and society. It is often produced by providing automated solutions to specific policy problems. However, government automation may fail to deliver on such expectations. For instance, it may fail to solve a given policy problem, offer a solution to a different problem than the one pursued, or generate additional problems in the course of trying to solve a given one.

Specific risks that could lead government automation to fail to solve problems include: 1) under pressure to use the latest technology, government automation may create problem-solution mismatch; 2) by replacing human judgment, government automation may produce suboptimal solutions; and 3) government automation may have to clean up and compensate for algorithmic errors. The following sections explain and provide evidence supporting all three risks.

### 4.3.1. Government automation may create problem-solution mismatch

Many government organizations tend to pursue the latest technology, regardless of its value to the stakeholders and how well it contributes to solving the problem they face. This is called the "shiny object" syndrome—pursuing a trendy object, regardless of how valuable or beneficial it may be for the task at hand. For government automation, AI often represents such a shiny object. Agencies may pursue AI-based automation due to the funding pressure to use the latest technologies, causing a problem-solution mismatch.

This risk is highlighted by the Estonian government's experience (Velsberg et al., 2020). The government provided central funding to agencies to develop AI projects to stimulate the public sector's adoption of AI. Submitted project proposals were subject to competitive evaluation. Under pressure to pursue AI-based automation, proposals were sometimes labeled "AI projects" even when not applying AI or applying AI to problems that could be solved with other, more appropriate technology (Velsberg et al., 2020). The shiny object syndrome is also observed elsewhere, even when none of their problems are suited for AI solutions. Agencies would be encouraged to apply and, if successful, would receive funding to pursue AI solutions to non-AI problems (Rogers et al., 2020).

### 4.3.2. Government automation may produce suboptimal solutions

Pursuing effective solutions to relevant problems faced by the public and the state is one of the central tenets of government performance. One of the main questions about government automation is how it affects performance. Here we examine this question when automation replaces street-level bureaucrats with street-level algorithms.

Unlike street-level bureaucrats, street-level algorithms cannot reflect on the purpose and meaning of their work (Alkhatib and Bernstein, 2019). While the former can "reflexively refine the contours of their decision boundary before making a decision on a novel or marginal case," the latter "at best refine these contours

only after they make a decision" (Alkhatib and Bernstein, 2019). Thus street-level bureaucrats use new cases to "refine their understanding of the policy." In contrast, street-level algorithms treat them as missing data in the training dataset and apply "similar" data instead. In addition, street-level algorithms never recognize their mistakes or revisit their own decisions until they are reviewed by a human. Thus, the displacement of human judgment caused by replacing street-level bureaucrats with street-level algorithms may result in suboptimal performance and suboptimal solutions. On a societal scale, the cost of such suboptimal performance is immense.

### 4.3.3. Government automation may have to compensate for algorithmic errors

Both algorithms and bureaucrats can make mistakes. Due to the speed of automated processing and lack of immediate feedback, a series of mistakes made by street-level algorithms may rapidly increase the clean-up and compensatory burden on government agencies. Automation generally increases efficiency, but due to the speed of processing and dependence on constantly changing data, any small mistake in an automated procedure may quickly multiply, leading to a lot of compensatory work. In contrast, although human-performed casework takes much longer than machine-performed casework, humans can recognize their mistakes. In this sense, "the slowness can sometimes be an advantage," and automation may increase efficiency and fragility in casework (Justesen and Plesner, 2018).

The clean-up burden due to automation errors involves executing time-consuming tasks by trained staff to analyze the cases and explain the decisions made. It may also include implementing ad-hoc procedures to solve the problems that affect the citizens involved. In addition, since street-level algorithms may make mistakes with marginal cases, street-level bureaucrats' work does not disappear with automation. It becomes "new forms of clean-up, compensation and control" (Justesen and Plesner, 2018). All such remedial actions may increase the agencies' operating costs, becoming an automation risk.

Table 12 describes the three risks mentioned above that may cause the failure of government automation to solve problems and the public disvalues each of them produces.

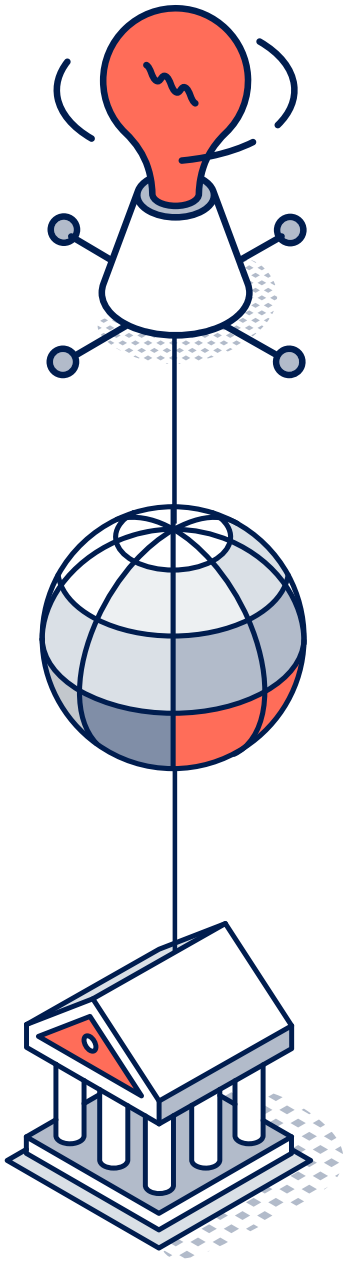


**Table 12.** Government Automation May Fail to Solve Problems – Risks

| ID | RISK | PUBLIC DISVALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial loss | Disempowered employees | Organization-technology misalignment | Increased administrative burden | Decreased user value | Non-inclusive public services | Closeness and opacity | Unaccountability | Disengagement |
| 3.1 | Government automation may create problem-solution mismatch | | | x | | | | | | |
| 3.2 | Government automation may produce suboptimal solutions | | | | | x | | | | |
| 3.3 | Government automation may have to compensate for algorithmic errors | | | | | x | | | | |

# 4.4

# GOVERNMENT AUTOMATION MAY UNDERMINE TRUST

Maintaining trust between the governed and the governing is a fundamental requirement for effective public governance. Trust is a fragile commodity in a world affected by conflict, resource scarcity, and technology-enabled social change. When government deploys new technology, it can affect the working of the state and the state-citizens relationships and, in turn, the trust between citizens and the state. Given the nature of government automation, it has the potential to strengthen as well as undermine such trust.

Specific risks that could lead government automation to undermine trustful relationships with citizens include the following: 1) government automation may transfer policy decisions to the actors who lack authority to make such decisions, displacing policy responsibility; 2) government automation relying on the hidden exchange of data from various sources may violate citizen privacy; and 3) automated decisions may compromise social values over economic gains.

### 4.4.1. Government automation may displace policy responsibility

In automated solutions, legal policy staff, system designers, and other technology experts have the power to influence policymaking and implementation. They provide definitions, clarify ambiguities in regulations, decide how processes should be designed and integrated, make decisions by implementing software code, and, in general, implement policies by building and modifying systems. Thus, automation displaces policy responsibility to the actors with no authority for policy decisions or responsibility for their outcomes.

For example, software engineers become policymakers instead of policy implementers (Bovens and Zouridis, 2002). Their choices can influence the "nature, amount and quality of sanctions and benefits provided by their agencies" (Lipsky, 1980), and the risk is their discretionary power, which should be managed through political control and accountability (Bovens and Zouridis, 2002). Such power raises legitimacy concerns since non-policymakers are responsible for translating policies into software code, with the ability to influence implementation decisions.

> ***The use of automated decision-making can raise accountability concerns since the public would complain about the outcomes of policy implementations to legitimate policymakers who are not in charge of (and thus not responsible for) implementation decisions.***

### 4.4.2. Government automation may violate citizen privacy

Citizen privacy, or the right to be left alone, free from interference or intrusion, is under threat in a world where massive volumes of data are collected about their personal lives and made available for businesses or governments to make decisions affecting them. The goal is generally to optimize outcomes—commercial, political, policy, and others—for decision makers, not citizens. Government automation amplifies this privacy-violating effect of digital transformation.

For example, AI-based automation can violate citizen privacy on a massive scale, integrating and processing personal data beyond the purpose for which the data was collected and using such data for surveillance and other illicit aims (Janssen et al., 2020). As another example, the fully automated, proactive delivery of public services simplifies interactions between government and citizens. It avoids having to ask citizens to provide data because the government relies on extensive data integration practices. This scenario entails data sharing among agencies, with citizens unaware of how their data is integrated, compared, and analyzed. The sharing involves handling citizens' personal information, usually without their consent, raising serious privacy concerns; big data, AI, and IoT further amplify these concerns by enabling ubiquitous retrieval and analysis of personal data (Mark, 2019).

### 4.4.3. Government automation may compromise social values

Efficiency and cost savings are among the main drivers of government automation, thanks to the gains from automating repetitive and time-consuming tasks and replacing manual checks with automated controls. Automation is also driven by the claims of scientific and statistical neutrality of the resulting systems. The risk of government automation is prioritizing economic gains and technical properties of automated systems, driven by technological opportunities and modernization pressures, over the social value produced by such systems (Cobbe et al., 2020). Social values are standards adopted by individuals and social groups to define personal goals and shape the community's nature and form of order (Tsirogianni et al., 2014). Examples of social values include the rule of law, human rights, and fair access to and delivery of public services. Social value commmitments in the social, justice, education, and elder care domains are discussed below.

In the social sector, automated systems and the use of AI, in particular, may expose technologically poor or socially vulnerable citizens to discrimination. For example, when citizens do not possess proper personal identification documents, automated solutions may make it unfeasible to decide on their cases. Such persons are then faced with additional requirements to receive services, like applying in person (Carney, 2020; Larsson, 2020) .

In the justice sector, the use of AI generates concerns arising from algorithmic bias, lack of transparency, encroachment of the executive upon the judicial branch, differential treatment between online and human decision making, and uneven technology take-up across jurisdictions, keeping legal systems up to date with technological developments (Sourdin et al., 2019).

In the education sector, using facial recognition in schools raises concerns about highlighting students' gender and race, categorizing students while making decisions, and forcing students to act differently when under surveillance. For example, in responding to school shootings, schools in the United States started applying closed-circuit television systems to recognize patterns of suspicious behavior, such as students fighting or even walking slowly when others walk faster. Since students knew that they were being recorded, they behaved unnaturally. In addition to the coercive and inescapable nature of school-based facial recognition, this technology facilitates the authoritarian nature of the school system (Andrejevic and Selwyn, 2020).

In the elder care sector, primarily the long-term automated health services used in this sector, the use of AI raises multiple technological risks and ethical dilemmas. For example, fairness is compromised when patients are unable to express their preferences and forced to deal with robots and autonomous systems for their care; social interactions, human touch, and the patients' intellectual capacity are compromised by mandatory automated solutions; and the authentic social commitment is compromised when the elderly are abandoned to interact by themselves and only with automated solutions (Tan and Taeihagh, 2020).

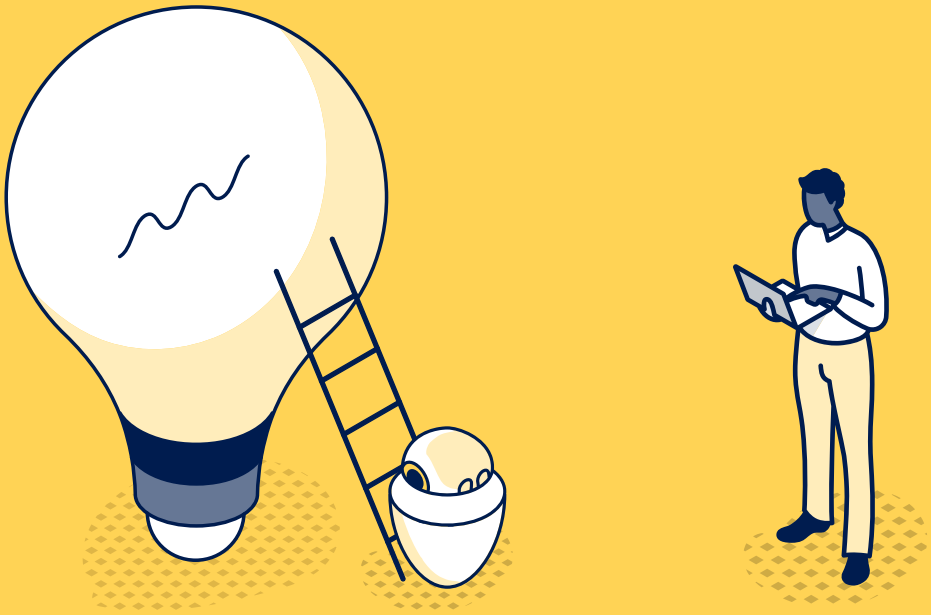
The three risks mentioned above that may cause government automation to undermine trust and the public disvalues each of them produces are described in Table 13.

**Table 13.** Government Automation May Undermine Trust – Risks

| ID | RISK | PUBLIC DISVALUE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Organizational | | | Constituency | | | Political | | |
| | | Financial loss | Disempowered employees | Organization-technology misalignment | Increased administrative burden | Decreased user value | Non-inclusive public services | Closeness and opacity | Unaccountability | Disengagement |
| 4.1 | Government automation may displace policy responsibility | | | x | | | | | x | |
| 4.2 | Government automation may violate citizen privacy | x | | | | | | x | x | |
| 4.3 | Government automation may compromise social values | | | | | | | x | x | |

# 5.

# FACTORS THAT ENABLE GOVERNMENT AUTOMATION



Government organizations share some common features, such as belonging to the same administrative structure, operating under one set of rules and regulations, implementing whole-of-government strategies and policies, and possibly serving the same constituency.

Still, considering their internal strategies, infrastructure, services and capabilities, and the institutional environment that shapes their behavior and interactions, they can differ widely. Such differences matter for government organizations' potential to realize the expected benefits and their exposure to the anticipated risks of automation.

The body of evidence presented in this report makes it possible to link the characteristics of government organizations and their institutional environment to the production of specific benefits and the exposure to specific risks of government automation, represented by the respective benefit and risk typologies in Chapters 3 and 4. Such characteristics give rise to the typology of factors of government automation. This chapter presents such a typology and the evidence that connects the factors to the identified benefits and risks. Like the benefit and risk typologies, the factors typology is limited to the body of evidence presented in this report. It can be extended or amended when new evidence comes to light.

The factors of government automation are organized into: 1) institutional readiness: technological and organizational readiness are prerequisites to successful government automation; 2) human capacity: government automation depends on the human capacity to lead, design, participate in, and sustain human-machine operations; 3) process innovation: government automation benefits from simplification, incrementality, adoption, and other process innovations; and 4) whole-of-government: government automation must be grounded in the whole-of-government strategy, collaboration, and integration. Each type is listed in Table 14 and elaborated in subsequent sections.

**Table 14.** Factors Enabling Government Automation

| ID | FACTOR | | SECTION |
|---|---|---|---|
| | NAME | DESCRIPTION | |
| 1 | Institutional readiness | Technological and organizational readiness are prerequisites to successful government automation | 5.1 |
| 2 | Human capacity | Government automation depends on the human capacity to lead, design, participate in, and sustain human-machine operations | 5.2 |
| 3 | Process innovation | Government automation benefits from simplification, incrementality, adoption, and other process innovations | 5.3 |
| 4 | Whole-of-government | Government automation must be grounded in the whole-of-government strategy, collaboration, and integration | 5.4 |

# 5.1 INSTITUTIONAL READINESS

Government automation is the responsibility of a government organization that owns the task, process, service, workflow, and office being automated. Typically, this organization is also the owner and sometimes the implementer of the automation project. However, other ownership structures such as the automation competence centers serving all other organizations' automation needs are also possible.

For automation to succeed—that is, to deliver the benefits and overcome the risks of automation—the organization must be automation-ready, both technologically and organizationally. The former covers the provision of well-governed digital infrastructures as technical foundations for various elements—systems, services, networks, and capabilities—of automated solutions. Infrastructure governance entails the monitoring and control over infrastructure-related decisions, for it to continue delivering value to the organization. By reducing human intervention, automated solutions are particulary sensitive to the volume and quality of data used to making decisions. Thus, technological readiness also entails access, mainly through the digital infrastructure, to trusted data. To be trusted, a process through which such data is produced, shared, applied and discarded must be governed through standards and policies enacted by the organization. In turn, the adoption of such standards and policies, along with procedure simplification, business process redesign, building of human-machine collaboration skills, and others, constitute organizational readiness to support automation and manage the associated change. Factor F1 is formulated as follows:

> ***Government automation requires the organizations involved to provide access to a common digital infrastructure, practice information technology governance, provide trusted data and organizational support, and manage change.***

The factor comprises four sub-factors: 1) automation is built on a digital infrastructure, 2) automation requires information technology governance, 3) automated decisions must rely on trusted, well-governed data, and 4) automation and the associated change require organizational readiness. The sub-factors are listed in Table 15 and elaborated in the sections below. Each section explains what the factor is about, why it is important, how it is implemented, and what evidence substantiates it. As usual, the evidence is drawn from the case studies in Chapter 2 or literature.

**Table 15.** Institutional Readiness Sub-Factors

| ID | SUB-FACTOR |
|---|---|
| **1.1** | Automation is built on a digital infrastructure |
| **1.2** | Automation requires information technology governance |
| **1.3** | Automated decisions must rely on trusted, well-governed data |
| **1.4** | Automation and the associated change require organizational readiness |

## 5.1.1. Automation Is Built on a Digital Infrastructure

### What is this factor about?

Automating government decisions relies on access to data drawn from various sources, capacity to process it, and the ability to update government records with the outcomes of these decisions. The operations are enabled by the digital infrastructure that connects databases, servers and networks run by different agencies and non-governmental partners. Using this infrastructure, agencies can access data owned by other agencies, process data to reveal patterns, make calculations and produce decisions, and record the outcomes in their own and other agency systems. Having a common digital infrastructure and shared services to access its functionalities reduces the technical and legal requirements for agencies to pursue automation.

### Why is this factor important?

All government agencies, including those with low technical capabilities, should be interested in fostering automation. Providing them with the whole-of-governnment digital infrastructure which offers access to the data from various agencies and common services to process it addresses the shortage of technical capabilities and reduces operating costs. Such an infrastructure can be implemented through a government cloud, avoiding government investment in multiple servers that mostly remain idle, and maximizing the utilization of government's digital resources.

The centralized digital infrastructure reduces duplication of government effort, releasing resources that can then be used elsewhere. At the same time, using the common infrastructure shortens system development times, enabling agencies to focus on value-added processes. It also reduces the risk of increasing operating costs due to the fragmented arrangements needed in the absence of such common infrastructure.

While a digital infrastructure is beneficial for digital government in general, it is vital for government automation since it facilitates access to data needed for automating government decisions and complements agencies' technical capabilities.

With respect to its contribution to benefits and risks, providing a central digital infrastructure can help increase government efficiency and productivity and minimize the risk of government wasting time, money, and institutional capital on automation. Regarding the public value framework (Figure 4), the digital infrastructure can save financial resources by avoiding duplication and empowering agencies with low technical capabilities.

### How is this factor implemented?

Three implementation approaches for the provision of digital infrastructure for automation are:

1. Providing and connecting agencies to a centralized digital infrastructure to enable the exchange and sharing of data
2. Providing a government cloud with secure data services
3. Providing access to the core infrastructure services, such as an interoperability platform, digital identity, or authentication

Regarding the strategic government triangle for implementing automation (Figure 5), the digital infrastructure builds operational capabilities, part of the operating environment.

Table 16 shows how the different approaches to digital infrastructure impact the benefits and risks of government automation.

