Government Trends 2025

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Built to deliver: Nine trends advancing government's capacity to deliver on big things

Governments around the globe are addressing contemporary challenges and enhancing public services through the strategic use of technology, innovation, and collaboration

Government leaders worldwide grapple with formidable delivery challenges as they strive to bridge the chasm between lofty ambitions—be it more affordable housing, energy resilience, or economic prosperity—and the stark reality of limitations in governmental capacity. This challenge is not merely about executing large-scale initiatives or investing in infrastructure; it is about fundamentally transforming governance mechanisms to improve speed, effectiveness, and efficiency.

In an era marked by escalating citizen expectations and the whirlwind of rapid technological advancements, often unpredictable in nature, the pressure on governments to deliver has never been more acute.[1] This is not simply a call for improved governance; it is a clarion call to revolutionarily change public management paradigms. Governments must become more agile and responsive, equipped to tackle the multifaceted challenges of our modern world.

The quest to close the gap between promise and performance is now a central focus for many government leaders worldwide, as they seek to enhance capacity and redefine what it means to govern effectively in the 21st century.

The evolving delivery challenge

Government's delivery challenge is hardly new. Delivering results has long been central to the legitimacy of governments. Starting several decades ago, many countries began developing highly structured approaches to improve execution across government, with a focus on addressing the gap between policy design and implementation.[2]

In the United States, in 2001, the President's Management Agenda laid the foundation for improving government efficiency, emphasizing accountability and execution.[3] The same year, the United Kingdom established the Prime Minister's Delivery Unit to monitor and accelerate the implementation of public service reform.[4] Numerous other countries—including Canada, Australia, Saudi Arabia, Ghana, and Costa Rica—emulated the delivery-unit model.[5] These units focused on delivering measurable outcomes and introduced performance metrics to improve public service delivery.[6]

While these early efforts achieved some success, political attention to delivery diminished over time, and many governments shut down their delivery units within a few years.[7]

Delivery excellence has once again risen to the top of many political leaders' agendas.[8] Today, however, governments are operating in a vastly different environment, encountering a range of factors that offer both challenges and opportunities for enhancing delivery mechanisms.

- **Waning public confidence:** Governments across the globe are navigating turbulent waters as they confront the dual challenge of rising citizen expectations and diminishing trust in large institutions. This erosion of public confidence can stifle innovation and constrain the very actions needed to address pressing societal issues.[9] Governments have the opportunity to incrementally enhance public trust through consistent, transparent, accountable, efficient, and empathetic actions. By focusing on these principles, governments can demonstrate their capability to effectively deliver services and meet the needs of the public.

- **Digital expectations:** Despite improvements, government digital services generally still lag the private sector.[10] In response to rapidly accelerating digital expectations, many governments have become more laser-focused on customer experience and digital delivery.[11] By crafting efficient, engaging, and user-friendly digital interactions, governments can empower citizens with seamless access to services and facilitate the execution of desired transactions.[12]

- **Emergence of artificial intelligence:** The emergence of artificial intelligence signifies a transformative era for public service delivery. AI is poised to revolutionize the delivery of programs, services, and initiatives, offering unprecedented opportunities for productivity and efficiency gains. Agencies that invest in scaling AI capabilities, enhancing data accessibility, and ensuring trustworthy AI are well-positioned to thrive in this AI-driven landscape. Conversely, those that fail to embrace these advancements risk falling behind.[13]

- **Complex cross-boundary challenges:** The complexity of today's most pressing challenges transcends traditional boundaries, demanding collaborative solutions that extend beyond the capabilities of government or the private sector alone. Governments that are willing to forge partnerships across sectors and leverage the strengths of diverse entities can significantly enhance mission effectiveness.[14]

To navigate the complexities of the modern era, governments should embrace transformative shifts that cultivate a culture of continuous improvement, accountability, and innovation. Central to this transformation is effective leadership—leaders who champion change and embed a results-oriented mindset that permeates every level of government. This mindset must prioritize adaptability, ensuring that government entities remain agile in the face of evolving challenges.

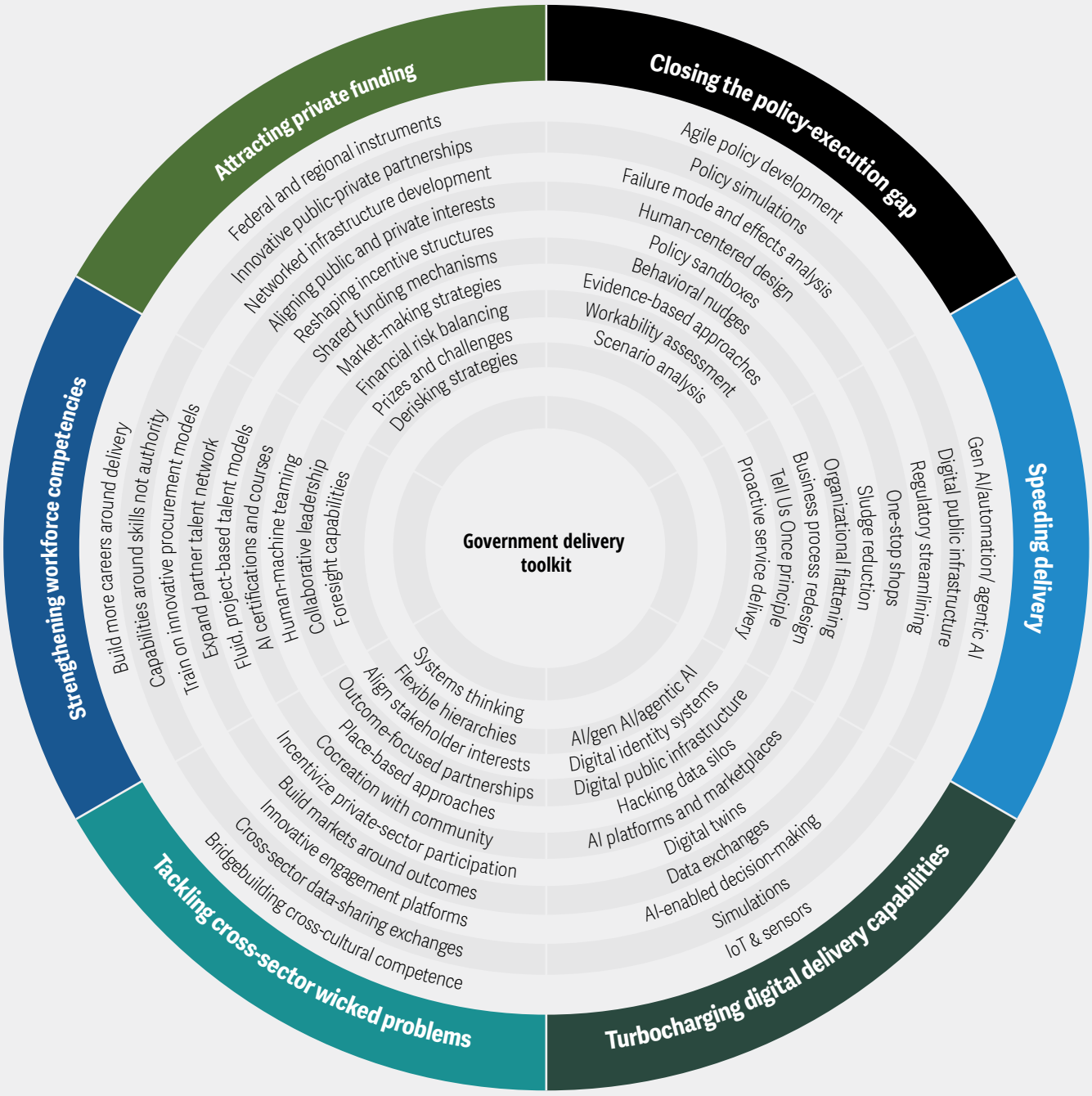
Tools of the trade: A broad portfolio of strategies to advance government delivery

In researching for Government Trends 2025, we found that governments worldwide, across levels, are leveraging a variety of tools and strategies to tackle some of the biggest delivery challenges, from the policy-execution gap and speeding delivery to tackling complex cross-border challenges and building digital delivery capacity.