**Table 16.** Digital Infrastructure – Benefits and Risks

| APPROACH | BENEFITS | | RISKS |
|---|---|---|---|
| | **B1 Increasing efficiency** | **B2 Increasing productivity** | **R1 Wasting time, money, and institutional capital** |
| 1. **Providing and connecting agencies to a centralized digital infrastructure** | Reducing operating and development costs | Releasing human resources<br><br>Complementing human resources | Reducing the risk of fragmented coordination arrangements |
| 2. **Providing a government cloud with secure data services** | | | |
| 3. **Providing access to the core infrastructure services** | | | |

### What is the evidence?

In Spain, the delivery of the school transportation benefit is a shared service offered by several local governments that relies on their capacity to connect to a common technical infrastructure offered by the Government of Albacete and to exchange data provided by the infrastructure cloud services (Case 2). Rather than owning data servers, agencies that rely on the government cloud can access centralized databases and utilize the cloud's substantive processing capacity for automation (Rogers et al., 2020).

In Estonia, automation relies on the core systems that provide common data, security, addresses, and document services. These are: 1) X-Road[10] serving as the data exchange layer for information systems; 2) ISKE[11] ensuring a security level sufficient for the data processed in IT systems; 3) RIHA[12] providing a catalog for the state's information system; and 4) DHX[13] enabling institutions to exchange documents. The main rationale for creating these systems was that many government organizations have similar needs, and meeting them separately by building and operating individual systems is wasteful and makes achieving interoperability more difficult (Velsberg et al., 2020).

In Chile, the automation of social security claims highlights the need for three core infrastructure services as significant enablers for automation: citizen and business identification, data sharing, and service notification.They are the central government's responsibility since agencies cannot provide such services by themselves (Case 6).

In Spain, automation of the civil registry relies on many whole-of-government platforms to provide common services, such as authentication, notification, and others (Case 7).

## 5.1.2. Automation Requires Information Technology Governance

### What is this factor about?

According to the IT Governance Institute (2007), IT governance "consists of the leadership, organizational structures, and processes that ensure that the enterprise's IT sustains and extends the organization's strategies and objectives." The definition emphasizes that IT governance cannot rely on a single person. It is the responsibility of executives and the board of directors and is part of corporate governance. The concept is powerful because it raises the level of information technology issues to the strategic level of an organization, makes IT an institutional concern that all senior managers are committed to, and makes technology a key enabler for achieving strategic goals.

### Why is this factor important?

Different IT governance practices contribute to realizing some automation benefits and minimizing the associated risks. For example, empowering the IT function helps to address the lack of political support. Defining rules for deciding about automation and its implementation increase decision quality since responsibilities are clearly and transparently assigned. Building the competencies of IT staff shortens development times and lowers operating costs. Establishing a governance model makes automation a shared responsibility of the senior management, who will ensure that automation investment is aligned with and contributes to organizational objectives.

**10.** X-Road, https://x-road.global/.

**11.** ISKE, https://www.ria.ee/en/cyber-security/management-state-information-security-measures/it-baseline-security-system-iske.

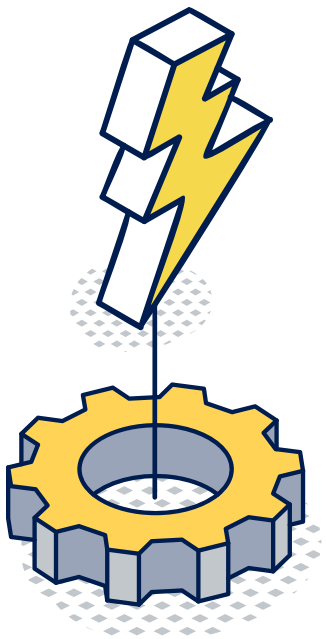
**12.** RIHA, https://www.ria.ee/en/state-information-system/data-based-governance-and-reuse-data/administration-system-riha-and-rihake.

**13.** DHX, https://www.ria.ee/en/state-information-system/data-exchange-platforms/document-exchange-layer-dhx.

By sharing responsibilities, collective decisions are more likely to be transparent and correct, and the collaboration needed to deliver such responsibilities increases stakeholder trust. At the same time, governance reduces the risk of fragmented coordination agreements.

Although IT governance is an enabler for digital government in general, due to the high-risk nature of automation projects and the collaboration required from various actors, it is especially relevant for automation. Without IT governance, automation may not be prioritized, resulting in the lack of stakeholder engagement and trust, the risk of duplication, invisibility of the results, and impaired potential for automation to scale up.

In summary, IT governance contributes to automation by increasing the efficiency of government operation and the quality of government decisions, and addressing the risk of agencies wasting time, money, and institutional capital on automation projects. Regarding the public value framework (Figure 4), IT governance contributes to organizational values, specifically organization-technology alignment, and political values such as openness, transparency, accountability, and participation of various stakeholders in IT-related decisions.



### How is this factor implemented?

Four implementation approaches for introducing IT governance to automation projects are:

1. Empowering the IT function by, for example, making it depend directly on the agency head. Thus the highest authority would be aware of the automation efforts, consider them strategic priority, and contribute to successful completion.

2. Building competencies, assigning responsibilities, and delegating powers would empower staff with a clear mission and competencies for achieving automation.

3. Establishing a governance model, such as a committee, board, or another corporate structure, promotes the sharing of services and data by agencies. The collective nature of such decisions makes them more likely to be transparent and correct.

4. By sharing responsibilities, the outcome depends on the collective action by many agencies, increasing stakeholder trust and complementing the agencies' capacities.

Technology governance is a critical capability for legitimizing IT and automation decisions, part of the authorizing environment of the strategic government triangle (Figure 5).

Table 17 shows how the different approaches to IT governance impact the benefits and risks of government automation.

**Table 17.** IT Governance - Benefits and Risks

| APPROACH | BENEFITS | | RISKS |
|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **R1 Wasting time, money, and institutional capital** |
| 1. **Empowering the IT function** | | | Minimizing the risk of lack of political support |
| 2. **Building competencies, assigning responsibilities, and delegating powers** | Reducing operating and development costs | Ensuring objective decisions<br>Ensuring transparent decisions | |
| 3. **Defining a governance model** | | | Reducing the risk of fragmented coordination arrangements |
| 4. **Sharing responsibilities** | | | Minimizing the risk of lack of stakeholder trust |

### What is the evidence?

In Chile, SUSESO could automate the social security claims due to raising its IT function and IT projects to the strategic level. While some IT functions in Chile depend on the finance or general services departments, SUSESO recognized the unique nature of the function and decided to treat it as a strategic component of its institutional development (Case 6).

Part of IT governance is building competencies, assigning responsibilities, and delegating authority to the teams responsible for the automation projects. In Spain, the Ministry of Justice, which leads the civil registry automation project, engaged the Ministry of Health a, the General Directorate of the Police, the National Statistics Institute, and Autonomous Communities with competences in health and justice, among others, in implementing parts of the project. Lacking delegated powers in the entire scope of the project and having delegated responsibilities, the implementation team had to invest a great deal of effort in coordinating with the various stakeholders to obtain project commitments. (Case 7).

Also in Spain, the delivery of the school transport benefits relies on a governance model, enabled by an online platform, for collecting stakeholder concerns, voting on them, and expressing commitments to address those that received the most votes. The model helps improve the administration of the shared services, distribute the costs proportionally, lower costs compared to other solutions, and ensure the sustainability of the initiative (Case 2).

In France, the experiences of the Law as Code team highlights the importance of the governance for collaborative development of open infrastructures and for the automation of certain services and benefits. Otherwise, when only one organization is responsible, automation is fragile as transparency, auditability, and other results are difficult to guarantee. Different actors must be responsible for automating the law and governing the process (Case 9). As a whole-of-government affair, IT governance engages various government actors and coordinates automation projects across them and across policy areas.

## 5.1.3. Automated Decisions Must Rely on Trusted, Well-Governed Data

### What is this factor about?

Automation relies on data. In rule-based automation, the outcome depends on the quality of the rules and of the data that is stored, sorted, and processed through such rules. In intelligent automation, the outcome heavily depends on the quality of the data used to train the algorithm. As data quality is of utmost importance for any automation scenario, governments are adopting data governance to embed the data culture within the public sector and, in turn, ensure such quality. Data governance "is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods" (Data Governance Institute, n.d.). In particular, this factor refers to institutionalizing different data governance practices relevant to automation.

### Why is this factor important?

Data governance helps overcome the ambiguity of the government agencies' approach to data. On the one hand, agencies want to access data owned by other agencies; on the other, they are possessive of the data they own and unwilling to provide access to it to other agencies. Thus, it is critical for the government to establish governance practices for regulating the use of its data. Such practices include defining what agencies can or cannot do with data, ensuring the availability and standardization of data, securing data access, and defining project data plans—how projects use and share data with other projects.

The benefits produced by data governance include reducing overlapping databases and simplifying processes using such databases, reducing the costs of developing and operating government systems, and enhancing the correctness and quality of decisions by relying on high-quality data and evidence to support them. They also include reducing the administrative burden on citizens, for example, repeated provision of the same data; and enabling the proactive delivery of services to citizens based on the data possessed by the government. Data governance also minimizes the risk of fragmented coordination of automation initiatives, and reduces the risk of violating citizen privacy since the governance authority should formulate who should process data and how. In the absence of data governance, the silo culture of each agency maintaining its databases makes it challenging to ensure the standardization, accuracy, and integration of government data.

In summary, the contribution of data governance to the benefits and risks of government automation includes increasing the efficiency, decision quality, and citizen convenience, while reducing the risks of wasting time, money, and institutional capital, failing to solve problems, and undermining trust by government automation.

Regarding the public value framework (Figure 4), data governance produces organizational values—providing secure access to government data and achieving financial gains through common solutions; constituency values—reducing the administrative burden on citizens and facilitating the delivery of more inclusive public services; and political values—transparency and accountability on the use of government data.

### How is this factor implemented?

Five implementation approaches for data governance are:

1. Establishing data governance authority
2. Standardizing data
3. Ensuring the availability of and access to data
4. Guaranteeing data quality
5. Defining project data plans

Concerning the contribution of data governance to implementing automation, according to the strategic government triangle (Figure 5), data governance helps build operational capabilities including data standardization and sharing, and strategic capabilities including rules for accessing and processing government data.

Table 18 shows how the different approaches to data governance impact the benefits and risks of government automation.

**Table 18.** Data Governance - Benefits and Risks

| APPROACH | BENEFITS | | | RISKS | | |
|---|---|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **B4 Increasing citizen convenience** | **R1 Wasting time, money, and institutional capital** | **R3 Failing to solve problems** | **R4 Undermining trust** |
| 1. Establishing the data governance authority | Simplifying processes<br><br>Reducing operating and development costs | | | Reducing the risk of fragmented coordination arrangements | | Reducing the risk of violating citizen privacy |
| 2. Standardizing data | | | | | | |
| 3. Ensuring the availability of and access to data | | Ensuring objective and evidenced decisions | Reducing administrative burden<br><br>Enabling proactive services | | | |
| 4. Guaranteeing data quality | | Ensuring objective decisions | | | Reducing the risk of having to compensate for algorithmic errors | |
| 5. Defining project data plans | | Ensuring evidenced decisions | | | | |

## What is the evidence?

In Chile, the staff responsible for automating the security claims recognized that the lack of a central authority for regulating the exchange of government data and protecting personal data across government, and the lack of standardization of data and metadata, are barriers to automation (Case 6). The automation was only feasible because SUSESO had previously created the classification and standardization system for all types of resolutions issued by insurance companies. The system took years to develop. They applied data standards defined by the National System of Information on Safety and Health in the Workplace, but they also had to tackle medical reports

containing non-standardized data. Based on such efforts, digital documents can be stored with all required data and metadata (Case 6). The key automation enablers are access to all data related to a case (Case 6) and having the required documents in electronic format with all data and metadata included (Case 6).

In Estonia, the National AI Strategy 2019–2021 established the Chief Data Officer positions, at least at the ministerial level (Government of the Republic of Estonia, 2019). These positions are the data governance authorities for the respective ministries and agencies.

In Spain, there are no standards for licensing and construction data, which means that every related agency organizes the data differently. Due to the difficulites in reconciling the interests of different agencies, multiple attempts at standardizing data were unsuccessful, (Case 2). In contrast, in the areas of public procurement and administrative contracting, the use of a common information model and a shared vocabulary established for all European Union Member States (Case 2) by the supra-national organization was a major automation enabler.

Also in Spain, the automation of the school transportation benefits revealed the importance of alternative ways for accessing information, not by asking citizens or businesses to provide it directly, but accessing and reusing existing government data. Even when data is already available within government, agencies find it more convenient to ask citizens to provide it again, producing duplicated databases and processes, than to arrange with other agencies to organize access to their databases (Case 2).

In Paraguay, the automation of public procurement relies on years of data, including structured data about all procurement cases, procurements protests, correct and incorrect bids, and others. Only by relying on such data can the system find similarities between successful, rebutted, and new procurements automatically, and predict the possibility of protests on the new bids (Case 1). With the project, the implementing agency—NDPP—considers that it reached the third stage of automation, driven by data structuring and use, after two previous stages of digitalization and business process reengineering.

Since automation relies on data, trust in the data is critical. Data governance practices such as base registries, data management, authorized data sources, and others enhance data quality and build trust in data. In Norway, the agency implementing the sickness allowance automation—NAV—dared to fully automate the service in some cases because they trusted their own data and the data provided by other government agencies (Case 4). In the case of child (Case 3) and other delivered benefits, NAV trusted the data from the tax department about citizen incomes but not the data provided directly by citizens. While in the past, NAV trusted the income data provided by businesses, it uncovered many inaccuracies. If NAV had decided to automate the welfare service based on such data, it might have established a gateway for considering fraudulent claims (Case 3).

Any automation project requires establishing and implementing a data plan to manage issues related to data at different project stages. In Paraguay, the implementing agency—NDPP—defined a policy that any new automation project must prioritize data structuring over the practice of scanning and uploading documents (Case 1). In Estonia, all automation funding proposals are assessed against availability and access to data. The proponents, possibly assisted by the office of the Government Chief Data Officer, must provide the mapping of the data, validate what problems could be solved by exploiting it, and assess what is feasible, unfeasible, or not worth doing (Velsberg et al., 2020).

In the United States, the Customs and Border Protection (CBP) Agency shares information with federal, state, and local authorities and various non-public actors. For example, airlines or airports might be able to use facial images for commercial purposes, subject to explicit contracts signed with CBP. However, such contracts proved insufficient to define the limits of the private use of government data and CBP faced criticism for its lack of transparency. Today, agencies demand clear guidelines for data gathering and sharing (Engstrom et al., 2020).

## 5.1.4. Automation and the Associated Change Require Organizational Readiness

### What is this factor about?

Automation causes significant changes to the implementing organizations' structures, processes, and culture. Typically, the more complex an organization, the larger the changes. In addition, a key success factor for automation projects is the readiness of the implementing organization. Automation-ready organizations are aware of the problems that should be solved, aware which problems can be or cannot be solved with automation, willing to reduce administrative burden by eliminating valueless processes, and pursuing renewed mission objectives. The latter may include delivering enhanced—that is, proactive, inclusive, and personalized—services. Organizational readiness also includes the capacity to measure business processes, to know their weaknesses and bottlenecks, and to assess their performance.

### Why is this factor important?

Awareness about problems facing an organization and commitment to solving them help minimize the risks of problem-solution mismatch and lack of stakeholder commitment for automation projects. The organizational capacity to measure and evaluate business processes can uncover process bottlenecks; areas to reduce unnecessary administrative burden on citizens, businesses and the government; and the tasks required to benefit from the efficiency and productivity gains through automation. Organizational readiness also means that the organization is able to build upon existing foundations, for example, by reusing existing technical, socio-technical, or organizational solutions. Thus, they can enjoy lower costs of developing and operating solutions, shorter decision times, and simplified processes. Automation-ready organizations can revise their human resource management practices to release and complement their staff, equip them with new human-machine collaboration skills, reallocate to value-added tasks like delivering inclusive and personalized services and, ultimately, increase their productivity.

In summary, organizational readiness can help increase the efficiency and productivity of government operations, increase citizen convenience, and address the risks of wasting time, money, and capital, and failing to solve problems by automating processes. Regarding the public value framework (Figure 4), organizational readiness can produce organizational values—obtaining financial gains and relying on empowered employees, and constituency values—reducing administrative burden and offering enhanced public services.

### How is this factor implemented?

Four implementation approaches for building organizational readiness are:

1. Building capacity for problem awareness
2. Building capacity for process measurement and evaluation
3. Building capacity for reusing existing technical or socio-technical solutions
4. Revising human resource management practices and upgrading human resources

Organizational readiness contributes to the development of operational capabilities and the environment (Figure 5) for automation to deliver expected benefits and address the risks.

Table 19 shows how the different approaches to organizational readiness impact the benefits and risks of government automation.

**Table 19.** Organizational Readiness – Benefits and Risks

| APPROACH | BENEFITS | | | RISKS | |
|---|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B2 Increasing productivity** | **B4 Increasing citizen convenience** | **R1 Wasting time, money, and institutional capital** | **R3 Failing to solve problems** |
| 1. Building capacity for problem awareness | | | Reducing administrative burden<br><br>Enabling personalized, inclusive, and proactive services | Minimizing the risk of lack of political support | Reducing the risk of problem-solution mismatch |
| 2. Building capacity for process measurement and evaluation | Reducing operating and development costs<br><br>Shortening decision times<br><br>Simplifying processes | Releasing human resources<br><br>Complementing human resources | Reducing administrative burden | | Reducing the risk of problem-solution mismatch |
| 3. Building capacity for reusing existing technical or socio-technical solutions | | | | | |
| 4. Revising human resource management practices and upgrading human resources | | Releasing human resources | Enabling personalized and inclusive services | | |

### What is the evidence?

According to the team responsible for automating the delivery of school transportation benefits in Spain (Case 2), introducing automation is more complex in large organizations since they have more layers of decision making, they are subject to more complex patterns of changes, and, although more resourceful, they face more technical and organizational barriers to automate. The larger the organization, the bigger the reaction, and the greater the changes to introduce (Case 2). Moving from the paper-based to digital administration, based on data and interoperability, requires a continuous and sustained effort. While tools exist, each administration has to facilitate access to data, decide how to manage information, plan and oversee how changes will permeate the organization, and carry out defined procedures. Automation should be done incrementally since it relies on implementing many changes that cannot be carried out in one large step. The whole organization, or a large part of it, has to be automation-ready (Case 2). In addition, after automation, some tasks and even the whole functional role may disappear. While the project team aimed at protecting personnel and not laying anyone off due to automation, they recognized how automation challenges the rigidity of the government's human resource management policies. To overcome this challenge, one activity was devoted to human resource planning redesign. For example, those conducting manual processes were trained to work on digital processes. Secretaries became case analysts (Case 2).

In Sweden, the Trelleborg Municipality recognized itself as a mature organization, ready for automation-induced change. Having a clear picture of the working of the municipality, including detailed information about its business processes, was helpful to decide on the future automation goals and plan the implementation in small steps (Case 5). However, the municipality had to change many aspects of its work, such as engaging employees, before RPA could take hold (Case 5). After succeeding with their automation efforts, the municipality decided to share its experience with other municipalities. However, among 15 municipalities engaged in this effort, only two were able to make progress. Non-technical reasons, such as managing people working in the organization and organizations opting to maintain the status quo, were highlighted (Case 5).

With respect to social security claims in Chile, an important issue for the implementation team was raising awareness among the stakeholders that automation is not a problem of technology but rather of changing business processes. The team was able to verify that most of the digital transformation process failure was due to problems associated with institutions and people. Thus, the key enablers became change management practices and the sensitization of the key stakeholders (Case 6). SUSESO also hired a mathematician to conduct data analysis on its business processes to identify patterns in the applicants' conditions to inform automation (Case 6).

The main problems with the automation of the civil registry in Spain were also related to people, such as who provides the service, who depends on it, who pays salaries, and others (Case 7). The project also revealed the importance of building automation upon previous digitalization efforts, such as digitalizing and sharing government documents and data (Case 7).