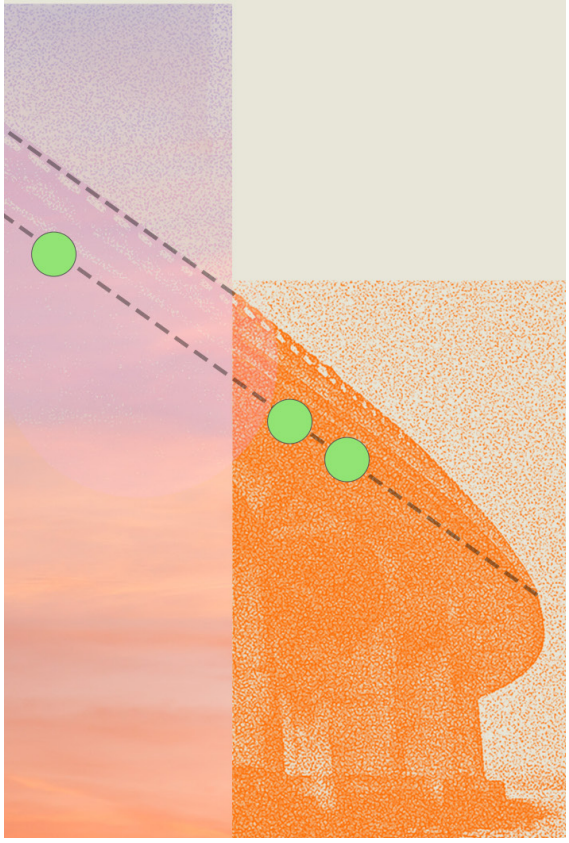
Closing the policy-execution gap: The root of many delivery challenges is the gap between policy design and implementation, when policy design is disconnected from the implementation process.[15] One issue: There is a structural separation between policymaking and operational delivery; policy is developed by one team, implemented by another, and monitored by yet another—often with limited communication among these groups.[16] To address this longstanding issue, governments are employing new technologies, data insights, agile development, cocreation, and behavioral insights to enhance policy effectiveness.[17] Broward County in Florida uses digital twins to predict extreme weather impacts on infrastructure for better planning,[18] while the United Kingdom's Behavioral Insights team boosted pension enrollment by making it automatic rather than optional.[19]

Figure 1

Tools and strategies for solving delivery challenges



Source: Deloitte analysis.



Speeding delivery: Outdated bureaucratic processes and structures and multiple layers of regulation and documentation hinder the agility of government systems. To address this issue, forward-thinking governments are streamlining government functioning by re-engineering workflows, integrating data systems, and simplifying organizational structures. The UAE's Zero Government Bureaucracy program aims to make procedures simpler, quicker, and more efficient by consolidating similar processes, eliminating unnecessary steps, adopting commercial best practices, reevaluating existing process controls, and leveraging digital tools to automate and expedite tasks.[20]

Turbocharging AI and digital delivery capabilities: Governments have made strides in digital transformation but can further enhance their digital infrastructure to boost efficiency. Rapid advancements in AI are prompting a reevaluation of bureaucratic frameworks as executives adopt digital solutions such as digital identity systems, data exchanges, new platforms, and customer experience tools to improve service quality and delivery.

Tackling cross-sector wicked problems: Leaders are working to build collaborations with diverse stakeholders by understanding their priorities, convening solution ecosystems, and defining their roles within the broader ecosystem. Australia has emerged as a leader in forming innovative public-private partnerships to encourage companies to develop next-gen energy infrastructure.[21]

Strengthening workforce competencies: Governments worldwide are investing in attracting, retaining, and upskilling talent to help their workforce navigate evolving demands. The advent of the AI era has brought a renewed focus on public sector productivity and managing the delicate balance in human-machine collaboration.[22] Governments must prioritize enhancing collaborative efforts within their institutions to establish strong connections with other stakeholders in the ecosystem. Singapore introduced a suite of AI-based solutions aimed at helping government employees boost productivity by automating daily tasks and enhancing large data set searches, nearly halving the time that employees spend on administrative tasks.[23]

Attracting private funding: Governments can struggle to deliver in critical capital-intensive areas due to inadequate funding and financing mechanisms, as well as risks that commercial partners see as too high.[24] To address these challenges, leading governments are exploring and adopting innovative ways to derisk such projects for the private sector by developing new financial instruments to attract private funds and catalyze new markets. India has been at the forefront of developing new hybrid-annuity revenue models to attract private sector participation in highway projects.[25]

Nine trends transforming government in 2025

Launched in 2019, the Deloitte Center for Government Insights' Government Trends report annually covers trends that continue to hold relevance today. Some trends, such as digital government, have been constant throughout the years. Others, such as quality of life and AI, have emerged more recently. The 2025 report identifies nine trends where governments are addressing delivery challenges.

Cross-cutting trends

Delivering on lower-cost, higher-value government: In the face of fiscal pressures, many governments are shifting their approach from seeking incremental changes and minor cost savings to fundamentally transforming the economics of fulfilling their missions. By achieving such enduring efficiencies, governments can transform their paradigms to deliver lasting and sustainable cost reduction. They aim to accomplish these objectives by enhancing operational efficiency, undertaking structural transformation, and mitigating fraud, overspending, and misuse of funds. These efforts can help streamline processes and optimize resources, potentially leading to significant and lasting financial savings.

State of play: Governments are shifting from short-term cost-cutting to sustainable strategies, leveraging AI, optimizing organizational structures, and working to eliminate persistent fraud. By embracing digital tools and structural transformations, leaders aim to increase efficiency, reduce costs, enhance service quality, and enable long-term financial stability.

Delivering on the promise of AI in government: Artificial intelligence has the potential to assist government organizations in addressing the ongoing challenge of balancing tight budgets with increasing citizen expectations. However, for AI to fulfill this promise, governments must do more than merely adopt the technology. They should ensure they have the right technology platforms, training, and partnerships to facilitate the widespread implementation of AI at scale across the organization. With government organizations beginning to lead the way in generative AI and agentic AI, the time has come to adopt these capabilities.

State of play: Many governments are taking an employee-driven approach to AI adoption. They are leveraging AI platforms, developing workforce AI fluency, implementing age Agentic AI, and implementing governance frameworks to scale AI solutions while balancing innovation with public sector responsibilities.

Delivering on reducing government red tape: Governments worldwide are looking for ways to reduce regulatory burden while safeguarding public interest. Through process improvement, workforce training, stakeholder engagement, and digital tools, they aim to improve the regulatory experience to drive business innovation, simplify citizen access to services, and reduce friction. Balancing the need for regulations with efficiency can help governments achieve better mission outcomes.

State of play: Governments are employing technological and business tools such as human-centered design, norm engineering, and AI to eliminate redundant processes and unnecessary paperwork, integrate data, and remove friction to provide better services to businesses and citizens and ease unproductive compliance constraints on government employees.

Delivering on public service modernization: Government services that involve both digital and physical interactions can present significant delivery challenges for governments—and can disproportionately impact citizen satisfaction.[26] By making ongoing process improvements and using innovative digital tools and new technologies such as digital ID and AI, governments can redesign services and simplify complex interactions. The focus on improving these "high-touch" interactions can enhance the customer experience and build public trust.

State of play: Government innovators are demonstrating how to deliver high-touch services better, faster, and more cost-effectively, both through small, targeted process updates and comprehensive redesigns of delivery systems.

Domain-specific trends

Delivering future-ready infrastructure on time and on budget: Despite infrastructure being an important foundation that contributes to making modern life possible, projects often are delivered late, over budget, and fail to meet society's evolving needs. Forward-thinking leaders are increasingly embracing new technologies and processes to optimize every stage of infrastructure development.

State of play: Governments are adopting digital twins and other novel technologies to help improve project planning and design as well as refining internal processes to streamline business-to-government interactions. They are redistributing financial risks to attract private-sector participation and helping to upskill the workforce to build future-ready infrastructure.

Delivering on a better quality of life: Governments face the task of creating the economic and social conditions that are designed to help citizens thrive. To do this, leading governments are retooling policy interventions to improve access to essential services and affordability while also designing physical and digital infrastructure to meet citizen needs.

State of play: Governments are reimagining policies and partnerships to make essential services more affordable and accessible, from housing to high-speed internet. They're investing in infrastructure and evolving new programs to foster stronger social connections to combat isolation and build vibrant, engaged communities.

Delivering an energy-resilient future: As global energy demand continues to surge, the energy landscape is experiencing significant changes with the increased incorporation of non-conventional energy alternatives into the mix. Governments are leveraging this transformation as an opportunity to adopt a holistic approach to managing energy demand and supply, diversify the energy portfolio, and develop resilient electric grids to build long-term energy resilience.

State of play: Governments seeking to build resilience and energy security are aligning their energy strategies, policies, and regulations; investing in future-ready energy infrastructure; and strengthening energy resilience at the community level.

Delivering on the jobs of the future: As rapid technological shifts create new roles while disrupting existing ones, the challenge of preparing workers for tomorrow's economy is increasingly urgent. With AI and automation reshaping the employment landscape, it's important to closely align workforce development with rapidly evolving market demands.

State of play: Government agencies are leveraging data analytics and industry partnerships to transform workforce development. Through expanded apprenticeships and innovative education models, leaders are working to bridge the growing gap between worker skills and employer needs.

Delivering on space development growth: The economic, scientific, and national security benefits of space development are immense. The space industry, in collaboration with national space agencies, is on the cusp of delivering societal and economic benefits through new activities and markets that can further space development. To accelerate these benefits, leading governments are supporting the development of new markets, evolving industry regulations, and fostering new international collaborations.

State of play: Government space budgets are increasing (particularly in defense), and much of that funding is fostering the growth of a growing commercial space industry. Leading governments are rethinking national regulations and international partnerships to help nurture new markets and opportunities. Increased geopolitical tensions, however, could impact future space development.

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Delivering on lower-cost, higher-value government

Governments are moving beyond tweaking their budgets to transforming the economics of mission delivery, driving efficiencies and enhanced value

Budget pressures for government are on the rise around the world, due to factors including slowing tax revenues, rising health care and entitlement costs, and interest payments on government debt. Many governments find themselves on an unsustainable fiscal path[1] (see "Governments in financial distress: A driving force for change").

Recognizing this, governments are moving beyond *tweaking their budgets* to *transforming the economics of delivering on their missions*. This trend covers a host of approaches that are creating significant and lasting cost reductions.

Faced with budget shortfalls, governments often adopt short-term measures that temporarily reduce outflows without changing their underlying cost structures. Short-term "fixes" such as hiring freezes, business travel restrictions, and delaying expenditures in areas such as training, maintenance, and IT modernization can make organizations less efficient in the long run because they leave the underlying economics of the organization largely unchanged.[2]

There is growing public concern across the globe about how taxpayer dollars are used.[3] Myriad strategies exist that can enable governments to bend the cost curve down on a more permanent basis, while still meeting citizens' service expectations.

This trend highlights the tools and key strategies governments are employing to deliver on lasting cost reduction. These cost management approaches, unlike traditional cost-cutting measures, take a broader, more integrated view of the organization and its mission. As shown in figure 1, these approaches fall into three main categories:

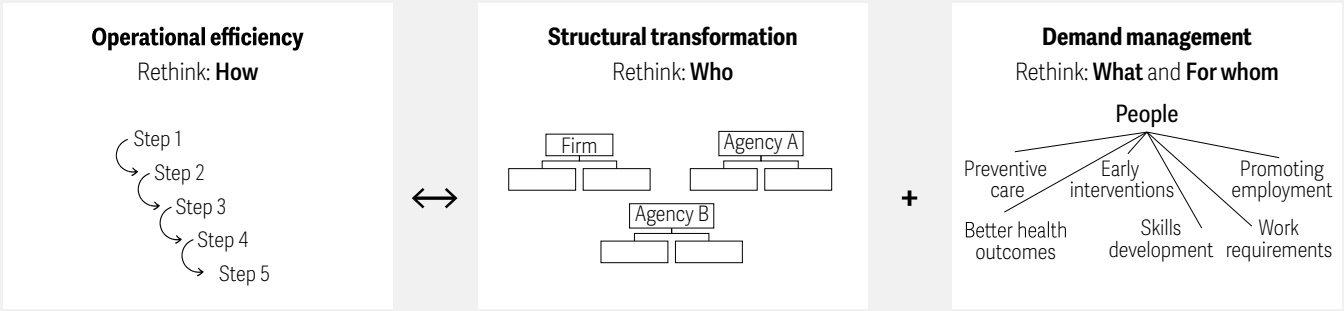
Operational efficiency: Rethinking the "How" This includes introducing new technologies, including AI and gen AI, that can fundamentally alter the cost structure of service delivery. Enhancing efficiency also includes reengineering processes to streamline workflows and internal systems, and taking steps to reduce waste, fraud, and abuse.

Structural transformation: Rethinking the "Who" These approaches include substantive structural and operational changes that involve new ways that public sector institutions deliver on their mission. Such strategies may include mergers, reorganizations, shared services models, and various forms of public-private approaches and privatization to address public challenges.

Demand management: Rethinking the "What" and "For Whom" These strategies reduce the demand or need for certain programs while still delivering essential services to those in need. Demand management is often most effective in the areas of health care and social welfare spending, which have been a growing portion of government costs.

Figure 1

Government cost transformation strategies



Source: Deloitte analysis.