In Argentina, the PROMETEA project also highlights what has to be done before automation, mainly understanding business processes conducted by the Public Prosecutor's Office of the City of Buenos Aires. By measuring, diagnosing, reengineering, and modeling such processes, the project identified the most repetitive cases, the cases demanding the most of the prosecutors' time, process bottlenecks, and other relevant features to consider for defining the scope and priorities of automation (Case 8).

Likewise, in France, technology was not an obstacle to automating My Social Rights. Instead, determining the type and scope of automation applied to the delivery of social benefits were the main problems to resolve (Case 10).

# 5.2
# HUMAN CAPACITY

Shifting the bulk of government work from humans to machines does not eliminate the need for human presence in an automated workplace. More common than replacing humans by machines is introducing various forms of human-machine collaboration that complement rather than replace human performance. In addition, the evidence shows that the human capacity critical to pursuing and sustaining the benefits of government automation should not be delegated or outsourced outside government, but developed and maintained within.

The main reasons for this seeming contradiction are deep interactions between government goals, technological solutions, organizational processes, and legal requirements to be addressed when pursuing government automation. Managing such interactions requires in-depth understanding of government rules, tasks, and processes to be automated, what technology and data are available for such automation, how to ensure that the automated solutions conform to the legal requirements, and how to protect users from the possible adverse effects of automation. It also requires technology experts who can design, implement, and manage these solutions in collaboration with government and legal experts. Once a solution is operational, experts are needed to maintain it in a changing environment, and build awareness and capacity to use it, including through human-machine collaboration, among the stakeholders. Thus, Factor 2 is formulated as follows:

> ***Government automation needs in-house expertise in technological, legal, and governmental domains as well as empowered teams able to link such domains, driven by public mission and seeking to maximize human-machine complementarity.***

The factor is refined into four sub-factors: 1) automation needs human capacity in-house, 2) automation needs competent and empowered staff, 3) automation relies on government-technology collaboration, and 4) automation maximizes human-machine complementarity. The sub-factors are listed in Table 20, and elaborated in the sections below. Each section explains what the factor is about, why it is important, how it is implemented, and what evidence substantiates it. The evidence is drawn from the case studies in Chapter 2 or literature.

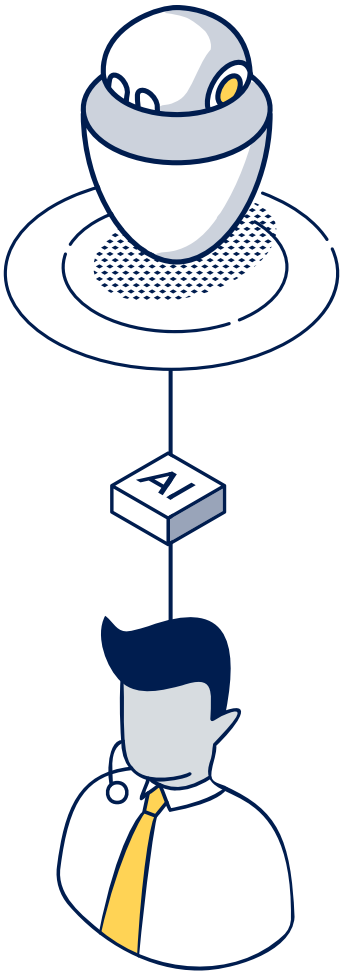


**Table 20.** Human Capacity Sub-Factors

| ID | SUB-FACTOR |
|---|---|
| 2.1 | Automation needs human capacity in-house |
| 2.2 | Automation needs competent and empowered staff |
| 2.3 | Automation relies on government-technology collaboration |
| 2.4 | Automation maximizes human-machine complementarity |

## 5.2.1. Automation Needs Human Capacity In-House

### What is this factor about?

Government agencies are discovering the high financial, institutional and political costs of relying on external consultancy and technology companies for their automation projects. They are also discovering that proposing automated solutions to achieve government goals and requirements, while lacking the knowledge of the internal working of government and its relationships with citizens and other stakeholders, is risky. While technological expertise is generally transferable and ready to outsource, process and legal expertise is generally embedded in the government context and difficult to transfer. Thus government agencies are building, managing, and sustaining in-house capacity on technological development and merging such capacity with internal know-how of government processes and regulations.

### Why is this factor important?

Civil servants with deep experience and understanding of government processes are in the best position to identify the activities that can bring significant gains through simplification and automation. Civil servants with experience and knowledge of the business rules and exceptional and borderline cases are vital for ensuring that the automated systems work correctly. If empowered, they can also identify ways to reduce administrative burden and foresee new opportunities for innovation, such as, for example, proactive, inclusive, and personalized services. In turn, having in-house innovation capacity protects against project failure, problem-solution mismatch, and clean-up burden due to automation errors. While the lack of such capacity could be partly compensated by external consultants specializing in digital transformation, the lack of knowledge of government rules and processes is a risk factor.

In summary, in-house human capacity can help increase the efficiency of government operations, the quality of government decisions, and the convenience of government-citizen interactions. It can also help reduce the risk of wasting time, money, and institutional capital, and failing to solve problems by government automation. Regarding the public value framework, human capacity contributes to organizational values—empowered employees, and constituency values—increasing user value, delivering enhanced services, and reducing administrative burden.

## How is this factor implemented?

Four implementation approaches for building in-house human capacity are:

1. Relying on in-house domain and process expertise
2. Building in-house technology expertise to reduce external dependency
3. Adopting new approaches for bringing new professions into government
4. Building competencies that offer value across government

Regarding the strategic government triangle, in-house human capacity contributes to developing the government's operational capabilities, such as redesigning business processes and information systems and enhancing the operational environment. It also contributes to strategic and political capabilities, such as the availability of qualified staff to maintain automated solutions and produce public value over time. Table 21 shows how the different approaches to in-house human capacity impact the benefits and risks of government automation.

**Table 21.** In-House Human Capacity – Benefits and Risks

<table>
<tr><th rowspan="2">APPROACH</th><th colspan="3">BENEFITS</th><th colspan="2">RISKS</th></tr>
<tr><th>B1<br>Increasing efficiency</th><th>B3<br>Increasing decision quality</th><th>B4<br>Increasing citizen convenience</th><th>R1<br>Wasting time, money, and institutional capital</th><th>R3<br>Failing to solve problems</th></tr>
<tr><td>1. Relying on in-house domain and process knowledge</td><td>Simplifying processes</td><td rowspan="3">Ensuring objective decisions</td><td>Reducing administrative burden<br><br>Enabling personalized, inclusive, and proactive services</td><td rowspan="4">Minimizing the risk of lack of innovation capacity</td><td>Reducing the risk of problem-solution mismatch<br><br>Reducing the risk of having to compensate for algorithmic errors</td></tr>
<tr><td>2. Building in-house technology expertise to reduce external dependency</td><td></td><td rowspan="3">Enabling personalized and inclusive services</td><td rowspan="3">Reducing the risk of problem-solution mismatch</td></tr>
<tr><td>3. Adopting new approaches for bringing new professions into government</td><td></td></tr>
<tr><td>4. Building competencies that offer value across government</td><td>Simplifying processes</td><td></td></tr>
</table>

### What is the evidence?

In Argentina, the automation performed as part of PROMETEA relied on an extensive business process measurement, assessment, and reengineering, which identified within each process the most routine, repetitive, and methodical tasks as candidates for automation. The analysis was performed by civil servants with years of experience in the organization and management of such processes, and thus with deep understanding of them. It is important to note that the members of the Prosecutor's team actively participated in the training and development of the system (Case 8).

In Chile, SUSESO receives complaints from citizen about social security claims: all of which are currently submitted, managed and resolved electronically. Such automation requires expert knowledge about medical licenses, benefits for workers, accidents at work, compensation funds, and other causes of complaints under consideration (Case 6). Thus the automation team was formed in a multidisciplinary way and integrated both, experts in the respective business areas and specialists in technological issues. Working simultaneously with domain and technology experts was a crucial enabler and motivator for the automation team while they observed the benefits of the automation efforts (Case 6).

In Norway, NAV changed its approach to renewing its information systems a few years ago. They decided to hire IT developers, designers, and other technical staff to build the in-house capacity to build, operate, and maintain their information systems, and reduce their dependency on external firms and consultants (Case 4).

In Singapore, VITAL realized the importance of in-house human capacity for developing, modifying, testing, and maintaining RPA scrips. They quickly understood the high level of maintenance required by such scrips and the high costs of relying on vendors for such maintenance. Initially, to train their existing staff about the development and maintenance of scripts, they worked with vendors through job shadowing.[14] For new staff, however, they hired qualified technical personnel or provided them with relevant training (Case 12).

Building skilled human capacity in government is made difficult by the government's inability to compete with the private sector on salaries, particulary in the information technology sector (Case 1). In addition, governments fail to attract valuable experts due to their ineffective outreach and recruitment methods, outdated working environments, and unchallenging job responsibilities (Porrua et al., 2021). To overcome such barriers, the UK government created the Digital, Data and Technology Profession Capability Framework, also called DDat (Government of UK, 2021), which aims at identifying and incorporating new professions into government, breaking traditional structures in the process. Although DDat is new and progressing, there is still a need to solve the salary and career progression problems (Rogers et al., 2020).

The case of Paraguay is instructive in showing how the lack of human capacity can open new opportunities to government. At NDPP, a four-person team, after attending a one-month workshop on machine learning (ML), started identifying how to initiate ML projects with external help. The team applied to a call for organizations willing to implement ML projects and for postgraduate students in data science, supported by the Data Science for Social Good program at Carnegie Mellon University and the Alan Turing Institute. Their application was successful, and they received academic support to develop an ML proof of concept (Case 1).

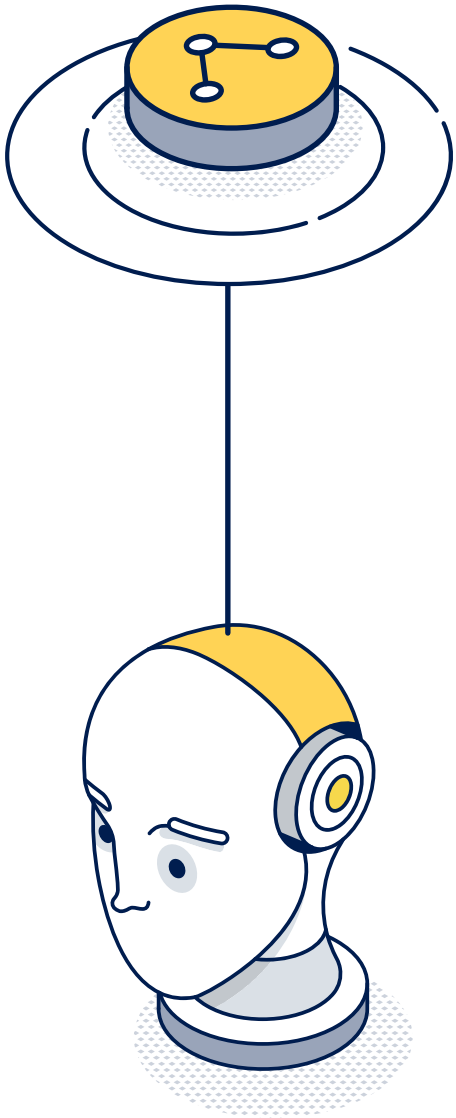
**14.** Job shadowing is a kind of on-the-job training in which an inexperienced employee follows and closely observes an experienced employee performing the tasks and learns through such process.

In Singapore, VITAL follows another approach. Facing the simultaneous lack of qualified staff and financial resources, it hired four young, bright, but untrained interns. The interns learned about RPA by themselves using online videos and digital resources, and developed code. In return for their contribution, they received certificates from VITAL (Case 12).

In specific areas, such as biometric automation, it is unusual for governments to develop automation solutions in-house since recognized solutions from established technology companies are available on the market. However, to coordinate and oversee the work of such companies, government needs staff with deep knowledge of the technology and business processes to be automated. For example, eu-LISA supports the European Commission with subject matter experts who can translate legal requirements into business requirements to define use cases; to monitor, support, and audit the development done by companies; and to perform independent testing. In fact, due to the complexity of systems, the overarching interoperability domain, and the need for joining technical and business knowledge, eu-LISA has become a regular and appreciated contributor to the Commission's efforts. eu-LISA is also interested in keeping this knowledge in-house, to empower the enterprise architecture team with capacity to design high-level components, build low-level technical artifacts, define standards and methodologies, and formulate requirements for contractors. The team's responsibility is to also ensure that the final system lives up to the principles and standards defined by them (Case 11).

In the United States, to reduce the knowledge gap and reliance on contractors, the Customs and Borders Protection (CBP) Agency realized the need to build greater in-house capacity for artificial intelligence and machine learning. According to one internal report about the iris scanning technology, "If CBP fails to understand the flaws in its own technology, it can expose itself to unknown vulnerabilities and fail to detect adversarial attacks. More broadly, agencies that lack access to a contractor's proprietary technology may be unable to troubleshoot and adapt their own system" (Engstrom et al., 2020).

In Estonia, the government provides support and guidance to the agencies that implement automation, including examples that worked, examples that did not, reusable components, core competences with value across government sectors, and generally leading by example. Thanks to this approach, many similar use cases are repeated across government agencies to improve government functions (Velsberg et al., 2020).



## 5.2.2. Automation Needs Competent and Empowered Staff

### What is this factor about?

The in-house human capacity discussed in Section 5.2.1 to carry out automation projects includes individual and collective capacity. Individual capacity includes hiring, training, and retaining competent staff (i.e., those who have the right skills, knowledge, and aptitudes to conduct automation projects). General knowledge includes understanding the transformative power of technology, the disruption it can cause in a government workplace, and its limitations for problem solving. The aptitudes include self-motivation, mission orientation, role conviction, willingness to act as change agents, and others. Individual capacity must be coupled with staff empowerment to exercise initiative in identifying problems, to innovate, and to take calculated risks. Government organizations should adopt new approaches to anchor these resources in the public sector and recognize them publicly to develop talent and inspire others.

### Why is this factor important?

In the context of government automation, competence implies knowing what is and is not possible to achieve through automation. Highly competent staff are motivated, willing, and able to apply automation to solving problems to create public value. One example is using automation to increase efficiency and citizen convenience through proactive and personalized services. Competence and empowerment also entail the ablity to overcome various challenges associated with automation and manage the associated risks, including lack of innovation capacity, lack of stakeholder trust, and problem-solution mismatch. Considering the public value framework, developing competent and empowered staff helps deliver organizational value, which includes empowering employees.

In turn, empowered employees can deliver constituency values, such as increasing user value, reducing administrative burden, and delivering enhanced public services.

### How is this factor implemented?

Four implementation approaches for developing competent and empowered staff are:

1. Sensitizing staff about the value of automation
2. Implementing a continuous-learning culture for automation
3. Enabling civil servants to act as automation entrepreneurs
4. Promoting results-oriented management for automation

Regarding the strategic government triangle for implementing government automation, competent and empowered staff contribute to developing operational, strategic, and political capabilities by, respectively, developing and deploying automated systems, providing support to such systems, and delivering public value through them.

Table 22 shows how the different approaches to developing competent and empowerd staff impact the benefits and risks of government automation.

**Table 22.** Competent and Empowered Staff – Benefits and Risks

| APPROACH | BENEFITS | | RISKS | |
|---|---|---|---|---|
| | B1 Increasing efficiency | B4 Increasing citizen convenience | R1 Wasting time, money, and institutional capital | R3 Failing to solve problems |
| 1. Sensitizing staff about the value of automation | Simplifying processes | Reducing administrative burden<br><br>Enabling personalized, inclusive, and proactive services | Reducing the risk of lack of innovation capacity and the risk of lack of stakeholder trust | Reducing the risk of problem-solution mismatch |
| 2. Implementing continuous-learning culture for automation | | | | |
| 3. Enabling civil servants to act as automation entrepreneurs | | | | |
| 4. Promoting results-oriented management for automation | | | | |

## What is the evidence?

In Chile, initially the staff at SUSESO did not recognize the value of the automation project for managing social security claims. Over time, they realized the importance of automation and working on a high-impact, high-value project at the center of the state's modernization efforts. In the end, they felt proud to contribute to the transformation of the 90-year-old agency from paper-based to technology-based operations (Case 6).

In France, the Beta Gouv program (Government of France, n.d.) encourages civil servants to become entrepreneurs to create digital public services to resolve public policy problems, inspired in some of the methods used by startups. These public sector entrepreneurs are also called intrapreneurs. Empowering government staff to become intrapreneurs could unleash their initiative, creativity, and contribution to the improvement and revitalization of the public sector, raising its attractiveness and dynamism (Case 9).

In Paraguay, the automation in NDPP was initiated by four staff members who attended a month and a half-long of training on machine learning to understand its possible applications to further the mission and goals of the agency (Case 1).

In Sweden, the Trelleborg Municipality procured a training program for seven government leaders about a methodology for defining and realizing so-called "extraordinary goals," that is, goals that challenge the status quo by introducing radical change to improve performance (Case 5). One of the participants responsible for automating social welfare benefits decided to implement what she learned. After completing the project, she was relocated to the central department of the municipality. Since then, the municipality has established its digital administration strategy, developed its RPA capacity, and is in the process of applying RPA to administrative tasks and multiplying its automation experience (Case 5).

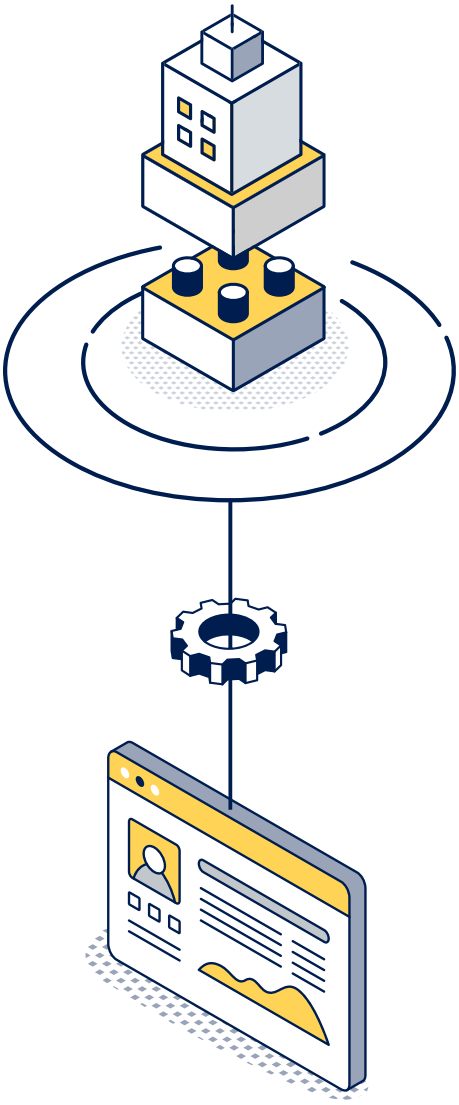
Developing new capacities in the public workforce is an enabler for automation, as experience in the United Kingdom shows. There, many government organizations changed because of qualified staff. Incorporating software engineers, designers, product managers, and others disrupts the public sector culture since those professionals have the skills and abilities and want to use them (Rogers et al., 2020).

A well-recognized enabler for government innovation and automation is the trend in public sector changes built around modern management techniques. Such skills include sensitizing and building capacity for service leadership, working and behaving with humility, practicing inclusiveness, all of which introduce a different language into the public sector. The assumption is that leaders succeed by investing in and caring about their teams. The change relies on leaders empowering their teams to decide what to do and how to do it, rather than telling them. Seeing the modern civil service embrace this leadership style is exciting (Rogers et al., 2020).

In Chile, as part of its change management for automating social security claims, SUSESO invested two years in building the required leadership. As part of the process, it identified allies and coached leaders. The process produced qualified team leaders and project sponsors (Case 6).

In France, beta.gouv.fr helps civil servants become intrapreneurs, following an approach used to create startups. They are empowered to create digital services for public policy problems (Case 9). The startup name is a metaphor to focus on three points: give more "sense" to the public vocation, through great operational "autonomy," in exchange for greater "returnability" (accountability) through management based on the real impact on solving people's problems (public policy) and not on the operational needs of the state administration. In Case 9, civil servants deal with the daily cases and know business processes well. They contribute with innovative ideas, becoming innovators within government. They have valuable networks, which they use to advocate for their ideas. While they do not always achieve final products, as imagined initially, they generally obtain many by-products or pivots, which are valuable for the resolution of each problem at hand (Case 9).

Government information systems produce dashboards and other forms of information of interest to public managers, but in most cases, the managers cannot exploit such information. The COVID-19 pandemic demonstrated that public managers' ability to make data-based decisions is scarce. There is a shortage of government specialists who know how to use government-collected data and a shortage of applications to exploit such data. Thus, public administrations must build new workforce skills (Case 7), including skills in data analytics.



## 5.2.3. Automation Relies on Government-Technology Collaboration

### What is this factor about?

In traditional information system projects, domain experts are passive clients who provide system requirements, while IT experts, who can autonomously design and build systems to meet these requirements, are the active actors. Automation projects require both groups to collaborate with the automation teams, and each group to be aware of the requirements and limitations of the other. The starting point for automation projects should be the problem that the project is supposed to solve, not the technology to solve it. Thus, for automation to happen, the problem and technology expertise must co-exist and collaborate within the automation teams.

### Why is this factor important?

To identify the processes that can be simplified and automated using existing technology, a team of business and technology experts is needed. The role of the business experts is to provide knowledge of the process to be automated and the rules governing this process. The role of the technology experts is to evaluate the technology that can automate the processes, following the rules, and to use it to design and build an automated solution. By working together, business and technology experts can reduce the risks of automated solutions misjudging citizen circumstances and producing incorrect decisions, particularly for borderline cases, producing suboptimal solutions or problem-solution mismatch, and displacing policy responsibility.

Automation relying on the government-technology collaboration increases the efficiency of government operations, enhances the quality of government decisions, and facilitates government-citizen interactions. It can also address the risk of automation lowering the quality of government decisions, failing to solve problems, and undermining trust in government institutions. Regarding the public value framework, automation relying on the government-technology collaboration can help produce organizational values—empowering employees and achieving organization-technology alignment; and constituency values—reducing administrative burden, offering more inclusive public services, and delivering increased user value.

### How is this factor implemented?

Three implementation approaches for building government-technology collaboration are:

1. Building capacity for team building
2. Developing organizational competencies among technology experts
3. Developing technological competencies among domain experts

> ***Empowered government-technology teams know about the problems to be solved and how technology can be applied to solve them, and can contribute to operational and strategic capabilities and deliver public value.***

Government-technology collaboration enhances the operational and strategic capabilities for implementing government automation through interdisciplinary expertise.

Table 23 shows how the different approaches to government-technology collaboration impact the benefits and risks of government automation.

**Table 23.** Government-Technology Collaboration – Benefits and Risks

| APPROACH | BENEFITS | | | RISKS | | |
|---|---|---|---|---|---|---|
| | B1 Increasing efficiency | B3 Increasing decision quality | B4 Increasing citizen convenience | R2 Lowering decision quality | R3 Failing to solve problems | R4 Undermining trust |
| 1. Building capacity for team building | Simplifying processes | Ensuring objective decisions | Reducing administrative burden | Reducing the risk of misjudging citizen circumstances and the risk of producing suboptimal decisions for borderline cases | Minimizing the risk of problem--solution mismatch and the risk of producing suboptimal solutions | Reducing the risk of displacing policy responsibility |
| 2. Developing organizational competencies among technology experts | | | | | | |
| 3. Developing technological competencies among domain experts | | | | | | |

## What is the evidence?

Automation teams require new profiles from the software development experts, including designers, product managers, delivery managers, researchers, and content designers. The public sector needs these profiles to develop software, as is done in the private sector (Rogers et al., 2020).

In the Chilean case of automating social security claims, team building was essential. SUSESO created a team for a project of strategic importance, with high public impact, and involving the main government areas. Team building was also essential for creating various quality-related committees within the agency, such as a committee responsible for data cleansing. The team consisted of representatives of various agencies involved in the social security processes, supported by the technical staff. It contributed to collaborative work, enabled civil servants to share their experiences, help manage frustration, and built ownership of the automation project (Case 6).

Automating EU border control requires engaging large teams of experts, including highly-qualified practitioners in all relevant domains. High qualification is essential to ensure that the automation team is able to lead the external contractors, that the system is built in complete alignment with the organization's interests and needs, and that the contractors receive what they need to develop the solution but no more (Case 11).

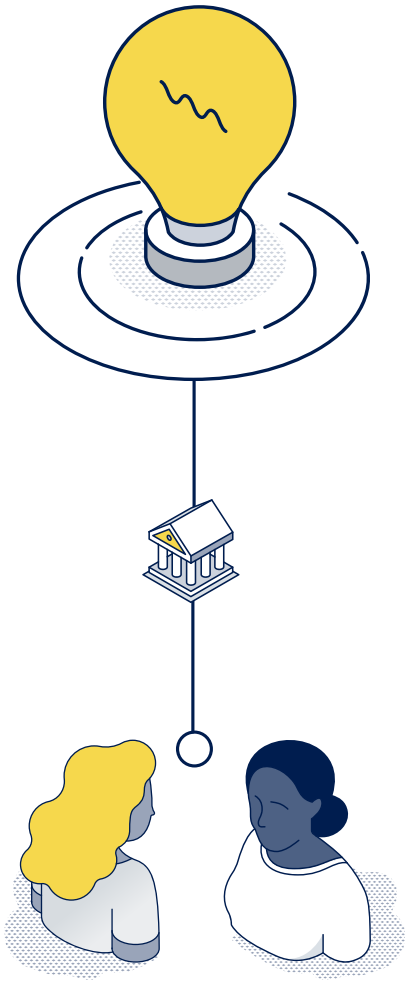
In Estonia, the idea for team building was to bring together high-, medium-, and lower-level management with people who actively perform various operational tasks. The government changed its approach for developing new solutions, which had previously relied on IT experts. However, it recognized that such experts are not in the best position to initiate innovation, in contrast to the employees who are responsible for managing and resolving operational issues on a daily basis (Velsberg et al., 2020).

In Norway, the automation of benefits delivered by NAV relies on self-managed teams as a new way of working and a challenge for the whole organization. While government leaders defined their agenda and goals, they delegated implementation responsibility to the teams. This brings extra pressure on the team members, who sometimes, due to the innovative nature of the automation projects, can not deliver on time and had to request additional time to test and correct the system. They also have to convince the leaders that they were able to deliver and should be trusted (Case 3).

In Spain, central offices drive the government's whole-of-government transformation efforts using highly qualified IT staff. However, if staff does not know the business processes, it will be difficult for them to simplify and automate them. Thus, every institution needs a core team of the IT experts who also know the organization, its business processes, and IT project management practices. In particular, they should know the weaknesses and bottlenecks of the processes, administrative mechanisms to apply, organizational culture, integration with other agency processes, and complaints related to service delivery. They are in the best position to identify, plan, and conduct automation projects (Case 7). Civil registry automation was accomplished by assembling working groups from the business and technical staff, each aware of and appreciating the requirements and limitations of the other group's context. Team building involved building a common understanding of the task and methods to conduct it (Case 7).

Having a proper mix of expertise in an organization is one challenge. Ensuring that such experts work together is another. This problem is non-trivial and not easily prescribed. It has to be identified and solved systematically using technology as a tool for change (a means) and not as the change in itself (an end). In the case of the Law as Code project in France, the automation teams consisted of government experts with deep knowledge of the customers, processes, and rules, and private sector experts with deep understanding of technology management, product management, user interfaces, and other technology-related issues (Case 9). While government experts must think about the rules, technology experts need to apply such rules to build services that deliver user experience and meet their needs. However, IT experts working for years in taxation, education, welfare, and other government domains and who must collaborate with economists, lawyers, and other domain experts, become domain experts themselves.

In Singapore (Case 12), VITAL observed that developing automation scripts for RPA software requires business expertise. While advanced automation tools help business users who lack programming skills learn and build such scripts, identifying officers who could be trained to develop automation scripts is a significant challenge.



## 5.2.4. Automation Maximizes Human-Machine Complementarity

### What is this factor about?

Government automation is causing jobs to be reassigned from employees to machines, freeing staff to perform other jobs. Government employees are assigned jobs that require human intelligence, flexibility, and empathy, none of which can be presently delivered by machines. At the same time, human employees are increasingly trained to work with machines that enhance their performance or to work within automated processes that need them to exercise their common sense and judgment. However, the human-machine performance boundary is dynamic.

> ***Many tasks that machines cannot perform today will be automated tomorrow, creating new requirements for humans to work with more intelligent machines.***

The public sector's human resource management practices must account for such trends (Porrua et al., 2021).

### Why is this factor important?

Automation can help maximize complementarity between humans and machines, each of them assigned tasks best suited to their relative capabilities. For example, automating repetitive cognitive tasks can make their execution faster and more reliable, releasing human resources to preform more complex tasks, like providing inclusive services. To perform effectively in the new automated environment, staff require training. By acquiring new skills and learning human-machine collaboration, staff are able to perform the tasks that are more suited to human capabilities and will feel more satisfied with their jobs.

Thanks to human-machine complementarity, government automation can increase government productivity and the convenience of government-citizen interactions. Regarding the public value framework, human-machine complementarity delivers organizational value—empowered employees and organization-technology alignment, and constituency values—increasing user value in public service delivery.

### How is this factor implemented?

Three implementation approaches for maximizing human-machine complementarity are:

1. Reassigning staff from automatable to non-automatable tasks
2. Training staff to improve their work through automation
3. Organizing the optimal human-machine performance

Concerning the implementation of government automation, maximizing human-machine complementarity improves the government's operational capabilities—assigning human or machine capabilities to the tasks best suited to them, and delivers public value—increasing the quality of the outcomes and putting the liberated resources to better use.

Table 24 shows how the different approaches to maximizing the human-machine complementarity impact the benefits and risks of government automation although we only identify benefits.

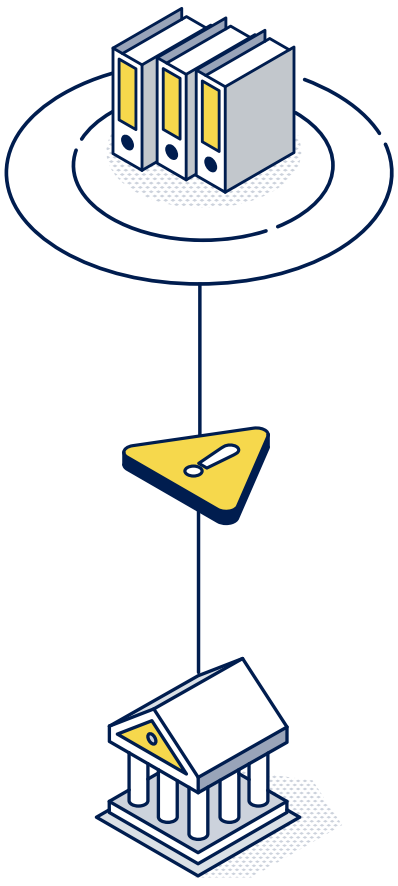
**Table 24.** Human-Machine Complementarity – Benefits and Risks

| APPROACH | BENEFITS | |
|---|---|---|
| | **B2** Increasing productivity | **B4** Increasing citizen convenience |
| Reassigning staff from automatable to non-automatable tasks | Releasing human resources<br>Complementing human resources<br>Completing machine-only tasks | Enabling personalized and inclusive services |
| Training staff to improve their work through automation | | |
| Organizing the optimal human-machine performance | | |

### What is the evidence?

The rigid nature of public sector human resource policies shapes and constrains the impact of automation processes. For many governments, regulatory frameworks prevent reductions in personnel. However, after automation, many tasks cease to exist. For example, in Chile, the SUSESO staff previously involved in paper-based tasks were trained to digitalize documents and become case analysts (Case 6).

Automation enables releasing the time spent by civil servants on routine tasks to handling exceptional cases and performing non-routine tasks. In Argentina, PROMETEA automates repetitive and time-consuming tasks performed by prosecutors (Case 8). Prosecutors read, analyze, and amend system-generated reports, exercising their judgment before the result is sent to the judges. The system saves the time spent on repetitive tasks, allowing prosecutors to invest more time on strategic issues and complex cases, and helps reduce the rate of grammatical and syntactic errors.



In Sweden, eight people handled cases for the Trelleborg Municipality before automation, and four remained after automation. The four staff released from handling cases are currently working on other processes within the department, offering more services and support to residents seeking employment. This support is still needed since the legislation forbids fully automated decisions. For example, to obtain unemployment benefits, citizens must meet their caseworkers, who check whether they are following the appropriate re-employment plan.

Government employees involved in automated processes often fear losing their jobs. In response, in Singapore, VITAL promotes the notion that automation could help extend, improve, and compliment employees' work. An example is learning how to use RPA to enhance their job performance or help them perform other jobs (Case 12).

In Norway, the automated system that delivers child benefits is designed to stop and wait for human intervention when it meets uncertainty. To reduce these interventions, instead of simplifying the automation rules, NAV created the rules for handling uncertainty. If all conditions set by the legal and regulatory framework hold for a case, the system makes a decision automatically. If certain conditions fail, logical checkpoints, also called "action triggers," stop the system and wait for human intervention to advance to the next step. However, the intervention is not to handle the case manually—the case handler only checks a single condition before the system continues processing (Case 3).

In France, the OpenFisca team discovered that disintermediating and automating all processes based on the rules-as-code paradigm is not only unfeasible, but also counterproductive. However, automating parts of the processes is still useful as it frees case handlers' time, which they can invest in addressing the most complex cases. The greatest potential of technology as a vector of change is found in the "increase" of the field of action of public servants, rather than in the automation or digitalization of procedures and processes (Case 9).

According to the current EU legislation, when automated systems rely on machine learning or other AI technologies, they should produce recommendations, not decisions. For the immigration process, automated systems should enhance its efficiency and effectiveness, while the role of immigration officers is to guarantee the quality of the final decisions (Case 11). For example, based on the defined thresholds and a list of hit probabilities, when a biometric system confirms a match with certain confidence, it passes control to the immigration officer who sees a list of system-produced matches and selects the closest of them. As the EU Member States insist on being in control of the final immigration decisions, the role of the system is to enable immigration officers to make these decisions (Case 11). The officers decide to let the passengers through, relying on machine learning, biometrics, and other checks. The system is sophisticated and solid: the biometric matching engine has been tested by the National Institute for Standards and Technology (NIST) and the implementation has been tested by the European Commission's Joint Research Centre. It typically offers advice on interpreting the results, but the action of an officer who receives the advice is basic (Case 11).

In Estonia, the government has reservations about using automated systems that cannot guarantee that the correct answers will be produced in all cases. A system that produces correct answers 80 percent of the time but can be wrong 20 percent of the time is not be used even if it is more precise than humans. Thus, the use of the fully automated systems is disallowed. A person is currently required to make the final decision (Velsberg et al., 2020).

# 5.3
# PROCESS INNOVATION

To achieve the best possible effect from digital transformation, the entity being digitalized should be analyzed, rethought, and improved before it is transformed. Depending on the scale and target of transformation, this entity can be a task, procedure, process, transaction, workflow, or even an entire organization or a network of organizations. In the future, we refer to all these entities as “processes." The expected effect can include various improvement measures—efficiency, effectiveness, transparency, conformance—and the improvement itself entails various forms of innovation. In the absence of such innovation, digitalization will tend to preserve in the digitally-transformed process all deficiencies present in the original process—inefficiency, ineffectiveness, opacity, non-conformance, and others.

As a particular form of digitalization, innovation should naturally accompany automation. However, innovation is especially important for automation projects. First, the nature of automation, particularly its speed, replication, and limited human control, amplifies the costs of compensating for the adverse effects of inefficiency, ineffectiveness, opacity, non-conformance, and any other digitally preserved deficiencies. Second, most human-executed processes can rely on estimates, projections, interpretations, flexibility, and other forms of human intelligence. Automating such processes is not feasible, as none of these forms is accessible to machine-executed processes. They must first be made ready for automation. Third, the consequential nature of many automated decisions requires a human to make the final decisions and take responsibility for it. Deliberately introducing such decision points also requires process innovation. Consequently, Factor 3 is formulated as follows:

> ***Government automation requires making the process automation-ready through simplication, incrementality, reviewability, trust-building, problem orientation, and other forms of process innovation.***

The factor is refined into five sub-factors: 1) automation is about solving problems, 2) automation should be preceded by simplification, 3) automation should be introduced incrementally, 4) automation outcomes must be subject to human review, and 5) automation needs a paradigm shift towards trusted partners. The sub-factors are listed in Table 25 and elaborated in the sections below. Each section explains what is the factor about, why it is important, how it is implemented, and what evidence substantiates it. The evidence is drawn from the case studies in Chapter 2 or literature.

**Table 25.** Process Innovation Sub-Factors

| ID | SUB-FACTOR |
|---|---|
| **3.1** | Automation is about solving problems |
| **3.2** | Automation should be preceded by simplification |
| **3.3** | Automation should be introduced incrementally |
| **3.4** | Automation outcomes must be subject to human review |
| **3.5** | Automation needs a paradigm shift towards trusted partners |

## 5.3.1. Automation Is about Solving Problems

### What is this factor about?

Automation in government is about identifying, diagnosing and solving problems that exist in the working of the public administration, the interactions between the administration, citizens and businesses, the formulation/implementation of public policies, or other means of producing public value. It requires a deep understanding of the problem source (i.e., the process to be automated), and what technology exists to automate this process and solve the original problem. Technology is just a problem-solving tool.

### Why is this factor important?

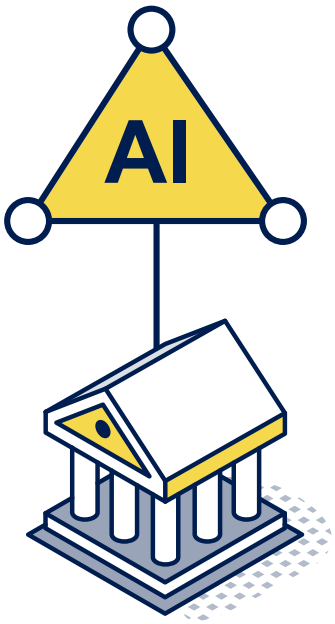
Government automation should be driven by real problems that are impacting citizens, businesses or the administration itself, rather than emphasizing technology use to automate part of government operations and interactions. Problem-driven automation forces the strategic use of digital technologies to simplify processes, shorten decision times, or produce other efficiency improvements; to increase convenience for citizens, businesses and administration itself by reducing administrative burden and delivering personalized, inclusive, and proactive services; and to improve other means of producing public value. It also minimizes the risk of producing problem-solution mismatch or producing suboptimal solutions to problems by focusing too much on the technology and not enough on the problem and its source—the process.

Considering the public value framework, problem-driven automation delivers organizational values—organization-technology alignment, and constituency values—reduced administrative burden, increased user value, and inclusive public services.

### How is this factor implemented?

Four implementation approaches for problem-driven automation are:

1. Ensuring that automation solves consequential problems
2. Sensitizing automation teams about solving the right problems
3. Empowering technology and government experts to contribute to problem solving
4. Making sure that the selected technology is the best fit for the problem to be solved




Regarding the strategic government triangle for implementing government automation, problem-driven automation improves the government's political capabilities—selecting consequential problems to solve by automation, operational capabilities—selecting the right technology for the problem at hand, and strategic capabilities—building problem awareness among government decision makers and managers.

Table 26 shows how the different approaches to problem-driven automation impact the benefits and risks of government automation.