GOVERNMENTS IN FINANCIAL DISTRESS: A DRIVING FORCE FOR CHANGE

In the last quarter of 2024, global government debt reached an unprecedented US$95.3 trillion, while the projected global GDP for the year stood at US$109.5 trillion.[4] The International Monetary Fund projects that if the current trajectory continues, global public debt will surpass US$100 trillion by the end of 2024, with the global debt-to-GDP ratio approaching 100% by the end of the decade.[5]

France's debt has surged from 98% of GDP in 2019 to 112% in 2024, driven by efforts to mitigate economic disruptions due to COVID-19 and the Russia-Ukraine war.[6] This has resulted in higher borrowing costs and reduced investor confidence. The United Kingdom faces a similar predicament, with borrowing reaching £131.1 billion in the financial year ending March 2024 and debt hitting 100% of GDP.[7]

In the United States, government debt held by the public is nearing US$27.5 trillion,[8] or 100% of GDP.[9] In 2024, for the first time in modern history, interest payments on the national debt exceeded spending on national defense—and interest costs are projected to increase.[10] The US Government Accountability Office (GAO) noted that long-term fiscal projections show that "the current federal fiscal path is unsustainable."[11]

State, local, and regional governments globally are also grappling with significant budget deficits. In Canada, the combined provincial deficit surged from CA$10.6 billion in 2023 to CA$27.9 billion in 2024. Additionally, the total provincial debt is expected to increase by more than CA$65 billion in 2025 marking the largest annual increase on record.[12] In the United States, some states are experiencing budget shortfalls.[13]

What makes controlling costs such a challenge?

Agency leaders face stubborn obstacles to controlling costs—some long-established challenges, others more recent arrivals, and some on track to only grow in the years to come.

- **Aging populations** are driving up benefits spending around the world, with Organisation for Economic Co-operation and Development (OECD) nations devoting an average of 21% of GDP to social programs in 2022.[14] These programs offer broad-based benefits and are often politically popular, leaving less money for programs that are more discretionary.[15]
- **Demand is rising** for many government services even as **costs continue to climb** for providing services such as health care and education.

- **Up-front investments for long-term solutions can be hard to come by.** Public budgets are often constrained in providing the funding needed to make big improvements, especially when the benefits of the spending may not occur within the term of the current administration.

- Government leaders can be **risk-averse** when it comes to fundamentally transforming operations or taking drastic measures like closing facilities. This stems from the fear of potential backlash or negative public perception if things don't go as planned. Consequently, they often revert to familiar and tried-and-tested short-term fixes to cut costs.

- **Technical debt** entails the high cost of maintaining legacy technology, which makes it even more difficult to invest in modernization.[16] Moreover, this outdated tech infrastructure makes it harder to utilize cutting-edge technologies to streamline tasks.[17]

- **Procurement processes** in government can be inefficient and may waste up to a quarter of the US$13 trillion that global governments spend annually on goods, services, and public works.[18]

- **Siloed structures** within government, with overlapping services and different planning and accountability methods, make it hard to make decisions efficiently and save costs.

- **Cost information gaps** can mean that leaders don't have the data to accurately determine the true costs of government operations. This gap hinders their ability to make informed strategic decisions.

Trend in action

Operational efficiency

Goal: Improve employee and process efficiency/ productivity often via technology investment, while simultaneously improving the customer experience

Next-gen digital approaches offer the opportunity to alter the economics of public sector operations. AI and other digital technologies can help create tremendous public value, just as companies have used them to generate enormous market value.

Implementing these approaches well is complex. It may require technology investments, or changes in legislation, or significant changes to organizational culture. These technologies, however, can ultimately repay the investment many times over.

AI, productivity, and operational improvements

Productivity is about achieving more with the same inputs. As technology continues to boost productivity in the private sector, public expectations for government to realize similar gains also increases.

A new era of technology tools, in particular AI, gen AI and agentic AI, are ushering in a new generation of cost management in government as well as the private sector. A Microsoft study found that 70% of employees across industries report an increase in productivity from AI and a 29% faster completion rate in tasks such as researching, summarizing information, and enhancing content.[19] The cost of automating tasks is falling rapidly: Early AI adoption often required high investment charges, and the skills needed were scarce. Today, introducing new AI platforms typically demands far less investment of resources. Newly developed digital tools can change the fundamentals of mission economics and work, enabling government agencies to do more with less.

Leaders can use these flexible tools to both enhance existing operations *and* enable entirely new approaches. Digital twins can help find optimum workflows and aid in policy scenario planning. AI-enabled process and service redesign can help leaders understand the art of the possible around how organizations can be more optimally organized.

Agencies have processes and systems that can be made more efficient with the application of technology. The challenge for leaders is to identify and implement the optimal technology solutions, transform business processes to be more cost-effective, and update talent policies to fully realize employees' potential in a manner that is outcome-oriented.

AI and beyond

- In the United Kingdom, Swindon Borough Council developed a gen AI application that translates complex government documents into easy-to-read formats, making them easier for individuals with learning disabilities to understand. The tool can effectively translate documents into 75 different languages, reducing translation costs from £120 per page to less than 10 pence.[20]

- Over a six-month period, the Digital Transformation Agency of Australia made Microsoft 365 Copilot available to more than 7,600 employees across more than 60 government agencies to assess gen AI's impact on employee productivity. The tool saved each employee an average of one hour a day on administrative tasks.[21]

- In 2023, Brazil's National Treasury introduced PagTesouro-GRU, a digital tool for automating tax payments for entities without their own systems. Handling 27,000 requests daily, the platform has reduced government fee processing time significantly.[22]

- With a large chunk of government spending in most countries going to health care, many leaders are looking to new technologies to boost the productivity—and lower the costs—of health services. International Data Corporation estimates that gen AI will free up 10% of clinicians' time, leading to nearly US$100 billion in annual health care savings in the Asia Pacific region, excluding Japan.[23]

Automation

- In 2015, health care provider North Tees and Hartlepool NHS Foundation Trust launched a transformation aimed at digitizing paper-based systems, giving clinicians an enhanced decision-support tool, and revolutionizing emergency and inpatient wards by creating an electronic prescribing and medications administration module. With the system finally fully operational, administrators have reported dramatic reductions in medication errors and, equally important, freeing nursing staff by nearly 20,000 hours annually to spend time on direct patient care instead.[24]