**Table 26.** Problem-Driven Automation – Benefits and Risks

| APPROACH | BENEFITS | | RISKS |
|---|---|---|---|
| | **B1 Increasing efficiency** | **B4 Increasing citizen convenience** | **R3 Failing to solve problems** |
| 1. **Ensuring that automation solves consequential problems** | Simplifying processes | Reducing administrative burden | Reducing the risk of problem-solution mismatch |
| 2. **Sensitizing automation teams about solving the right problems** | | | |
| 3. **Empowering technology and government experts to contribute to problem solving** | | Enabling personalized, inclusive, and proactive services | Reducing the risk of producing suboptimal solutions |
| 4. **Making sure that the selected technology is the best fit for the problem to be solved** | | | |

### What is the evidence?

In Estonia, the central authority helps agencies think about consequential problems and opportunities for improvements through interactive sessions. Each agency invites participants, including senior agency management, front-office staff that work directly with customers, operators of the customer service channels, and technology experts. The sessions typically start by identifying business problems, not limited to data science problems, asking business experts to list the problems they face, and collecting, refining, and prioritizing ideas. The approach helps to collectively identify, among the agency's managers and business and technology experts, problems worthy of automated solutions (Velsberg et al., 2020).

In Chile, the staff responsible for automating the social security claims recognized the need to have a clearly identified problem to obtain funds from the central government or a donor agency. However, agencies are used to requesting funds for concrete solutions using concrete technology, not to start from the problem to be solved (Case 6).

In France, the implementation team of the Law as Code project works with business experts to identify problems since they conceive solutions as by-products that can change over time (Case 9). The project relies on teams consisting of civil servants, private company staff, and freelancers. The members consider themselves missionaries, not mercenaries. The needs of the customers they are serving drive their work, and they measure their performance by how well they solve the customers' problems (Case 9).

In Norway, the NAV's project on automation of child benefits emanated from the vision formulated by the head of the agency, who was concerned about the increasing costs of welfare support and the number of people requesting services (Case 3).

In Sweden, the main problem for the Trelleborg Municipality's social welfare delivery project was providing benefits to those who needed welfare support. The ultimate aim was to help them be self-sufficient. Prior to automation, the municipality was making decisions about approving or denying the welfare applications within eight days to three weeks. The team challenged this arrangement by asking three questions: 1) How long is it acceptable for someone to worry about getting food on the table, and why does it take at least eight days to decide on the applications? 2) What would happen with the service if the civil servants involved were moved to other assignments? 3) For whom do civil servants work—for themselves or for the citizens? Thus, the municipality set a 24-hour target to deliver decisions and reorganized the process to meet this target. This reorganization relied on trusting citizens more by not checking their bank accounts, housing situation, or spending habits, and making the process very basic (Case 5).

In Norway, NAV rethought the underlying process to make payment of the sickness allowance more effective and faster. Such improvements were also expected to save the agency resources since it spent a lot of time on tasks that could be automated. The idea was to issue accurate payments automatically and to free up agency resources to provide personal help to people who had been sick or lost their job to return to work (Case 4).

In Spain, the IT experts responsible for the automation of the civil registry were supported by an application called "InfoReg", in operation for the last 20 years, in finding out about daily incidents, keeping contact with the agencies, understanding the problems with public services faced by citizens, and, in general, monitoring and managing government processes. When IT experts support computer applications, they learn more about business processes since they receive incident reports and citizen complaints, and they even have to contact citizens to understand their needs and challenges. This understanding is critical since problems that are not known cannot be solved (Case 7).

A technology culture is obsessed with advancing and always applying the newest technology. Under this culture, government leaders may not understand technology but believe they have found a silver bullet with the newest technologies. While new technologies may be appealing, exciting and modern, they may not fit the

actual problems to be solved. They also risk making agencies dependent and exploited by technology consultants and manufacturers. In fact, 90 percent of the problems faced by government can be addressed with the standard technology available (Rogers et al., 2020).

According to the team that automated social security claims in Chile, many agencies consider technology as an end in itself and give priority to the acquisition of IT tools. They face a barrier in understanding the proper role of technology in government: rethink the problem, redesign the process, and support the process with the technology most suited to this task. While new technology may not help solve any problems, process redesign which intelligently exploits an existing platform may lead to significant improvements (Case 6).

In Argentina, the PROMETEA project team assessed what technology should be used for process automation before designing the automated solution. To express the relevance of the technology, a metaphor was used of selecting the most appropriate means of transport to travel from one place to another. For example, a person will not choose a plane to travel around a city. Analogically, an agency is unlikely to solve all its problems using AI despite how appealing AI currently appears (Case 8).

Notably, AI has a patchy record in the public sector. It is hard to find the genuine AI examples and not just basic procedural software creatively branded to look modern. A genuine AI application might use machine learning to solve a given problem without introducing new problems such as bias (Rogers et al., 2020).

## 5.3.2. Automation Should Be Preceded by Simplification

### What is this factor about?

In digital government projects, applying technology to government processes without simplifying them first (or simplifying the rules that govern their execution) may still produce positive outcomes, such as quickly digitalizing processes, observing results, and gaining quick wins and political support for any follow-up. However, for automation projects, following this approach may not be feasible because the complexity of the business rules may impede their automation. Automation responds to the radically upgraded performance pledges by government organizations, forcing them to rethink and simplify their procedures, processes, and rules before attempting to automate them. Part of this simplification is using the available technological innovations, administrative authority, and political power to make the government's technical infrastructure and regulation automation-ready, extending the scope and reach of the shared services and thus increasing automation opportunities.

### Why is this factor important?

By transforming the rules and processes, simplification reduces development and operating costs, ensures that government decisions are more reliable, eliminates some of the administrative burden on citizens, businesses, and the administration itself, and delivers proactive and inclusive services. It also minimizes the risk of the government making opaque decisions which may reduce trust between the governing and the governed, and other social values.

In summary, applying simplification before automation may increase government efficiency, the quality of government decisions, and the convenience of interactions between citizens and government. It may also address the risks of lowering decision quality and undermining citizen-government trust due to automation.

Considering the public value framework, simplification delivers organizational values by reducing or eliminating valueless tasks and saving financial resources, and constituency values by reducing administrative burden, simplifying interactions between citizens and government and eliminating redundant task and data requirements on citizens.

### How is this factor implemented?

Two implementation approaches for process simplification are:

1. Providing a functionality-rich, automation-ready infrastructure
2. Simplifying rules before automating them

Regarding the strategic government triangle for implementing government automation, simplification improves the government's strategic capabilities—decision clarity, operational capabilities, removing unnecessary or redundant tasks, and political capabilities—producing organizational and community values.

Table 27 shows how the different approaches to process simplification impact the benefits and risks of government automation.

**Table 27.** Process Simplification – Benefits and Risks

| APPROACH | BENEFITS | | | RISKS | |
|---|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **B4 Increasing citizen convenience** | **R2 Lowering decision quality** | **R4 Undermining trust** |
| 1. **Providing a functionality-rich, automation-ready infrastructure** | Simplifying processes<br><br>Reducing operating and development costs | | Enabling proactive services | | |
| 2. **Simplifying rules before automating them** | | Ensuring objective decisions | Reducing administrative burden<br><br>Enabling proactive services | Reducing the risk of opaque decisions | Reducing the risk of compromising social values |

### What is the evidence?

Some technologies are designed to simplify processes. Chief among them is cloud computing, around for over ten years but still relatively new for some government organizations. The cloud significantly reduces the government's intrastructure complexity.

> ***Government organizations do not have to own their data servers or dedicate resources to maintaining them.***

This simplification is a revolutionary change and a fundamental enabler for progress and automation in the public sector (Rogers et al., 2020).

In Spain, the Albacete Government delivers services such as school transportation benefits proactively, thanks to infrastructure simplification. This includes data homogenization, information access through the interoperability platform, and common tools (Case 2).

In Sweden, the Trelleborg Department of Welfare and Labour started its automation efforts after significantly enhancing its service performance measures, such as pledging to deliver its services within 24 hours of receiving the applications. They understood that rethinking and simplifying procedures and processes was necessary to achieve this commitment. After analyzing processes, the department started simplifying its regulations. For example, as dental care applications required the submission of many documents, including pricing models from different dentists, they defined a medium reimbursement amount for which a person can apply. A similar approach was conducted for other services. After documenting the system before automation, the department focused on "extraordinary" goals, such as reducing service delivery times and producing concrete benefits to citizens. It realized that the way of working, mostly business processes and the approach to automation, should change before applying RPA (Case 5).

In Argentina, the automation conducted by the Public Prosecutor's Office, part of the PROMETEA project, first aimed at understanding, analyzing, and simplifying the underlying business processes. After discovering through business process assessment and measurement that 66 percent of the workload was handling one case type, the Office reengineered and simplified the business process, eliminating redundant, duplicated, and unnecessary tasks (Case 8).

In Singapore, the primary concern of VITAL, the Public Service's Shared Services Centre, was to avoid automating inefficiencies (Case 12). To this end, it worked to streamline and remove unnecessary steps from business processes before automation. After streamlining, standardizing, and automating processes, the center reported efficiency gains between 30 and 80 percent.

In Norway, NAV discovered that discretion reduces automation, while simpler rules reduce discretion. However, the agency also found out that simplifying laws and regulations is difficult. When technologists approach politicians to introduce changes because a legal clause is difficult to apply, the politicians argue that a certain number of people receive the benefit using this particular clause and they are too important for this clause to be amended or removed. As politicians are unconvinced that automated systems can double the number of beneficiaries using digital fairness and discretion, the main challenge is convincing them to change the laws and their implementation (Case 3).

## 5.3.3. Automation Should Be Introduced Incrementally

### What is this factor about?

Automating through the big-bang approach, that is, implementing and deploying the entire system at once, is risky. If an error occurs, automation may scale up its effect, affecting many transactions and requiring a significant amount of clean-up. Such a failure may also be highly visible to stakeholders, undermining their trust in the system and compromising successful completion and adoption of the project and its outcomes.

A safer approach is to proceed incrementally, from simple to complex cases, gradually gaining confidence in the correctness of the results before scaling up the use of the system. This incremental development can also proceed component-wise, with new functionality added in iterative cycles, each comprising the specification, design, implementation, testing, and deployment of the new or revised functionality.

### Why is this factor important?

Automation proceeding incrementally, from simple to complex cases, enables the project team and the stakeholders to gradually build trust in the automated solution. Initially, the old and the new system would be running in parallel, including manual processing of the old system and automated processing of the new one, and comparing the results. This parallel processing ensures that the automated decisions are correct, supported by evidence, and that the risk of opaque automated decisions is minimized.

The incremental and component-based approach makes the functions deployed in each cycle operational, so that users can analyze system behavior incrementally and request changes as soon as they are needed. If errors are detected earlier, the cost of the corrective actions and of the entire development can be reduced.

> ***The incremental and component-based approach also ensures that the automated decisions are correct and the risks of opaque automated decisions and stakeholders' mistrust in such decisions are minimized.***

In summary, introducing automation incrementally contributes to increasing the efficiency of the government operations and the quality of the government decisions. It also helps minimize the risks of wasting time, money, and institutional capital on the failed automation projects, and lowering the quality of automated decisions. Based on the public value framework, incremental and component-wise automation contributes to producing organizational values—financial gains; constituency values—stakeholders' trust; and political values—transparency and accountability.

### How is this factor implemented?

Two implementation approaches to incremental automation are:

1. Deploying automation incrementally, from simple to complex cases
2. Following the incremental and component-based approach

Regarding the strategic government triangle for implementing government automation, the incremental approach to automation contributes to government's operational capabilities (managing the impact and risks of automated solutions), strategic capabilities (building trust, confidence, and legitimacy of automated solutions among the stakeholders), and political capabilities (producing organizational and political values).

Table 28 shows how the different approaches to incremental development impact the benefits and risks of government automation.

**Table 28.** Incremental Development – Benefits and Risks

| APPROACH | BENEFITS | | RISKS | |
|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **R1 Wasting time, money, and institutional capital** | **R2 Lowering decision quality** |
| 1. Deploying automation incrementally, from simple to complex cases | Reducing development costs | Ensuring objective, evidenced, reliable, and transparent decisions | Minimizing the risk of lack of stakeholder trust | Reducing the risk of opaque decisions |
| 2. Following the incremental and component-based approach | | | | |

## What is the evidence?

In Spain, the experts responsible for the automation of the school transportation benefits recognize that proceeding with automation incrementally helps staff realize that the change and gaining trust in the results are feasible. What is infeasible is "reaching level 100 from level 0 in one day," that is, moving from a paper-based to a digital organization, based on data, interoperability, and changes in people's understanding and approach. The presence of automation tools is insufficient since the organization must execute its business processes, access information, and manage this information differently. It is a gradual process that permeates the whole or a large part of an organization (Case 2).

In Norway, the automation of the child welfare benefits followed an incremental approach to ensure the correctness of the automated decisions. For some cases, due to their complexity and the risk of the system producing incorrect results, it was inconceivable for NAV to rely on full automation. Thus, they started automating the easiest cases first, although it took a significant amount of time to deploy the first version of the automated system due to the correctness requirements. NAV also realized that automating 100 percent of the cases it would not be possible since some of them require manual tasks. Following a staged approach, they released a new version in October 2020, including the automation of parts of the most challenging cases (Case 3).

In Sweden, the automation of the social welfare benefits by the Trelleborg Municipal Government's Department of Welfare and Labour was also incremental, conducted through several steps, including the training of the robots (Case 5).

In Singapore, a lesson learned by the automation experts is that the incremental process includes selecting a suitable task or process with low-to-medium complexity for automation, and that this selection is critical for successful implementation. Although end-to-end process automation may yield higher savings and efficiency gains, it is usually complex, particularly the business rules for exception handling. Identifying, reviewing, and redesigning the process is crucial to avoiding automating inefficiencies (Case 12).

In Chile, the development process for automating the social security claims was divided into modules and components. Using an integration layer, such modules and components can exchange and integrate data, and collaborate with each other as part of a business process. The approach helped SUSESO manage complexity and was vital for ensuring the project's development success (Case 6).

In Spain, the automation of the civil registry relied on a distributed system approach, each agency building its part of the business process, while other agencies providing common services. Relying on existing components facilitates the development process since building everything from scratch would have been challenging and risky (Case 7).

## 5.3.4. Automation Outcomes Must Be Subject to Human Review

### What is this factor about?

For automated decision making having consequential impact on citizens, businesses, and the administration itself, reviewability becomes a significant concern. According to Cobbe et al. (2021), "Reviewability involves breaking down the automated and algorithmic decision-making process into technical and organizational elements to provide a systematic framework for determining the contextually appropriate record-keeping mechanisms to facilitate meaningful review—both of individual decisions and the process as a whole." Without reviewability, governments may lose their capacity for accountability, undermining the stakeholders' trust, and challenging the stakeholders' support and commitment.

Automated systems must comply with reviewability requirements to guarantee the principles of fairness, equity and the rule of law in government decision making. The requirements entail the ability to revise the mechanisms and data used for automated decision making and to determine whether the outcomes are correct. In rule-based systems, reviewability can be achieved through program transparency (i.e., access to the software source code). In AI-based automation where a system makes recommendations, a person should manually check the recommendation and make the final decision.

### Why is this factor important?

The reviewability of the automated decision making ensures that such decisions are objective, reliable, and transparent, minimizing the risks of opaque decision making which compromises social values and undermines stakeholders' trust.

Reviewability increases the quality of automated government decisions, and minimizes the risks of wasting time, money, and capital, lowering decision quality, and undermining citizen trust by failed automation projects. Concerning the public value framework, the reviewable automated decisions produces organizational values—empowered employees and organization-technology alignment; community values—increased user value; and political values—openness, transparency and accountability.

### How is this factor implemented?

Two implementation approaches for reviewable automated decision making are:

1. Providing mechanisms to review system-generated decisions
2. Opening algorithms for independent inspection

Regarding the strategic government triangle, the reviewability of the automated decision making contributes to government's strategic capabilities (ensuring the correctness, ability to challenge, and legitimacy of such decisions) and political capabilities (ensuring transparency and accountability).

Table 29 shows how the two approaches to reviewability of automated decision making impact the benefits and risks of government automation.

**Table 29.** Human Review – Benefits and Risks

| APPROACH | BENEFITS | | RISKS | |
|---|---|---|---|---|
| | B3 Increasing decision quality | R1 Wasting time, money, and institutional capital | R2 Lowering decision quality | R4 Undermining trust |
| 1. Providing mechanisms to review system-generated decisions | Ensuring objective, reliable, and transparent decisions | Minimizing the risk of lack of stakeholder trust | Reducing the risk of opaque decisions | Reducing the risk of compromising social values |
| 2. Opening algorithms for independent inspection | | | | |

## What is the evidence?

In Paraguay, the public procurement project assembled a team of experienced verifiers, trained them, and worked closely with them to manually analyze the outcomes of the selected automated decisions. The result allows concluding whether the system is reliable or should be revised to achieve greater reliability and performance (Case 1).

In Norway, a major concern for the sickness allowance project was ensuring that automated decisions were correct. To this end, the team decided to review system outputs by defining process checkpoints, collecting all input and output data at such checkpoints, and verifying if such data was correct. It took considerable time to manually process all automated cases. While conducting the checks, the team realized that before automation, many of checkpoints were not verified (Case 4). They also realized that ensuring the correctness of automated decisions is especially challenging in the public sector.

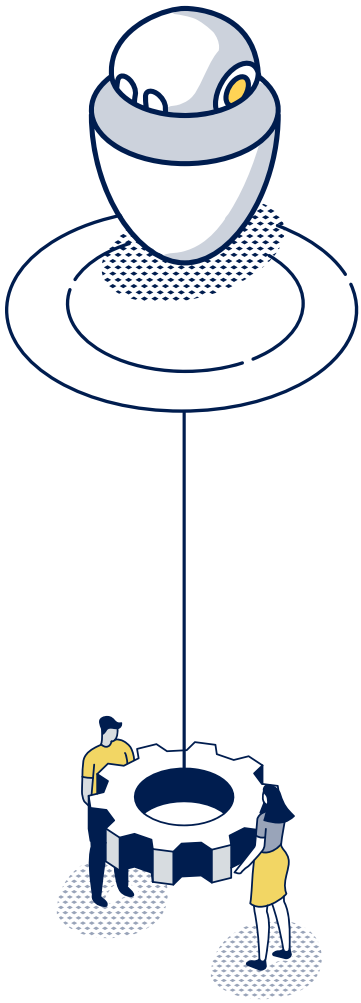
In addition, incorrect automated decisions may provide additional arguments to the reluctant officials who were already arguing against automating public services. Thus, automation requires systematic controls, and checking correctness at each step. For the child welfare benefits service, 60 percent of the cases were processed automatically, relying on five checkpoints established along the business process.

When a processing arrives at a checkpoint, it seeks human intervention: the caseworker controls the status of the process and the data and authorizes the process to continue or makes amendments (Case 3).

In Argentina, the PROMETEA project team dedicated efforts to the implementation throughout the system's life cycle of transparent, reviewable, and auditable "white box" algorithms. A rigorous process of defining and documenting the rules and keywords used by the algorithm, and introducing manual controls over the system was followed (Case 8). In particular, the document generated for the prosecutor includes the legal background and the arguments about the decision. The prosecutor then revises the document and accepts or amends the recommended decision (Velsberg et al., 2020).

In Singapore, VITAL conducts quality assurance reviews of the automation scripts and monitors robot performance. One of the lessons learned is that RPA is sensitive to system changes, and performance and software upgrades. Thus, VITAL regularly tests, maintains, and modifies the deployed scripts to ensure that they work as expected (Case 12).

In the EU, the automation of the border control system automatically processes the data of a person crossing the border, and provides information to the immigration official to revise and make decision manually (Case 11).



## 5.3.5. Automation Needs a Paradigm Shift towards Trusted Partners

### What is this factor about?

While government automation is implemented through innovative, high-risk projects, government organizations are typically risk-averse. They prefer maintaining the status quo, and have low innovation capacity. They also distrust citizens, businesses, their own employees, and other agencies. In particular, they distrust the data they receive from outside. This culture of distrust also affects automated solutions and their results. Instead of citizens, businesses, agencies, and other partners trying to earn government trust, which is a hard call, government automation needs to rely on the already trusted partners.

### Why is this factor important?

Moving from partners making significant efforts to gain government trust to government relying on already trusted partners, is a paradigm shift. Applied to government automation, this shift contributes to several benefits: simplifying processes, shortening decision times, reducing operating and development costs, releasing and complementing human resources, and completing machine-only tasks. All of them aim at eliminating processes which solely exist to compensate for the lack of trust. This shift also helps reduce administrative burden and minimize the risk of stakeholder distrust.

In summary, the paradigm shift from earning trust to relying on trusted partners increases the efficiency and productivity of government operations, enhances the convenience of government-citizen interactions, and minimizes the risk of wasting time, money, and capital when implementing automation projects. Regarding the public value framework, the paradigm shift contributes to producing organizational values—empowered employees; constituency values—reducing administrative burden; and political values—building trust between government, citizens, and business.

### How is this factor implemented?

Three implementation approaches to the paradigm shift towards trusted partners are:

1. Building trust in empowered automation teams
2. Building trust in citizens and businesses
3. Relying on trusted government data

Regarding the strategic government triangle, the paradigm shift from partners earning trust to trusted partners helps develop strategic capabilities such as delegating responsibilities to other trusted partners, and political capabilities such as enabling process simplification and reducing administrative burden.

Table 30 shows how the three approaches to the paradigm shift towards trusted partners impact the benefits and risks of government automation.

**Table 30.** Paradigm Shift towards Trusted Partners – Benefits and Risks

| APPROACH | BENEFITS | | | RISKS |
|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B2 Increasing productivity** | **B4 Increasing citizen convenience** | **R1 Wasting time, money, and institutional capital** |
| 1. Building trust in empowered automation teams | Reducing operating and development costs<br><br>Shortening decision times<br><br>Simplifying processes | Releasing and complementing human resources<br><br>Completing machine-only tasks | Reducing administrative burden | Reducing the risk of lack of stakeholder trust |
| 2. Building trust in citizens and businesses | | | | |
| 3. Relying on trusted government data | | | | |

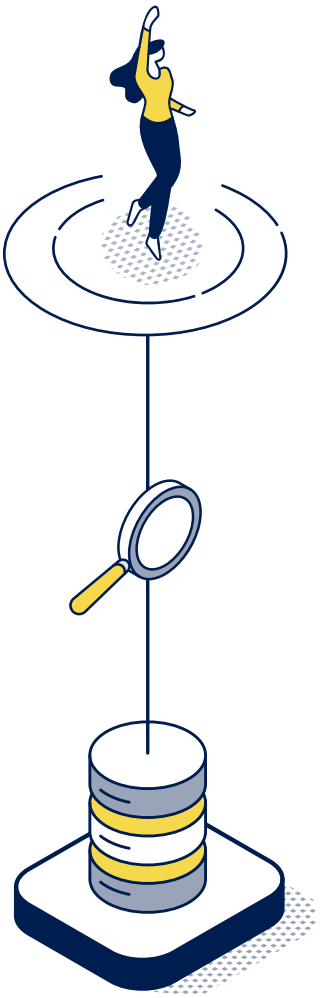
### What is the evidence?

Traditionally, the public sector promotes the culture of civil servants earning trust. When a team receives funding for conducting a project, the assumption is that they will be reckless with spending. This may incentivize all kinds of wrong behaviors, like project managers try to constantly show that all is under control and not informing about existing problems, or experts signaling that they are successful and only revealing project failure in the last minute. Since automation projects are risky, and money and innovation are not mixing smoothly, because of the behaviors above, trust is the only way to engage in innovation. Therefore, automation projects need a paradigm shift, from teams who work towards earning trust, to relying on entrusted teams that deliver results. Eventually, if such teams underperform, they would lose trust (Rogers et al., 2020).

In Sweden, to achieve the new performance goals for social welfare services—from eight days to three weeks prior to automation, to 24 hours after automation—the Trelleborg Municipal Government needed to change its organizational culture from controlling citizens to trusting them. The government realized that it was not worth controlling citizen bank accounts, housing conditions, or what they do with their money. To reach the new performance goal, they realized that they must work efficiently and only rely on basic controls (Case 5).

In Norway, NAV was able to automate 100 percent of many of the child benefit cases, mostly the simplest ones, because they were sure of the automated decisions. This was only possible because such decisions relied upon trusted data, including salary and other data about employees, stored in government-owned information systems. NAV also recognized that they had to trust the team responsible for automation. This was a challenge that required new ways of working at all levels of the organization which, in turn, put a lot of pressure on the team members. If the experts were unable to deliver on the new timeline, they had to explain that they needed more time and asked to be trusted that they would deliver later. The trust placed by the agency in the team contributed to building trust across the rest of the agency (Case 3).

Trust in data is also essential for automation. eu-LISA is making efforts to standardize data quality measurement for automation of the border controls to guarantee interoperability at the centralized level. Questions about trust may arise bilaterally between EU Member States. The Commission and eu-LISA aim at defining common thresholds that all member states should comply with. The EU requires its member states to trust the central systems, and eu-LISA needs to guarantee that its systems are worthy of such trust (Case 11).



# 5.4
# WHOLE-OF-GOVERNMENT

Public institutions typically operate within well-defined operational, administrative, and legal borders. These borders are important to establish the limits of the institutional mandate and authority, to define who is responsible for decisions and accountable for results, to manage dependencies with other institutions including the sharing of risks and benefits between them, to reduce operational complexity, and for other reasons. Within hierarchical systems, borders also faciliate the establishment of clear lines of reporting and control.

However, while government capabilities are developed and maintained within institutional borders, delivering public services or implementing public policies requires deploying such capabilities across such borders. The whole-of-government approach enables this cross-border execution and linking of government capabilities and citizens' needs and naturally facilitates them through digitalization and automation. The latter is particularly susceptible to networking, linking of multiple data sources, and scaling up results across government, made possible in the digitalized whole-of-government environment. This environment must deliver cross-border coordination covering: technology, such as integrating heterogenous government data and drawing insights from it; regulation, such as ensuring conformance of data processing to the established rules; and operations, such as executing multi-organizational processes by human or machine agents acting on behalf of individual organizations.

Multiple case studies show that the whole-of-government approach is a key success factor for government automation. It provides a government-wide mission and strategy to drive automation initiatives. It sensitizes stakeholders across government about the importance of working together in supporting such initiatives, and it simplifies business processes, reduces administrative burden on citizens, busineses and the administration itself, and delivers better services for everybody. In the absence of a whole-of-government approach, citizens may perceive their interactions with government as incompatibile, inconsistent, redundant, and confusing. Thus, Factor 4 is formulated as follows:

> ***Government automation should be supported and legitimized by the public and driven by an overarching digital strategy, and there should be collaboration between government organizations and integration of capabilities across government.***

The factor is refined into four sub-factors: 1) automation needs public support, 2) automation is enabled by digital strategy, 3) automation calls for collaboration but fails in isolation, and 4) automation benefits from integrating capabilities across government.

> ***The sub-factors are listed in Table 31 and elaborated in the sections below.***

Each section explains what the factor is about, why it is important, how it is implemented, and what evidence substantiates it. The evidence is drawn from the case studies in Chapter 2 or literature.

**Table 31.** Whole-of-Government Sub-Factors

| ID | SUB-FACTOR |
|---|---|
| **4.1** | Automation needs public support |
| **4.2** | Automation is enabled by digital strategy |
| **4.3** | Automation calls for collaboration but fails in isolation |
| **4.4** | Automation benefits from integrating capabilities across government |

## 5.4.1. Automation Needs Public Support

### What is this factor about?

Given a leading role played by government organizations in responding to the needs and aspirations of society and to disruptive changes happening internally and in the world, public support of this role, its legitimation, is essential. Such support conditions the effectiveness and even the efficacy of the government response. In addition, the response increasingly relies on digitalization and automation, and both require continued social acceptance and compliance with the law (Calo and Citron, 2021). The legitimation of automation projects is especially difficult given the increasing rate of government decision making conducted fully or partially by machines, going against the traditionally risk-averse and controlling culture of government organizations. Such legitimation can be sought from the political or administrative authority, directly from citizens and other stakeholders, or by adopting and adapting well-established solutions that were used and legitimized elsewhere.

### Why is this factor important?

In all three scenarios—political, public, and technical—legitimation of the automation projects raises their visibility, assuring the needed resources, aligning the stakeholders' interests, and facilitating the required partnerships and organizational change. Legitimation can also reduce development costs by streamlining various agency efforts, contributing to process simplification, and increasing stakeholder trust in automated solutions. Without political support, expecting government stakeholders to embrace the changes made possible by automation is unrealistic.

In summary, obtaining public or political support to automation projects or reusing automated solutions helps increase the efficiency and quality of such solutions. It also helps reduce the risk of pursuing automation without the key institutional enablers in place, thus helping save time, money, and institutional capital. Regarding the public value framework, legitimation contributes to producing organizational values—organization-technology alignment and empowered employees; constituency values—reducing administrative burden; and political values—promoting participation.

### How is this factor implemented?

Three implementation approaches used to gain public support to automation projects are:

1. Engaging the public through information and consultation
2. Seeking high-level political or administrative support
3. Promoting the adoption of established solutions

Regarding the strategic government triangle, gaining public support to the automation projects contributes to developing operational capabilities – reusing established automation solutions, strategic capabilities—obtaining stakeholder support to automation projects, and political capabilities—producing organizational, constituency, and political values.

Table 32 shows how the three approaches to gaining public support to the automation projects impact the benefits and risks of government automation.

**Table 32.** Automation Needs Public Support – Benefits and Risks

| APPROACH | BENEFITS | | RISKS |
|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **R1 Wasting time, money, and institutional capital** |
| 1. Engaging the public through information and consultation | Simplifying processes | Ensuring transparent decisions | |
| 2. Seeking high-level political or administrative support | Simplifying processes<br>Reducing operating and development costs | | Minimizing the risk of lack of political support |
| 3. Promoting the adoption of established solutions | | Ensuring objective decisions | Minimizing the risk of lack of stakeholder trust |

### What is the evidence?

In Chile, the head of SUSESO envisioned automation of social security claims. He had previously worked on modernization projects for an international organization and knew about the concepts and practice of public administration modernization. He assembled a competent team, gave high visibility to the project, and maintained a long-term (six years) focus on it. The main difference with other projects financed by the government's modernization program was that the automation project was the main focus for the agency (Case 6).

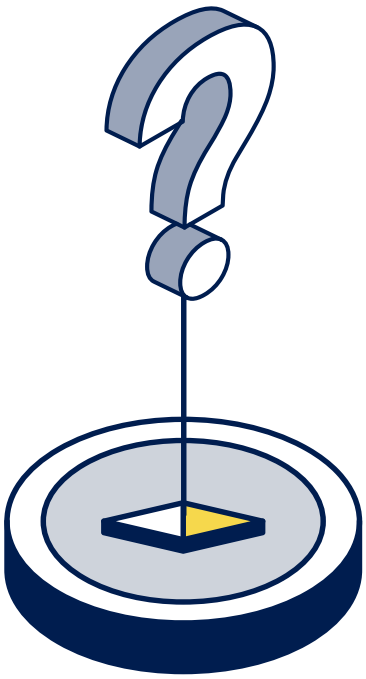
In Spain, the authority of the central government that understood the value of automation legitimized the automation of school transport benefits and encouraged the team to promote the initiative among other local governments (Case 2). This case highlights the adoption of existing solutions as a tactical approach to legitimizing government automation and scaling up automation efforts. The sharing of efforts and knowledge among public administration systems, including the practice of software reuse, is well-aligned with the European Union's principles and directives.

In Norway, seeking political support to automate the delivery of the sickness allowance benefits was vital to breaking the resistance of civil servants, particularly during system deployment. At that time, a department manager for benefits in NAV stated that the automated process should be trusted and that occasionally producing wrong results would be acceptable. This statement from the high-level authority helped release the pressure on the automation team and enabled a smooth and productive system startup (Case 4).

In the absence of political leadership and interest in automation by agency leaders, approaching the agency about automation is not worthwhile (Cases 3 and 7). While the data and technologies required for automation might be available, the critical barrier is lack of political and administrative support. This situation is not uncommon, as many high-level officials are still unaware of what they can do with automation (Case 9).

Just as high-level officials should be sensitive to public demands, public engagement is a valid tactical approach to obtaining political support and legitimizing government automation. This is demonstrated by the failed automation project from Denmark (Henriksen, 2018). Aimed at automating the case handling of the compensation claims received by an agency, the project assumed that citizens could play an active role in the application procedure and case preparation while ignoring that they might not be sufficiently technology savvy and even if they are, may not know public administration practices.

This discrepancy resulted in a newspaper editor expressing citizens' dissatisfaction with the level of scrutiny in case handling by the agency, triggering a legal action for possible violation of citizens' rights, challenging the legitimacy of the project, and demanding more detailed case handling by the agency's legal staff. This ultimately led to the project's termination.



## 5.4.2. Automation Is Enabled by Digital Strategy

### What is this factor about?

In the public sector, digital strategy entails setting strategic digital government objectives, ensuring the coherent use of digital technology across different policy areas and levels of government, and building capacities within and across government, business, and society to facilitate the implementation of such objectives (OECD, 2014). As explained in Chapter 1, automation builds upon digital government efforts and, as such, it benefits from an overarching digital strategy. In particular, conceiving automation projects as part of the whole-of-government digital strategy helps ensure access to data, algorithms, partnerships, and capacities necessary to plan, implement, manage, and sustain automation.

### Why is this factor important?

Digital strategy enables automation through inter-ministerial coordination, mobilizing agencies to share their data and ensuring the needed financial and human resources. The strategy also helps obtain the stakeholders' commitment to share the responsibility of automation implementation, and ensure continued support to automation projects. Without an overarching digital strategy, automation demands greater efforts to obtain access to data, convince stakeholders about required changes, and legitimize automation outcomes.

Pursuing automation as part of an overarching digital strategy produces definite benefits. First, it increases efficiency by reducing operating and development costs and simplifying processes. Second, it improves the quality of government decisions by facilitating access to data from different agencies and sources, facilitating access to decision-supporting evidence, and thus making decisions more transparent. In addition, it helps reduce the risk of agencies wasting time, money, and institutional capital by implementing automation projects that lack political support and have to overcome fragmented coordination agreements, and the risk of undermining trust by displacing policy responsibility for automated decisions.

Concerning the public value framework, pursuing automation as part of a digital strategy contributes to producing organizational values—financial gains, empowered employees, and whole-of-government organization-technology aligment; constituency values—increased user value; and political values—transparency and accountability.

### How is this factor implemented?

Four implementation approaches to pursuing automation through the digital strategy are:

1. Including automation projects in the digital strategy
2. Enabling inter-ministerial coordination
3. Mobilizing agencies to share their data
4. Mobilizing resources for long-term automation projects

Concerning the strategic government triangle, pursuing automation through a digital strategy produces operational capabilities—cross-agency sharing of data and resources, strategic capabilities—long-term funding and resourcing for automation projects, and political capabilities—producing organizational, constituency, and policial values.

Table 33 shows how the four approaches to pursuing automation projects as part of the overarching digital strategy impact the benefits and risks of government automation.

**Table 33.** Digital Strategy Enables Automation – Benefits and Risks

| APPROACH | BENEFITS | | | RISKS | |
|---|---|---|---|---|---|
| | **B1 Increasing efficiency** | **B3 Increasing decision quality** | **B4 Increasing citizen convenience** | **R1 Wasting time, money, and institutional capital** | **R4 Undermining trust** |
| **1. Including automation projects in the digital strategy** | Reducing operating and development costs<br><br>Simplifying processes | Ensuring transparent decisions | Reducing administrative burden<br><br>Enabling personalized, inclusive, and proactive services | Minimizing the risk of lack of political support<br><br>Reducing the risk of fragmented coordination arrangements | Reducing the risk of displacing policy responsibility |
| **2. Enabling inter-ministerial coordination** | | | | | |
| **3. Mobilizing agencies to share their data** | | Ensuring evidenced decisions | | | |
| **4. Mobilizing resources for long-term automation projects** | | Ensuring transparent decisions | | | |

## What is the evidence?

In Argentina, the digital transformation of the public prosecutor's office and the automation of various processes conducted by this office was the outcome of the strategy defined and implemented by the prosecutor in charge after assuming his position (Case 8).

In Estonia, agencies must submit proposals for AI-based automation project funding to the central authority, which evaluates them against the national strategy and prerequisites before deciding whether to fund them (Velsberg et al., 2020). By January 2021, there were 70 projects implemented or under development (Government of Estonia, 2021b), many of them focused on building automated tools for processing the Estonian language using the common open source AI components as building blocks (Government of Estonia, 2021a).

In France, between 2014 and 2018, the government-as-a-platform concept was adopted as part of the national strategy, and the government designated an agency with responsibility for implementing individual projects (Case 9).

Automation projects aim at building next-generation systems, far beyond the tenure of one administration. Such long-term projects, even in countries with available funding, can only be conceived within the framework and with support from the national strategy. The series of fixed-term, four-year strategies provides mid- and long-term availability of resources, enough to build on the previous achievement, ensure that such resources are well invested, and achieve progress (Case 7).

In Norway, the national strategy mobilizes agencies to pursue automation. In particular, since all agencies have their databases and registries, the strategy forces them to share them. This highlights the role of a national strategy for data integration. For example, national registries and tax databases have been available to public agencies for years, enabling digitalization and automation (Case 3).

The national strategy also provides long-term automation projects with the continuity and stability required amidst the ongoing political and administrative changes. In Paraguay, NDPP adopted a law that requires a long-term data policy to address changes in agency authorities causing operational and legal discontinuity and fragility (Case 1).

### 5.4.3. Automation Calls for Collaboration but Fails in Isolation

#### What is this factor about?

Government agencies are better prepared to undertake automation when they are willing to share their data, knowledge, and resources with other agencies; ready to use the data, knowledge, and resources offered by other agencies and trusted external parties; work through project teams that comprise both technology and government (process) experts; are open to working with other government agencies and trusted external entities; are connected to such entities through formal collaboration agreements; and other factors. Willingness to collaborate is key leverage for automation since other enablers, such as the presence of an overarching digital strategy, integration tools, or regulatory frameworks, are relying on it.

#### Why is this factor important?

Willingness to collaborate between agencies reduces agencies' development and operating costs, and simplifies multi-organizational processes. Collaboration may also help to reduce the risks of agencies lacking innovation capacity, producing suboptimal solutions to policy problems, creating problem-solution mismatch, or displacing policy responsibilities to non-authorized entities. When agencies engage in open collaboration and mobilize the wisdom of the crowd, they can be more effective in tackling policy problems and avoiding the problem-solution mismatch. When collaboration happens regularly, standardized collaboration agreements are preferred. They can mobilize political and administrative support, contribute to operational transparency, and lower development and operating costs.

Without collaboration, each government agency would need to rely on its data, human capacity, and technical solutions. This would result in duplicated databases, processes, and capabilities across government. In the collaboration-free scenario, only big and resourceful agencies would benefit from automation, while the government would lack capacity to act as a whole, and would produce inconsistent behavior vis-à-vis its customers.

In summary, collaboration within government and between government and trusted external entities contributes to increasing the efficiency of government operations, the quality of government decisions, and the convenience of government-citizen interactions. It can also address the risks of agencies wasting time, money, and institutional capital on failed automation projects, and undermining public trust in the outcomes.

Considering the public value framework, collaboration can help automation projects produce organizational values—financial gains and empowered employees; constituency values—increased user value and reduced administrative burden; and political values—participation and openness.