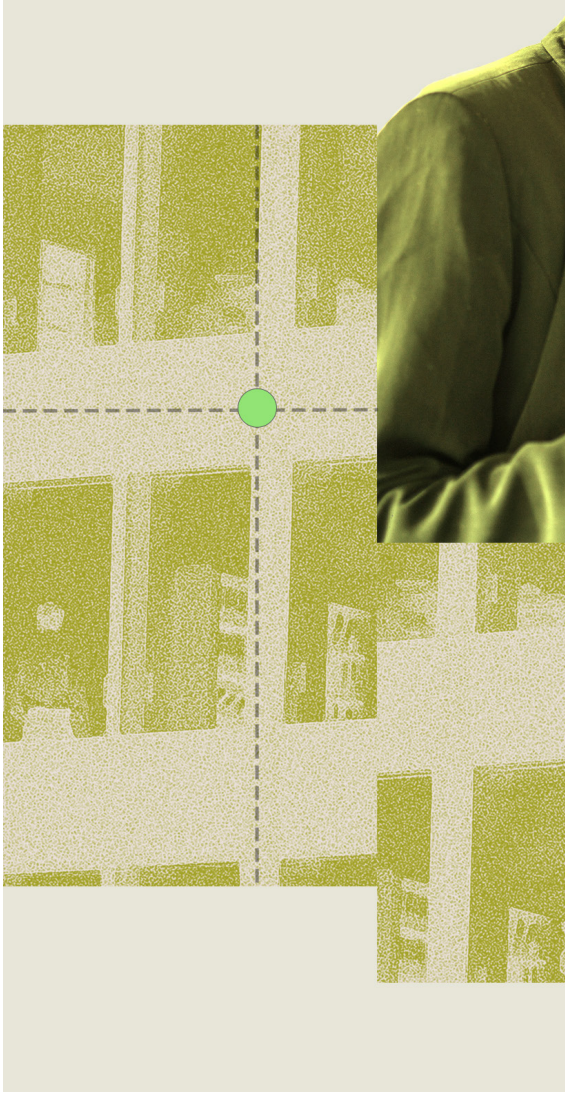
- The state of Ohio implemented a suite of bots to streamline administrative tasks for case workers handling Medicaid, SNAP, and TANF services. The Department of Rehabilitation and Correction bot saves case workers hundreds of hours monthly by directly incorporating new incarceration data into the Ohio benefit system, automatically updating case information, redetermining eligibility, and sending reports to county workers for cases that need follow-up. Each month, the bot reviews 4,000 new incarceration alerts, processing 60% of them within 24 hours. Alerts that require additional context are automatically passed to human caseworkers—ensuring a critical human-in-the-loop safeguard in place for complex eligibility decisions.[25]

Technology infrastructure

- With redundancy a persistent hurdle to controlling costs, many government leaders see real opportunity in transforming agencies' technology infrastructure. Indonesia is in the middle of an effort to consolidate some 27,000 government applications into a single "super app" that citizens can use as a portal to access administrative agencies and government services, as well as for civil servants to access employment-related functions.[26]

- Single-use, custom-built applications often add to inefficiencies, increasing operational and maintenance costs, especially as redundancies accumulate. The US Navy is consolidating some 200 HR applications in an initiative called MyNavy HR, expected to save countless hours and dollars.[27]

- A solid data and technology infrastructure can streamline processes and reduce operational costs. In 2010, the Indian government launched India Stack, a cross-agency suite of digital financial frameworks and products, to boost financial inclusion and make it easier for citizens to secure bank accounts. This initiative, lowering banks' cost of onboarding new customers from US$23 to only 10 cents, has led to more than 500 million Indians opening new accounts.[28]



Reducing fraud, waste, and abuse

Any successful attempt to eliminate waste, fraud, and abuse is the equivalent of found money—money that can be saved or used to deliver real value. Consistent with traditional cost management tools such as quality management and reengineering, this means taking a more holistic approach. It also requires leaders to recognize, as cost-of-quality studies have shown, that an ounce of prevention can be worth many pounds of cure.[29]

The GAO estimates annual losses to the US federal government from fraud between 2018 and 2022 to have been between US$233 billion and US$521 billion.[30] In the United Kingdom, officials estimate that fraud costs 0.5% to 5% of all government spending.[31] Armed with new tools, agencies are tackling this venerable problem by employing a variety of strategies.

One effective approach has been fast and agile collaborations that involve sharing data and intelligence to keep pace with evolving criminal strategies. Members of the Joint Chiefs of Global Tax Enforcement, a transnational joint operational group formed in 2018, develop strategies for gathering information and intelligence, communicate regularly, and conduct joint investigations.[32]

Advanced analytics and AI offer the ability to work with large sets of transactions to more effectively identify complex fraud patterns, limit false positives, increase operational efficiency, and avoid fraudulent losses. The UK Public Sector Fraud Authority, created in 2022, saved £311 million in fraudulent activity in its first year using this approach, collaborating with more than 1,000 public bodies to compare records and identify discrepancies, using advanced tools to identify potentially fraudulent activity.[33] Similarly, the US Department of the Treasury successfully prevented and recovered more than US$4 billion in fraud and improper payments in fiscal year 2024, a significant increase over previous years, by leveraging data-driven strategies. AI-based applications flagged high-risk transactions; machine learning helped to detect Treasury check fraud.[34]

Strengthening fraud monitoring for grant programs can also significantly reduce costs to programs. By combining technology, collaboration, and comprehensive oversight, organizations can significantly reduce fraud risks and associated costs, ensuring that grant funds achieve their intended purposes.

A strong digital public infrastructure (DPI) can help prevent leakages in government service delivery. India's DPI program is a suite of standards and platforms—such as digital identity, digital payments, and data exchange systems—that helps agencies deliver essential services to citizens at scale. DPI has enabled Indian agencies to remove duplicate beneficiaries and properly direct aid to farmers as well as elderly, underprivileged, and other citizens. The country's journey to develop DPI began with the digital Aadhaar identity system, with the government linking Aadhaar to beneficiaries' bank accounts for direct deposits. As of July 2024, DPI has saved the government more than US$41 billion by preventing leakages in benefits transfers.[35]

TOOLS FOR OPERATIONAL EFFICIENCY

AI, cloud, and Internet of Things: Invest in next-generation approaches to foundationally alter the economics of public sector operations. These technologies have the potential to enhance almost everything government does, from education and health care to policing and transportation.

Behavioral economics and nudge thinking: Design environments that help humans make better decisions, leading them to beneficial outcomes and improving compliance of government policies.

Data integration and analytics: Make sense of operational data and turn it into usable insights to improve resource allocation of people, physical assets, and money.

Digital public infrastructure: DPI is composed of open, interoperable digital tools that serve as the foundation for higher-level services. Governments must build a road map to pick the right mix of tools and technologies based on their unique circumstances (see "**The building blocks of monumental government service delivery**").

Business model transformation: Align business model with mission requirements by creating distinct value propositions and forming long-term approaches and partnerships.

Portfolio optimization: Assess functions to determine if portfolio changes better drive mission outcomes delivery of services to citizens.

Process optimization/business process redesign: Simplify, standardize, reengineer, and automate end-to-end processes across the organization (for example, task automation). This also applies to reducing friction and "sludge" as well as reducing red tape.

Organization design: Align the organizational structure, including reporting relationships, sizing, and shape, to operating and mission requirements (for example, workforce planning and analysis).

Service delivery model: Optimize "what work is performed, where" across departments and agencies, including shared services, outsourced partners, and operating companies.

Improved asset efficiency: Optimize operations and reduce redundancy within major processes.

Structural transformation

Goal: Pursue substantive structural and operational changes that reduce government's cost base

Consolidation

For obvious reasons, government agencies are far less likely to engage in mergers and acquisitions than for-profit entities. But consolidations or restructurings of public sector institutions do occur, and leaders are increasingly considering such moves. The underlying drivers may vary, but the goal is to cut costs and enhance effectiveness by streamlining and integrating services.