#### How is this factor implemented?

Four implementation approaches used to facilitate collaboration are:

1. Sharing knowledge and experiences among government experts
2. Central agencies providing common databases and tools to local governments
3. Adopting standardized collaboration agreements across government
4. Promoting open collaboration and providing rules to govern it

Concerning the strategic government triangle, pursuing automation through collaboration produces operational capabilities—sharing of data, knowledge, and resources between agencies; strategic capabilities—providing common tools for agencies to use; and political capabilities—opening up government. Table 34 shows how the four approaches to facilitating collaboration impact the benefits and risks of government automation.

**Table 34.** Automation Calls for Collaboration – Benefits and Risks

<table>
<tr><th rowspan="2">APPROACH</th><th colspan="3">BENEFITS</th><th colspan="3">RISKS</th></tr>
<tr><th>B1<br>Increasing efficiency</th><th>B3<br>Increasing decision quality</th><th>B4<br>Increasing citizen convenience</th><th>R1<br>Wasting time, money, and institutional capital</th><th>R3<br>Failing to solve problems</th><th>R4<br>Undermining trust</th></tr>
<tr><td>1. Sharing knowledge and experiences among government experts</td><td rowspan="3">Reducing operating and development costs<br><br>Simplifying processes</td><td rowspan="2">Ensuring objective, evidenced, and reliable decisions</td><td rowspan="4">Reducing administrative burden<br><br>Enabling personalized, inclusive, and proactive services</td><td rowspan="4">Minimizing the risk of lack of political support<br><br>Reducing the risk of lack of innovation capacity<br><br>Reducing the risk of fragmented coordination arrangements</td><td rowspan="4">Reducing the risk of problem-solution mismatch and the risk of producing suboptimal solutions</td><td rowspan="4">Reducing the risk of displacing policy responsibility</td></tr>
<tr><td>2. Central agencies providing common databases and tools to local governments</td></tr>
<tr><td>3. Adopting standardized collaboration agreements across government</td><td rowspan="2">Ensuring transparent decisions</td></tr>
<tr><td>4. Promoting open collaboration and providing rules to govern it</td><td></td></tr>
</table>

### What is the evidence?

The way the government is structured, in silos, facilitates its internal organization but prevents public agencies from working together in agile and coordinated manner. Lack of collaboration is the main barrier to automation (Case 10).

In Spain, the teams from the Ministry of Justice and Police discussed citizen identification issues for years. Since the positions were distant at the beginning, a dialogue was organized to break the status quo and initiate a cultural shift for them to understand that they had the same client and to identify the common needs, and what they could gain from collaboration. The key outcomes were communication, knowledge transfer, and identification of synergies. In the process, they discovered synergies, such as the role of the police in the civil registry system and the need for flexibility in sharing and integrating police data and other types of data. In addition, the dialogue highlighted the need for civil servants working on the same business processes to know each other, to connect, to communicate, to be aware of the broader goals than just their own, to understand that producing results on their own is not feasibile, and to appreciate the value of collaboration. The dialogue also discovered that the knowledge and trust built through collaboration are essential for automation, and identified the key collaborative roles, so-called "plumbers" who are the experts understanding the relevance of the project, have their networks within government, and help open doors (Case 7).

Standardized collaboration agreements should facilitate the willingness of government agencies to collaborate with other agencies or trusted external parties. The absence of such agreements can produce excessive costs for agencies. In Chile, to automate social security claims, it took SUSESO three years to close an agreement with the civil registry to gain access to one of its datasets. Currently, SUSESO operates five separate agreements with the civil registry, all managed independently between the partners. The substantial administrative costs of signing and maintaining these agreements were largely invisible to the public administration. Lacking formal obligations to collaborate, agencies engaged in data trade instead of data exchange, treating government data as a commodity expecting other to share data while refusing to share its own. They would ask, "if you want this data, and we give you access, what are you offering us in return?" The case highlights the need to establish data governance practices, define standardized collaboration agreements including but not limited to data sharing, and instill a culture of collaboration (Case 6).

The central government plays a crucial role in supporting local governments' automation efforts through central-local collaboration. Such collaboration can provide access to national registries, facilitate access to common tools, and promote solutions of interest to local governments. In Spain, for example, the Government of Albacete encouraged and facilitated other local governments to adopt their own solution, thanks to its collaboration with the central government. The latter, aware of the successful local experience, encouraged and supported sharing this solution from Albacete with other territories and institutions (Case 2). Also in Spain, the Ministry of Justice leading the civil registry project shared its experience with autonomous communities and motivated them to imitate and became early adopters of the initiative (Case 7).

The collaboration with non-government actors may help address the lack of capacity of government agencies and empower them to pursue automation. In particular, collaboration with academia, business, and NGOs can help agencies mobilize resources and provide contacts and know-how. In Paraguay, the public procurement automation project was only possible due to collaboration between NDPP, the Carnegie Mellon University, the Alan Turing Institute, and the German Research Center for Artificial Intelligence (DFKI) (Case 1). The project partners provided NDPP with skilled human resources, helped it build its own human capacity, and generally supported the NDPP's automation efforts.

According to the OpenFisca experience in France (Case 9), open collaboration initiatives present various challenges, from receiving contributions to relying on the results.

Following the digital commons approach, OpenFisca encourages the contribution of different people and entities to provide rules to each socio-fiscal system and to common software components, such as the simulation engine or the legislation explorer. The project has been challenged by some agencies doubting the contribution of external actors. Such organizational and cultural challenges hinder the contribution and the confidence in collaboration between the administration and civil society. They respond to the cultural canons of the state in the pre-internet era. As governance rules are defined more explicitly, they unleash the true potential of open collaboration.

### 5.4.4.
## Automation Benefits from Integrating Capabilities across Government

#### What is this factor about?

Government automation is based on the foundations established by digital government. Automation opportunities expand when such foundations apply explicit architectures and designs to integrate the components and capabilities from across government. The components include data, systems, tools, models, and other technical, methodological, and knowledge resources, while the capabilities can be technical, organizational, social, and others. The modular and organizing nature of such architectures and designs highlights how human, machine, or combined human-machine capabilities can be used to achieve various government tasks. Following the whole-of-government approach, the components and capabilities can be shared across agencies and with trusted entities from outside government.

#### Why is this factor important?

Building blocks for government automation and a layered technical architecture enabling data and process integration help reduce development and operating costs, release and complement human resources, and complete machine-only tasks. It also minimizes the risk of having fragmented arrangements for inter-agency or whole-of-government coordination. Data integration covering various government and trusted external sources helps simplify processes, reduce administrative burden, and deliver proactive and personalized services. In the absence of integration, government agencies run duplicate or overlapping databases and systems, lowering operational efficiency but, most important for automation, risking ambiguity and inconsistency of data, and thus compromising its quality.

In summary, the integration of capabilities from across government helps increase the efficiency and productivity of automated government operations, enhances the convenience of the automated government-citizen interactions, and tackles the risk of agencies wasting time, money, and institutional capital on automation projects. Considering the public value framework, integration helps produce organizational values—financial gains and organization-technology alignment, constituency values—reducing administrative burden and increasing user value, and political values—openness.

#### How is this factor implemented?

Three implementation approaches used to facilitate integration are as follows:

1. Providing access to government services through an integrated interface
2. Facilitating data integration through a common data platform
3. Providing common language, building blocks, and tools for service automation

Concerning the strategic government triangle, pursuing automation through integration produces operational capabilities—reusing the data, knowledge, and resources from across government; strategic capabilities—making government interactions seamless; and political capabilities—producing organizational, constitutency, and political values.

Table 35 shows how the three approaches to facilitating integration impact the benefits and risks of government automation.

**Table 35.** Automation by Integration – Benefits and Risks

<table>
<tr><th rowspan="2">APPROACH</th><th colspan="3">BENEFITS</th><th>RISKS</th></tr>
<tr><th>B1<br>Increasing efficiency</th><th>B2<br>Increasing productivity</th><th>B4<br>Increasing citizen convenience</th><th>R1<br>Wasting time, money, and institutional capital</th></tr>
<tr><td>1. Providing access to government services through an integrated interface</td><td rowspan="2">Reducing operating and development costs</td><td rowspan="3">Releasing human resources<br><br>Complementing human resources<br><br>Completing machine-only tasks</td><td rowspan="2">Reducing administrative burden</td><td rowspan="3">Reducing the risk of fragmented coordination arrangements</td></tr>
<tr><td>2. Facilitating data integration through a common data platform</td></tr>
<tr><td>3. Providing common language, building blocks, and tools for service automation</td><td>Simplifying processes</td><td>Enabling personalized and proactive services</td></tr>
</table>

## What is the evidence?

In France, hundreds of social benefits are offered to citizens between the responsible bodies without coordination, making it difficult for people to determine their rights and learn the application procedures, while asking them to provide the same data repeatedly. This motivated the launch of the Mes Aides project, currently My Social Rights (OpenFisca, n.d.), and the resulting system based on OpenFisca. The system provides a simple integrated interface where citizens provide their data once, the system collects all eligible services, and citizens are directed to visit relevant agencies and request such services (Case 10).

In Spain, the Data Intermediary Platform enables public agencies to access over 130 types of data from 45 data sources. The platform integrates identity, residence, unemployment, cadaster, civil registry, and other types of data supplied by the General State Administration, autonomous communities, local entities, universities, and others (Ministerio de Asuntos Económicos y Transformación Digital, n.d.). Agencies that need data provided by different institutions do not have to negotiate individual access with them; rather,

they issue formal requests to the platform which then resolves all legal, technical, and administrative issues for them. The platform, one among many crosscutting platforms built by the Spanish government, facilitates and speeds up data integration processes needed for automation (Case 2). The platforms are accessed through common services that perform registration, notification, and other functions. Together, platforms and services allow all new solutions to implement common functionalities based on standard components so they can instead focus on fulfilling actual business goals and solving the real automation challenges (Case 7).

Also in Spain, the Government of Albacete provides a shared technical and methodological environment for its affiliate partners and other institutions, through which they can gain access to the language, tools, and data for automation projects. Within this environment, the partners can work directly on solving business problems, such as proactive service delivery, and the common functionality, such as access to data, is provided to them (Case 2).

In Sweden, the automated delivery of social welfare services relies on the digital service SSBTEK, which enables local governments to access sensitive data in the central government registries (Swedish Association of Local Authorities and Regions, n.d.). For example, SSBTEK provides records of citizens on long-time sick leave, student grants and loans, immigration data about people allowed to live in the country, and others (Case 5).

In Chile, an important barrier to automation is the lack of a digital government model, despite being stipulated in the digital transformation law, that enables whole-of-government solutions, facilitates their adoption by public agencies, and facilitates digital transformation. The absence, complexity, or lack of capacity to use such solutions forces organizations to find alternative ones (Case 6). There is also a lack of central platforms for digital notification, which forces the organizations or services that must notify citizens to implement the notification functionality themselves. In addition, the digital identification model of citizens and the interoperability platform needs to be strengthened (Case 6). The SUSESO experience highlights the importance of providing integrated platforms, starting with the basic services directory, and of enforcing their adoption (Case 6).

Also in Chile, one of the key success factors for automating the social security claims was following a component-based approach in system design, development, and deployment. The approach, required by the IDB as the funding agency, determined the construction of the technical platform from components and modules, and its division into four layers: integration, web, business process, and management (Case 6).

In France, according to the Law as Code project experience (Case 9), digital government can be built from different automation-ready components: datasets, rules as code, APIs, and others which are directly responsible for introducing and managing automation. Similarly, Estonia has six platforms to facilitate automation. One is X-Road, the interoperability platform serving as the data exchange layer between different government systems and databases. Other platforms focusing on security, addressing, data, classification, and documentation all rely on X-Road. This modular structure was conceived to avoid every agency or ministry developing common functionality by itself (Velsberg et al., 2020).

In Singapore, VITAL develops and shares common RPA scripts in its Bot Library. These include scripts for compressing and uncompressing files, reading configuration files, verifying file types, opening a browser, triggering emails of digital invoices, logging in to government services, and others. VITAL also provides other agencies with common automation processes, attended or unattended. The former include, for example, creating personnel details records, updating leave transactions, or updating casual timesheets. The latter include, for example, creating deposit records or monitoring late weekly invoice payments (Case 12).

# 5.5

# SUMMARY

Table 36 presents the evidence used earlier in this chapter to substantiate different factors that influence government automation. The evidence includes the case studies from Chapter 2 as well as four selected publications. The evidence is distributed equally between the four categories of factors. The strength of evidence for individual factors ranges from four to nine case studies or publications.

**Table 36.** Which Cases Substantiate Which Factors? Factor-to-Case Mapping

| | | | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 | Case 8 | Case 9 | Case 10 | Case 11 | Case 12 | (Rogers et al., 2020) | (Velsberg et al., 2020) | (Engstrom et al., 2020) | (Henriksen, 2018) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Σ | 5 | 9 | 11 | 4 | 6 | 13 | 10 | 7 | 9 | 3 | 5 | 6 | 7 | 6 | 2 | 1 |
| **1. Institutional readiness** | | | | | | | | | | | | | | | | | | |
| **1.1** | Automation is built on a digital infrastructure | **5** | | **x** | | | | **x** | **x** | | | | | | **x** | **x** | | |
| **1.2** | Automation requires Information technology governance | **4** | | **x** | | | | **x** | **x** | | **x** | | | | | | | |
| **1.3** | Automated decisions must rely on trusted, well-governed data | **6** | **x** | **x** | **x** | | | **x** | | | | | | | | **x** | **x** | |
| **1.4** | Automation and the associated change require organizational readiness | **6** | | **x** | | | **x** | **x** | **x** | **x** | | **x** | | | | | | |

| | | | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 | Case 8 | Case 9 | Case 10 | Case 11 | Case 12 | (Rogers et al., 2020) | (Velsberg et al., 2020) | (Engstrom et al., 2020) | (Henriksen, 2018) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ∑ | 5 | 9 | 11 | 4 | 6 | 13 | 10 | 7 | 9 | 3 | 5 | 6 | 7 | 6 | 2 | 1 |
| **2. Human capacity** | | | | | | | | | | | | | | | | | | |
| **2.1** | Automation needs human capacity in-house | **9** | x | | | x | | x | | x | | | x | x | x | x | x | |
| **2.2** | Automation needs competent and empowered staff | **6** | | x | | | x | x | x | | x | | | | x | | | |
| **2.3** | Automation relies on government-technology collaboration | **8** | | | x | | | x | x | | x | | x | x | x | x | | |
| **2.4** | Automation maximizes human-machine complementarity | **8** | | | x | | x | x | | x | x | | x | x | | x | | |
| **3. Process innovation** | | | | | | | | | | | | | | | | | | |
| **3.1** | Automation is about solving problems | **9** | | | x | x | x | x | x | x | x | | | | x | x | | |
| **3.2** | Automation should be preceded by simplification | **5** | | | x | | x | | | x | | | | x | x | | | |
| **3.3** | Automation should be introduced incrementally | **5** | | x | x | | | x | x | | | | | x | | | | |
| **3.4** | Automation outcomes must be subject to human review | **6** | x | | x | x | | | | x | | | x | x | | | | |
| **3.5** | Automation needs a paradigm shift towards trusted partners | **4** | | | x | | x | | | | | | x | | x | | | |

| | | | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 | Case 8 | Case 9 | Case 10 | Case 11 | Case 12 | (Rogers et al., 2020) | (Velsberg et al., 2020) | (Engstrom et al., 2020) | (Henriksen, 2018) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Σ | 5 | 9 | 11 | 4 | 6 | 13 | 10 | 7 | 9 | 3 | 5 | 6 | 7 | 6 | 2 | 1 |
| **4. Whole-of-government** | | | | | | | | | | | | | | | | | | |
| **4.1** | Automation needs public support | **6** | | **x** | **x** | **x** | | **x** | | | **x** | | | | | | | **x** |
| **4.2** | Automation is enabled by digital strategy | **6** | **x** | | **x** | | | | **x** | **x** | **x** | | | | | **x** | | |
| **4.3** | Automation calls for collaboration but fails in isolation | **7** | | **x** | **x** | | | **x** | **x** | | **x** | **x** | | | | **x** | | |
| **4.4** | Automation benefits from integrating capabilities across government | **6** | **x** | **x** | | | | **x** | **x** | | **x** | **x** | | | | | | |

# 6.

# CONCLUSIONS

Government automation follows a long tradition of automation in manufacturing, industrial, and, more recently, service processes. Automating government processes also presents unique challenges and opportunities beyond technical or technological considerations typical for industrial applications, including legal, institutional, and even cultural concerns. Given the scale and scope of government operations and the potential of automated government to affect entire populations, the stakes—benefits and risks alike—are high.

This report aims to comprehensively account for government automation as a unique domain of inquiry and practice. The report conceptualizes government automation as a subdomain of digital government, itself a subdomain of government in the traditional sense. Government automation is treated as an outcome of the availability of the automation technology, the expectation that automation delivers substantial public value, and the ability of a government organization to adopt the technology to produce such value. The report primarily concerns the expectations and the ability to meet them.

To this end, an established public value framework is put forward to systematize the kinds of values and disvalues that are delivered by government automation. Twelve case studies of government automation initiatives from around the world and relevant literature provide the evidence for identifying different benefits (values) and risks (disvalues) delivered by such initiatives, giving rise to the respective typologies.

The evidence is applied to systematize the lessons learned from government automation in the form of factors that can bring success or failure to such initiatives. In the end, the factors are linked to the benefits they can realize and the risks they can overcome.

The primary outcome is an actionable framework to help government decision makers plan, implement, and manage automation initiatives. The framework makes it possible to describe the circumstances of an automation initiative by outlining its political (public value), authorizing (strategic capabilities), and operational (operational capabilities) environments, with the expected benefits (value) and anticipated risks (disvalues) contained in the political environment. The circumstances described can lead decision makers to choose the factors to consider in planning and designing the initiative. They can further look at the evidence to see what approaches were used to implement those factors and adapt them to their circumstances for direct application.

This report is the outcome of a research process carried out on the body of evidence and literature present at the time of writing. The process is outlined in the Research Methodology section of the Appendix. As governments worldwide conduct more automation initiatives, more experience is obtained, and more lessons are learned, the body of knowledge about government automation will advance. The forthcoming editions of this report will track this progress to keep the body of knowledge updated, informing government automation initiatives in Latin America and worldwide.

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# APPENDIX

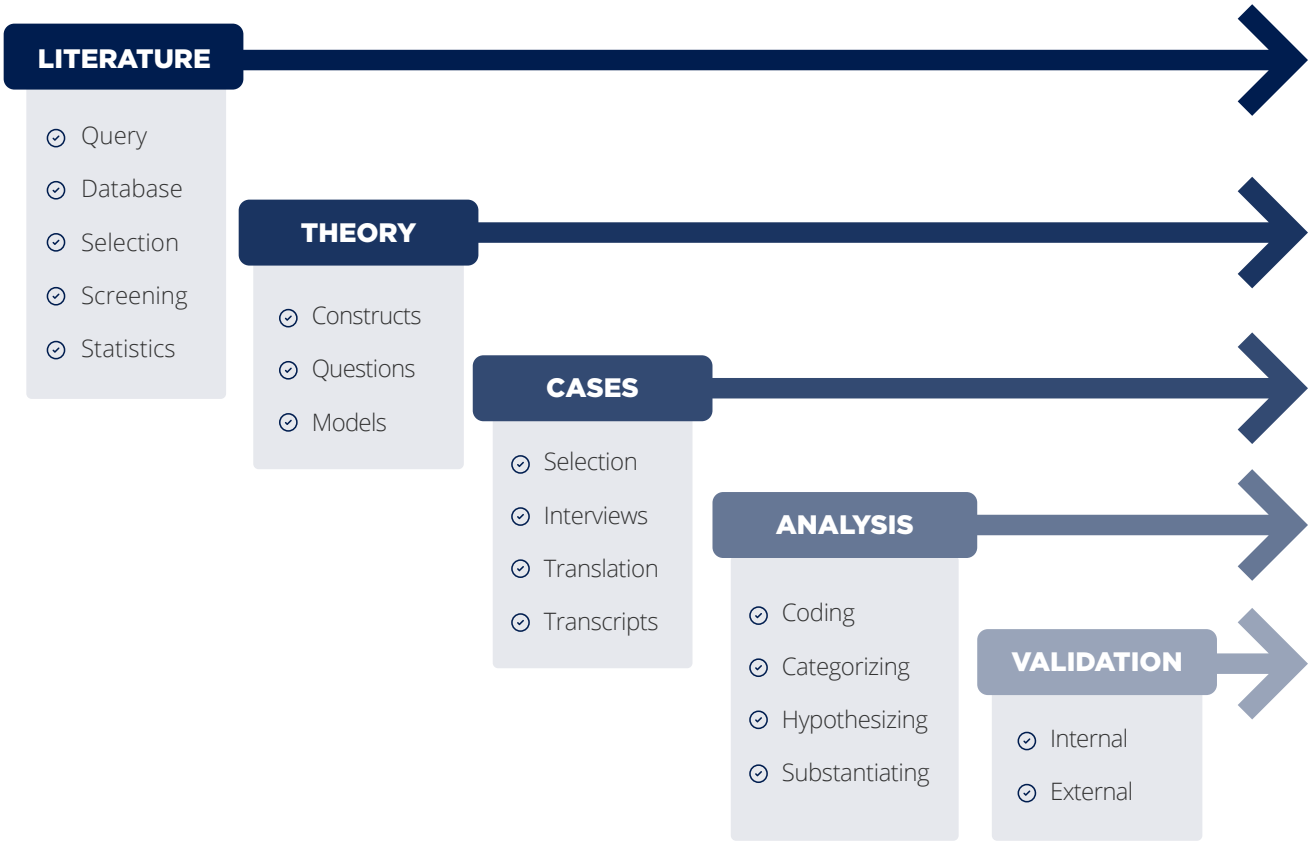
# A.
# RESEARCH METHODOLOGY

The analysis, insights, evidence, and findings published in this report are the outcomes of a systematic research process depicted in Figure 6. The process consists of six steps.

The first collects and organizes existing knowledge on government automation by identifying and analysing relevant literature. The second builds theoretical foundations aimed at challenging and extending existing knowledge on government automation. The third gathers empirical evidence on government automation initiatives conducted around the world, in the form of primary or secondary case studies. The fourth comprises the analysis of this evidence, conducted both within and across cases, to come up with findings: benefits, risks, and factors impacting government automation. The final step validates these findings, both internally against theoretical assumptions, and externally by seeking expert opinions.

The aim of this section, organized into six corresponding subsections, is to detail this process.

**Figure 6.** Research Process for the Government Automation Study



## A.1.
## Literature

The literature analysis aimed at uncovering the concept and state-of-the-art in government automation using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method (http://www.prisma-statement.org). The analysis mainly targeted the peer-reviewed, scholarly literature from the Scopus database (http://www.scopus.com). It also uncovered some non-peer-reviewed government literature through Google search.

The literature search applied the logical expression comprising the union (OR) of several near-synonyms of the keywords "automated government" or "automated governance," and the intersection (AND) of several near-synonyms of the keyword "automated" but without mentioning "government" explicitly. This is because "government" is occasionally used in article abstracts to refer to the source of research funding, not the topic of research.

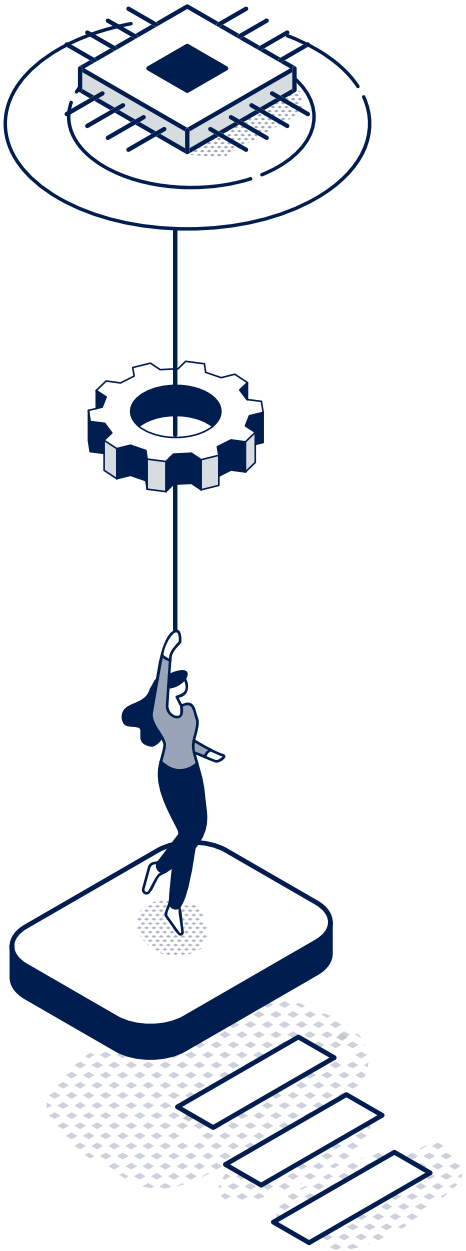
The expression was applied to article titles, abstracts, and keywords in Scopus. Conducted on 15.11.2020, it returned 2,170 results. Four exclusion criteria were used to narrow this set:

1. Publication language – 108 non-English articles were excluded from the study, leaving 2,062 articles.

2. Publication year – 986 articles published before 2010 were excluded to concentrate on the latest research, leaving 1,076 articles.

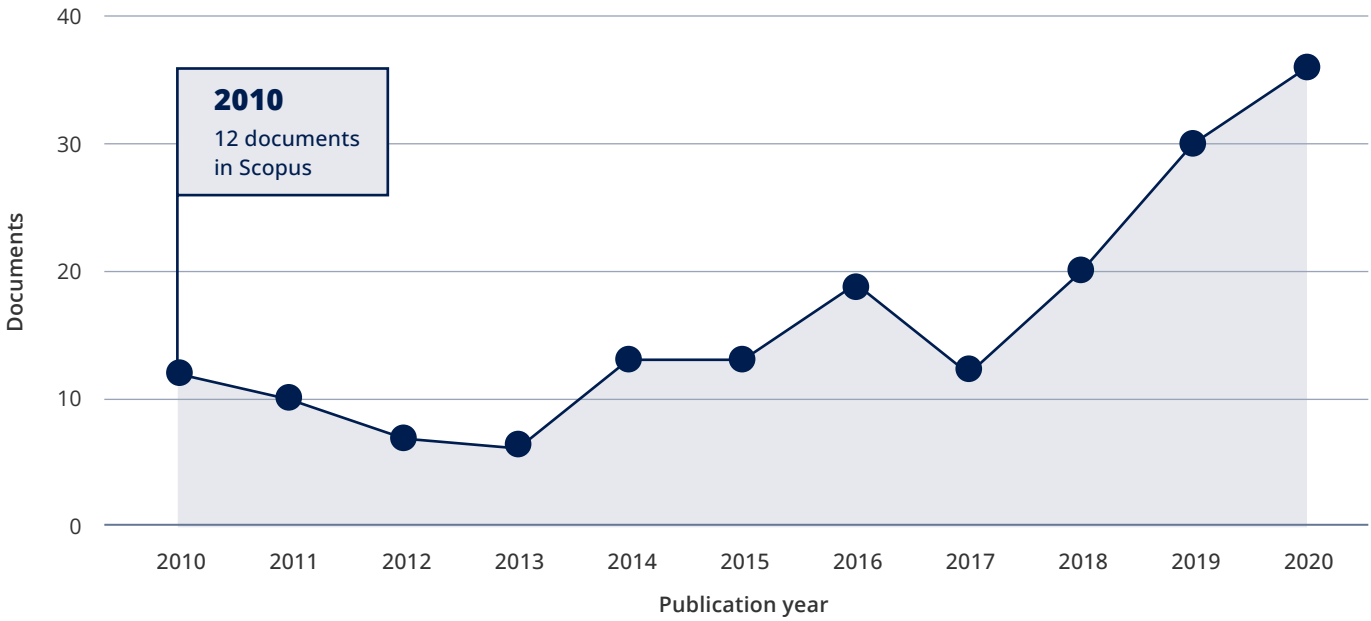
3. Document type – 519 conference papers, conference reviews, short surveys, notes, and editorials were excluded to focus on mature research, leaving 557 articles, reviews, books, and book chapters.

4. Subject area – 154 articles in natural sciences, medical sciences, engineering, and humanities were excluded, leaving 403 articles in social sciences; computer science; business, management, and accounting; economics, econometrics and finance; decision sciences; and multidisciplinary research.



The remaining documents were individually inspected concerning their relevance to the study. As a result, 225 documents were excluded, and 178 remained for further analysis. Among them, 54 documents were classified as methods, 60 as technology, 46 as policy, and 18 as cases of government automation. The publication years, sources, and subject areas of these documents are summarized in Figure 7. **References are made in Chapter 1 and throughout this report to some of the articles uncovered by this literature review.**

**Figure 7.** Statistics of Literature on Automated Government




## A.2. Theory

The study is guided by three research questions:

1. What are the benefits of government automation?
2. What are the risks of government automation?
3. What factors contribute to the success of government automation?

As success means realizing the benefits and addressing the risks of government automation, question 3 is related to 1 and 2. The factors link the characteristics of government organizations, their strategies, infrastructure, services and capabilities, and institutional environment, to the production of benefits and exposure to risks of government automation.

## A.3. Cases

The case studies include those developed specially for this report (primary case studies) and those documented in the literature (secondary case studies). We identified the primary case studies using five selection criteria:

1. the case pursues public value, not just technology-driven improvement;
2. the case entails explicit decision to automate part of government organization;
3. the case has consequence to the organization and its processes and culture;
4. the cases cover diverse national and sectoral contexts; and
5. experts with first-hand knowledge of the automation initiative are available.

We identified the secondary case studies through the literature reviewed, and selected them based on their relevance to the study. Table 2 presents the list of 12 primary case studies. Table 37 presents eight examples of the secondary case studies.

**Table 37.** Examples of the Secondary Case Studies

| ID | DESCRIPTION | COUNTRY | SOURCE |
|---|---|---|---|
| 1 | Immigration process control system | Canada | (Kuziemski and Misuraca, 2020) |
| 2 | Profiling and program assignment of the unemployed | Poland | |
| 3 | Utilizing citizen and business services through AI | Finland | |
| 4 | Helping municipal councils make better policy decisions with AI | United Kingdom | (Campion et al., 2022) |
| 5 | Predictor of financial service professionals violating federal securities laws | United States | (Engstrom et al., 2020) |
| 6 | Biometric Entry-Exit Tracking System | United States | |
| 7 | Accelerating social security appeals with the predicted likelihood of success | United States | |
| 8 | NLP for adverse event detection for medications | United States | |

We collected data for the 12 primary case studies through semi-structured online interviews attended by experts with first-hand knowledge and, in some cases, the responsibility for the documented initiatives. In total, we conducted 16 interviews, each lasting about one and a half hours, and all recorded following the experts' approval. For the secondary case studies, we used data available in the public domain.

## A.4. Analysis

Using the English interview transcripts, the researchers performed the first round of open coding to identify the major themes, resulting in 383 quotes grouped into seven themes.

In the second round, they conducted an axial coding, trying to identify relationships, conditions, and processes, and aiming to identify benefits, risks, and factors. In this round, the researchers classified and refined the codes and quotes, producing 66 references to benefits grouped into five categories; 30 references to risks grouped into six categories; and 24 references to factors grouped into five categories. The coding and concept formation follow Neuman (2011) and example codes are presented in Table 38.

**Table 38.** Examples of Interview Transcript Coding

| ID | THEME | CODE | QUOTE |
|---|---|---|---|
| **1** | Institution | Institution | UK Office for Artificial Intelligence |
| **2** | Initiative | Initiative | UK Gov Tech Catalysts |
| **5** | Challenge | Lack of awareness | The word automation is almost indistinguishable from software |
| **11** | Initiative | Initiative | UK National Data Strategy |
| **65** | Challenge | Lack of awareness | Government is using AI to achieve things like service delivery; however, they do not have clear understanding of what they are doing. |
| **130** | Enabler | Stakeholder engagement | You have to put them in context of your needs, but you have to talk to each other, you have to put them in common, because you don't do anything on your own. |
| **132** | Enabler | Civil servants as entrepreneurs | "Beta gouv" is an "intrapreneur" program that tries to help civil servants become intrapreneurs to create public services in the way we would create startups, to create digital services to public policy's problems. |
| **137** | Challenge | Human intervention | There is a lot of discussion about the capacity of algorithms of actually making decisions without human intervention, something in Europe that's being discussed and the actual legislation is like "we cannot have an algorithm decide for something that someone has a right or not. There must be at some point some human intervention." That's from a regulatory perspective. |
| **170** | Enabler | Following the trend | It is trendy to put an artificial intelligence component in every project. In fact, if you present a project that doesn't have the data science component, it won't be approved. |

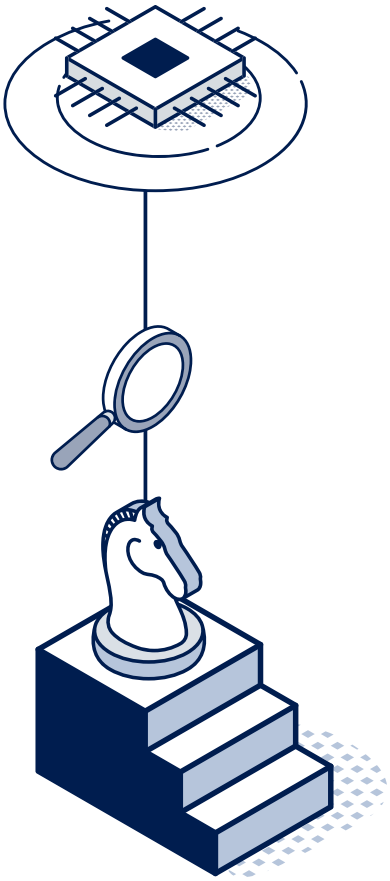
The researchers shaped hypotheses—mainly about factors—based on the knowledge gained from the interviews and the literature review, refining ideas, reviewing interview transcripts, and discussing the synthesis within the team. They also conducted six online meetings with the extended research team, including two with senior IDB experts.

After identifying the benefits, risks, and factors, the researchers documented evidence to substantiate them. For each factor, they synthesized the nature of the condition represented by it (What is this factor about?). They justified the factor's relevance based on its potential to achieve the benefits and address the risks, and its contribution to the dimensions of the public value framework in Figure 4 (Why is this factor important?). They also gathered the evidence of how different cases approach the factor's implementation, and what capabilities—operational, strategic, or political—the factor contributes to according to the strategic government triangle in Figure 5 (How is this factor implemented?). Finally, the researchers recorded the evidence for these findings (What is the evidence?).

## A.5. Validation

The main findings of this study are the benefit, risk and factor typologies. The researchers conducted the internal validation of these typologies by examining internal consistency (i.e., how the factors help realize the benefits or address the risks in the corresponding typologies). Internal validation also attempted to map the factors to the public value framework (which public values or disvalues they help realize) and to the strategic government triangle (which operational, strategic, or political capabilities they help produce).

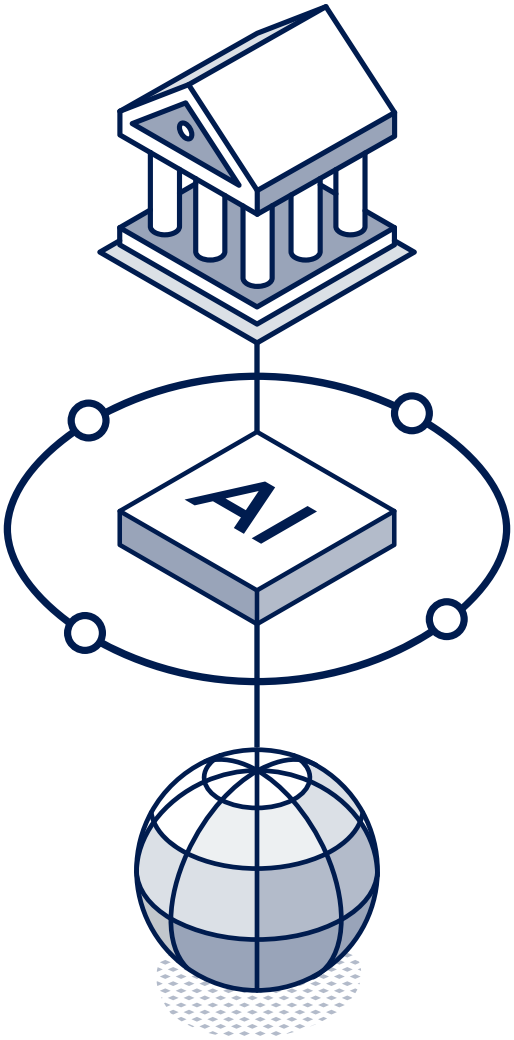
External validation of the results were conducted by presenting and discussing them with groups of digital government experts at three online events:



1. Validating the Rules of Government Automation, 23rd Annual International Conference on Digital Government Research. Theme: Intelligent Technologies, Governments and Citizens, organized by the Digital Government Society, June 15, 2022.

2. Validating the Rules of Government Automation, Smart Cities Smart Government Research-Practice Consortium meeting, organized by the Center for Technology in Governance, University at Albany, State University of New York, United States, June 29, 2022.

3. Combinatorial Innovation and Government Automation Typology, 2022 Samos Summit, University of Aegean, Greece, July 5, 2022.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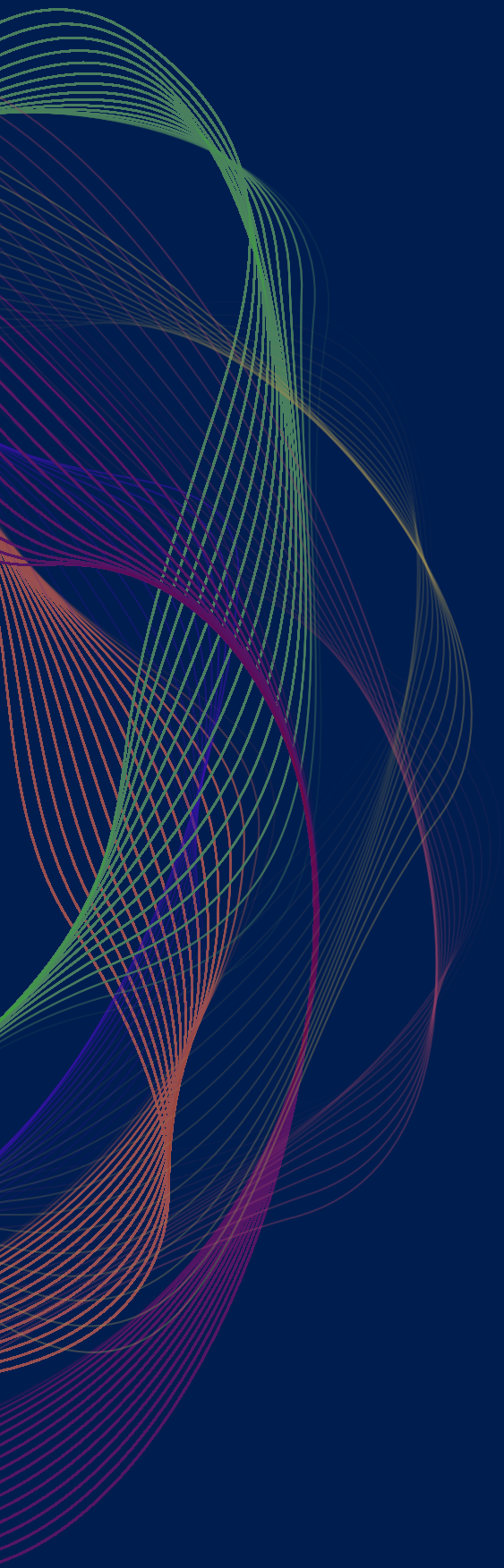

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