Consolidation of academic institutions. In recent years, declining enrollments and financial pressures have forced many small colleges to close or merge. Since 2016, nearly 60 public educational institutions in the US have either initiated consolidation efforts or announced their intentions to do so.[36]

For instance, in 2020, with the COVID-19 pandemic exacerbating existing problems, the state of Vermont began the process of closing three of the four Vermont State College campuses—part of a system facing a US$25 million combined structural deficit—and reopening them as Vermont State University. Through this consolidation effort, aided by federal funds, leaders cut 150 redundant academic programs, ramped up hybrid learning, reorganized infrastructure, and shrank the overall campus footprint.[37] By the second year of consolidated operation in fall 2024, year-over-year enrollment had grown 14%.[38]

In 2023, Connecticut merged its dozen separate community colleges into the Connecticut State Community College, becoming the state's largest institution of higher education, spread across multiple campuses. Through administrative restructuring and other cost reductions, leaders aim to save more than US$40 million annually.[39]

Data center consolidation. Government leaders elsewhere are looking to improve efficiency by consolidating data centers and other IT infrastructure across agencies. As part of the US Office of Management and Budget's (OMB) ongoing Data Center Optimization Initiative, the Department of Defense shut down 46 data centers while identifying additional cost savings of US$178.5 million in 2020 alone.[40] The US Department of Health

and Human Services also saved costs through data center closures—49 of them between 2016 and 2022—outsourcing and migrating to cloud. Since 2016, the department calculates at least US$340 million saved through cost savings and avoidance.[41] All in all, the OMB initiative helped federal agencies save a total of US$5.7 billion between fiscal years 2011 and 2021.[42]

Shared services

Shared services occurs when agencies source their mission support needs from a handful of other government agencies approved as service providers in particular areas, such as financial management, human capital, and acquisition. The goal is not simply to migrate services to a single large government provider; it is to find the best option for each service, wherever that option resides. In 2024, the United Kingdom launched an initiative under which three major UK government departments—HM Revenue and Customs, the Department for Transport, and the Ministry for Housing, Communities and Local Government—will create a shared digital platform for HR, finance, and procurement services. This shift is expected to lower costs and offer more streamlined services.[43]

Privatization and public-private partnerships

Privatization can help governments turn dormant physical capital into financial capital—and benefit governments financially by putting the assets on the tax rolls. Governments with underperforming assets such as parking lots, water facilities, and golf courses can use those assets to raise revenue through privatization.

In 2022, India privatized its state-run airline, selling Air India—which cost the government US$2.4 million a day to operate—to the Tata Group for US$2.3 billion.[44] Since privatization, Tata has focused on restructuring, upgrading IT infrastructure, and releasing digital apps; the privatized airline has placed the largest aircraft order in Indian history,[45] and in November 2024, Tata completed a merger of Air India with Vistara, bringing Singapore Airlines into a consolidated partnership.[46]

Government agencies can also consider forming alliances and strategic partnerships with private sector entities to enhance service delivery and capture value as part of the overall mission. Such alliances can attract new investments and introduce innovative private sector practices. These alternative delivery models offer significant opportunities for cost savings.[47]

Real estate portfolio rationalization

Today, government organizations are taking a hard look at the assets that make up their current footprints. Both direct facilities costs and associated costs, such as local management, represent significant expenditures.

Current physical configurations reflect past decisions, demographics, and needs. More importantly, they reflect historical trade-offs among service delivery, costs, and physical proximity. For many agencies, technology has fundamentally changed these trade-offs. Leaders may find significant savings through a process that begins by asking, *What work should be done and where? What infrastructure is needed to get that work done?* and *Do we need all these facilities?* Technologies, real estate markets, labor pools, and costs may have changed enough to make it worth reevaluating the current configuration.

In Ottawa, the federal public works department, Public Services and Procurement Canada, holds the second-largest portion of government floor space after the Department of National Defense,[48] with 6.2 million square meters of office space.[49] With hybrid work increasingly prevalent, the department is looking to halve its real estate footprint, generating income from sales and savings on rent and maintenance.[50]

In the United States, the General Services Administration (GSA) sees a similar opportunity to reduce the federal government real estate portfolio by 30%, saving up to US$60 billion over a decade. This effort is in addition to the GSA's ongoing initiatives since 2013, which have already reduced federally owned office space by 12 million square feet and leased space by 18 million square feet.[51] Additionally, the Department of Defense has saved US$12 billion annually from five previous rounds of base closures and consolidation through the Base Realignment and Closure (BRAC) process.[52]

TOOLS FOR STRUCTURAL TRANSFORMATION

Operating model redesign: A redesign of an agency's operating model or structure in whole or part. Examples include reevaluating the role of agency headquarters versus program areas, consolidating functions or program areas, and moving to a fee-funded or cost recovery service model.

Organizational structure optimization: Reviewing the organizational structures can lead to cost reduction and improved decision-making efficiency by streamlining and consolidating operations, reducing management layers, eliminating duplicate functions, and optimizing spans of control.

Carve-outs and spin-offs: Involve separating a portion of significant processes/activities to create a new entity. In a carve-out, the entity is stood up entirely separately, while in a spin-off the government retains control of the new entity.

Portfolio optimization: Assess functions to determine if portfolio changes better drive mission outcomes delivery of services to citizens.

Service delivery model: Optimize "what work is performed, where" across departments and agencies, including shared services, outsourced partners, and operating companies.

Alternative service delivery: Where workforce analysis identifies non-core/strategic capabilities or specialized skill gaps, and the business's workforce plans identify that "borrowing" the skill is the best way to acquire it, agencies may wish to strategically find alternative service delivery options such as managed services for certain functions or services. Through alternative service delivery options, government can potentially benefit from cost savings, increased flexibility, and access to specialized skills without the need for maintaining a large permanent workforce.

Commercialization: Upon commercialization, most agencies operate as revenue-dependent organizations, applying commercial best practices. A primary benefit of commercializing a government entity has been increased management latitude to more effectively pursue reductions in operating costs in a commercial operating model.

Public-private partnerships (PPPs): Governments can enter into partnerships with private entities to manage and maintain their physical assets. This allows governments to transfer some of the operational and financial risks to private partners while still retaining ownership. PPPs can bring expertise, innovation, and efficiencies that can lead to cost savings in asset management.

Real estate portfolio rationalization: Consolidate, redesign, and reduce underlying real estate and optimize the delivery of real estate–related services.

Demand management

Goal: Reduce the demand for certain programs

Government spending on social welfare globally has risen over the last century, with wealthier countries now allocating between 15% to 30% of GDP to retirement benefits, health care, education, housing, and other basic services (figure 2). The spending numbers rarely fall. Over time, the expectation of these benefits makes it challenging for lawmakers to reduce costs in this area.

Some governments are looking to better manage public demand for this suite of health and social services, in particular through policies that promote employment and reduce demand for health-related services through whole health, preventive health care, and early intervention.

Promoting employment

For working-age constituents, some government agencies are rethinking social welfare, shifting programs from merely delivering financial assistance to also promoting employment, with the receipt of benefits being contingent on individuals seeking work and developing their skills.

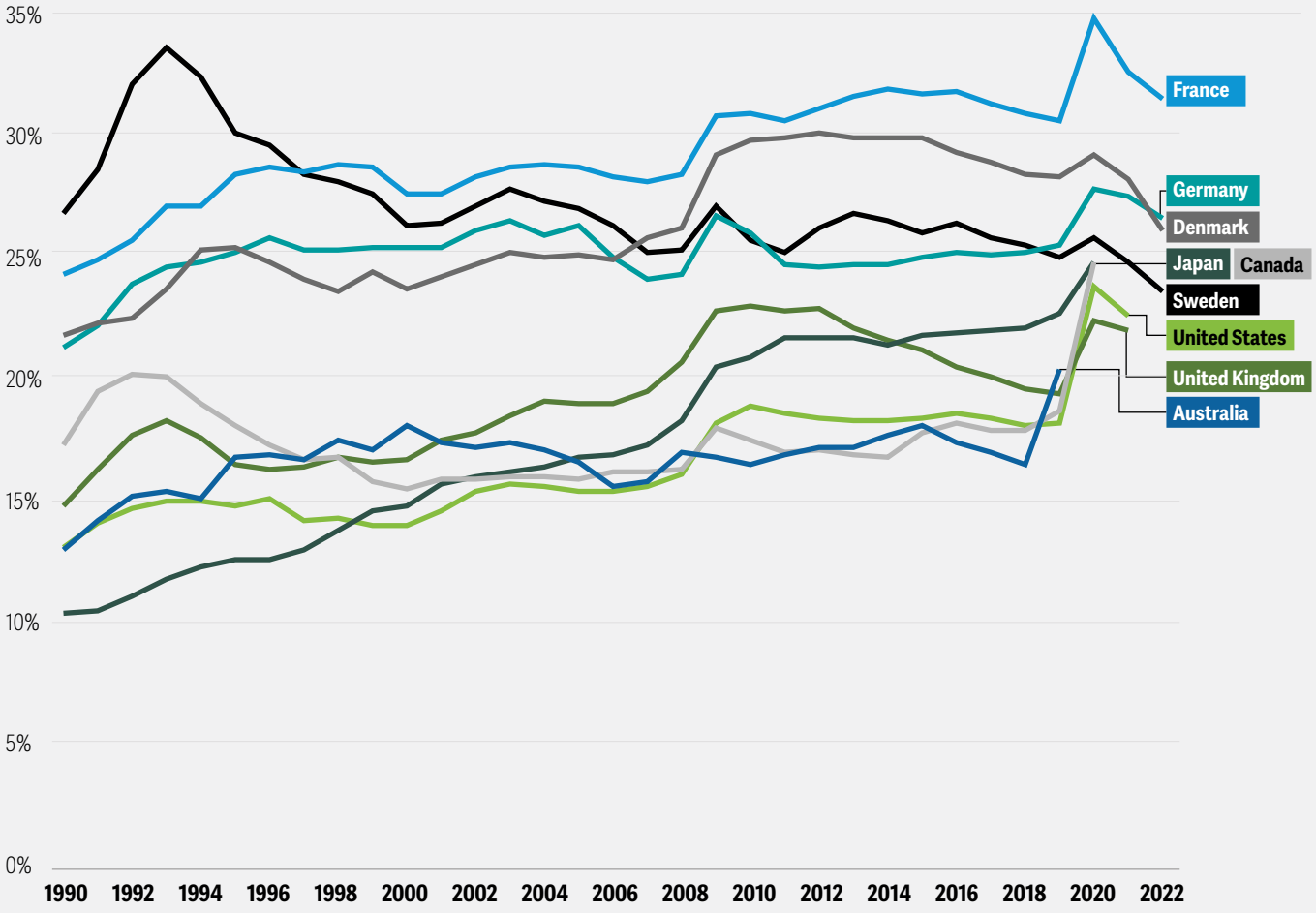
Active labor market programs—which help individuals find work, improve their skills, and succeed in jobs—can help reduce the demand on social welfare programs.

Ontario's poverty reduction strategy aims to help transition individuals from social assistance to employment through a comprehensive suite of supports. The province offers job placement assistance, skill training programs, and additional supports such as housing stability, crucial for enabling individuals to secure and maintain employment. In 2023 alone, more than 28,000 Ontario households successfully transitioned from social assistance to employment.[53]

Figure 2

In wealthy nations, government social welfare spending has steadily risen over the last century

Public social spending, percentage of GDP



Source: Social Expenditure Database, Organisation for Economic Co-operation and Development.

Similarly, the UK government designed its all-in-one Universal Credit program to facilitate employment by gradually reducing benefits as income increases rather than abruptly withdrawing support. This approach has proved particularly beneficial for lower-income individuals, encouraging them to take on jobs or work more hours without the fear of losing all their benefits at once. Participants are required to regularly meet with a work coach and take proactive steps to boost earnings.[54]

Denmark's labor policies combine labor market flexibility with active assistance for individuals. In its "flexicurity" model, the government assumes responsibility for retraining and reintegrating laid-off workers into the

workforce as quickly as possible. In exchange for benefits, unemployed individuals are required to participate in active labor market programs. These programs cost approximately 2% of GDP per year, making Denmark the OECD country that invests the most in active labor market policies, by a wide margin.[55] Since 2014, the number of social benefit recipients has decreased as more Danes have moved into employment.[56]

Reducing costs by improving health outcomes

Struggling with rising health care costs, governments are increasingly adopting a whole-health approach that emphasizes wellness rather than just treating illness.[57] Programs typically include preventive and early care services such as cancer screenings and pregnancy care along with wellness promotion activities such as anti-smoking campaigns.

To improve populations' living conditions and invest in lifelong health development, health care organizations and government agencies are increasingly addressing the drivers of health and factors such as lifestyle, nutrition, socioeconomic status, education, and environmental conditions that disproportionately affect health outcomes.[58] These measures aim to improve overall health and reduce emergency room visits, ultimately lowering government spending.[59]

The state of North Carolina has adopted a payment model rewarding providers that improve population health outcomes at a lower cost of care. Incentivizing stronger patient primary care helped improve management of chronic conditions and reduce the number of hospitalizations and emergency room visits. In its first three years, the program saved the state more than US$155 million and generated more than US$75 million in revenue for participating in health care practices through shared savings allocations and quality bonuses. The public-private partnership operates in more than 540 sites; about 85% of those sites are focused on federally designated primary health care provider shortage areas.[60]

The state of Maryland, following the lead of Germany and several other countries,[61] has tried a different approach by transitioning to an all-payer hospital global budget that allocates a fixed annual payment to each hospital, unlinked to the volume of services delivered. This paradigm shift has incentivized hospitals to actively work to reduce preventable hospital usage, and indeed, Maryland reduced hospital admissions by 16.2% and has narrowed disparities in several quality measures. Over its first three years, the model reduced the state's Medicare spending by US$689 million.[62]

The Nurse-Family Partnership is a community health program that helps specialized nurses connect with first-time mothers very early in their pregnancy, maintaining a partnership until the child's second birthday. During the early months of a child's life, support can reduce emergency room visits for accidents, food poisoning, and incidences of child abuse and neglect.[63]

TOOLS FOR DEMAND MANAGEMENT

Active labor market programs: Incorporate work requirements (which make the receipt of benefits contingent on working or preparing to work) and work supports (which make working more feasible and profitable for participants).

All-payer hospital global budgets: An innovative model that allocates a fixed annual payment to hospitals, untied to the volume of its services to actively work toward reducing preventable hospital usage.

Value-based care: Health care providers are paid to manage total cost of care versus the volume of services provided.

Behavioral economics and nudge thinking: Design environments that help humans make better decisions, leading to behavioral changes that can potentially reduce demand for services.

Public health campaigns are another way to improve health outcomes while reducing long-term costs. In its first three years, the US Food & Drug Administration's tobacco prevention campaign "The Real Cost" dissuaded an estimated 587,000 youth ages 11 to 19 from starting to smoke. Through a paid-media strategy and targeted messaging, the campaign effectively altered teenagers' perceptions of tobacco use, leading to a 30% reduction in smoking initiation among youths between 2014 and 2016. The campaign achieved significant projected cost savings from reduction in future disability, medical care, lost wages, and lower productivity: fully US$53 billion, more than US$180,000 for each of the youths who would likely have become a smoker.[64]

Tools and strategies for delivering on lower-cost, higher-value government

There is tremendous pressure today to increase efficiency and transform the cost structure of government. Doing so requires a thoughtful, integrated approach combining traditional cost management tools (mergers, fraud, and waste reduction) with new age solutions like digital and AI that can enable deep and enduring operational efficiencies (figure 3).

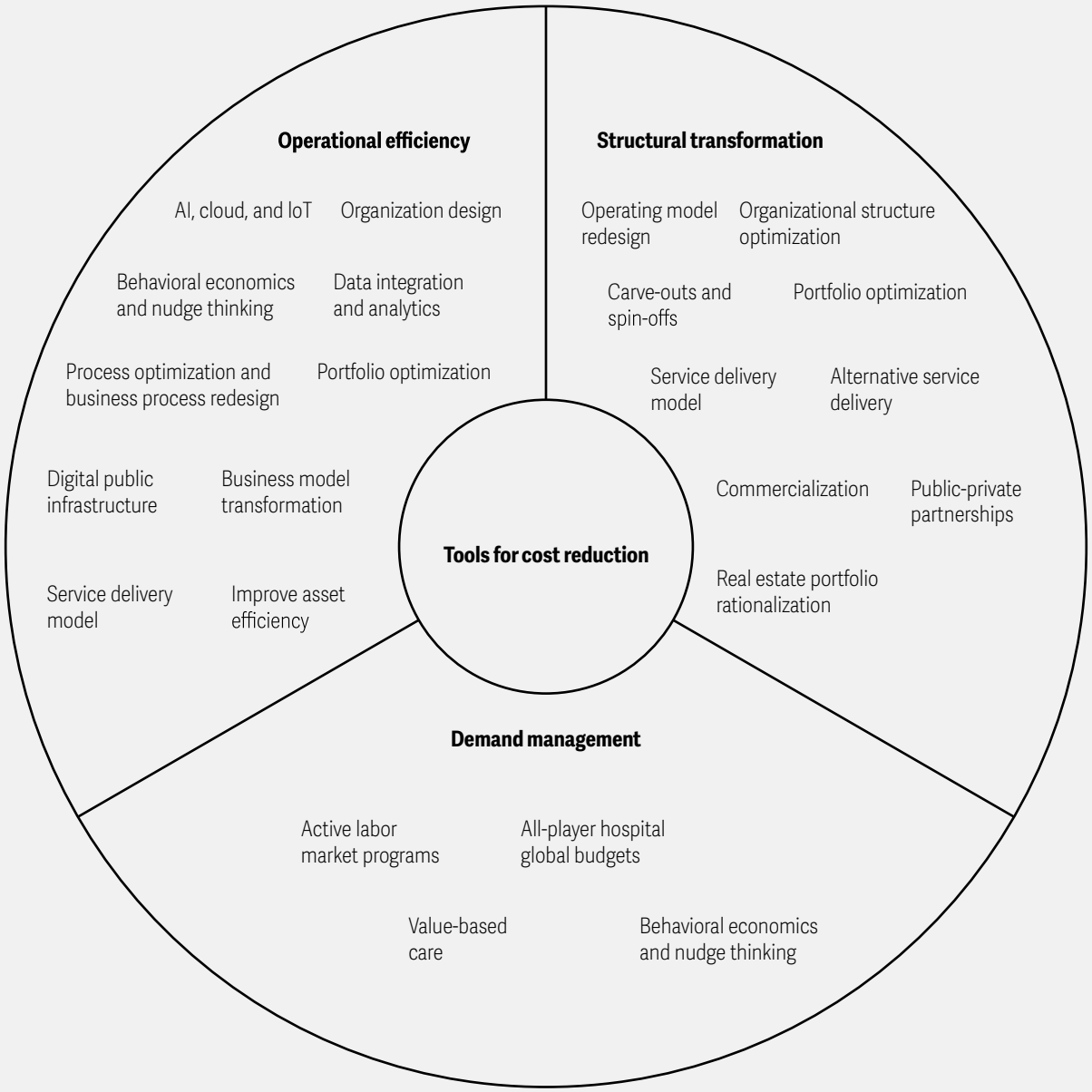
Operational efficiency: The proven tools of business process redesign take on new life when combined with AI tools and robust digital platforms. This is especially true in government where so much activity is centered on benefits processing, providing information, and financial transactions.

Structural transformation: Governments have a bevy of structural approaches they can use to reduce costs without negatively affecting services, ranging from consolidation to IT rationalization to different models of public-private partnerships.

Demand management: Significant savings are possible by using demand management tools to shift demand to lower-cost channels of access (digital rather than an in-person visit, for example) or by encouraging or by reducing the demand for some benefits by increasing labor force participation or improving health outcomes.

Figure 3

Consolidated set of tools for governments to transform cost performance



Source: Deloitte analysis.

My take

How Ireland's health system is doing more with less

Robert Watt, secretary general, Department of Health, Ireland[65]

Following the 2008 financial crash, Ireland needed continuing financial assistance from the European Union, the European Central Bank, and the International Monetary Fund, contingent on the government dramatically lowering the fiscal deficit. It was a classic burning platform: We needed to reduce the deficit without further harming the economy or weakening our social safety nets.

As the Department of Public Expenditure and Reform's first secretary general, I led a cost reduction initiative, implementing measures across all government sectors. We reduced employment numbers and pay rates, cut back on spending programs, and streamlined procurement processes. And we broadened the effort by not redlining specific spending areas, since protecting some sectors from cost-cutting consideration would have further pressured all the other areas.

Our focus was on lowering the cost of providing services, an effort involving a tough control framework and many hard choices. With union cooperation, we introduced operational efficiencies that allowed us to meet service demands with fewer staff. We instituted an industrial relations framework that was more cooperative than confrontational.

While these measures were difficult for all of society, and particularly challenging for some, the strategy succeeded: We regained our economic sovereignty when Ireland became the first Eurozone country to exit the aid program in 2013, moving on to achieve full employment, grow the economy, and deliver budget surpluses.

Overseeing health care in my current role, cost management and improving productivity remain top priorities. In the face of ever-increasing demand, we must be more productive and efficient, drive down patient costs, and stay within our budget allocation. For instance, with one-sixth of the health care budget allocated to medications, we are encouraging the use of lower-cost drugs; in 2024, we saved over €30 million in medicine costs.

Our Sláintecare program emphasizes prevention over treatment, shifting care from hospitals to community settings and freeing hospital beds for the seriously ill. Our chronic disease management program, for example, actively supports patients with conditions such as diabetes through regular care from general practitioners and nurse practitioners, supplemented by specialist input from hospitals. These initiatives require upfront investments but reduce long-term costs, and our evaluations suggest that patients experience fewer hospitalizations and shorter hospital stays.

Scaling approaches focused on prevention and wellness requires leadership from a dedicated community of caregivers as well as an integrated approach across the continuum of care, with a single budget holder overseeing both hospital and community services. Embracing technology is also critical: Video consultations with doctors eliminates the need for many hospital visits, and AI has revolutionized diagnostic screening, enhancing accuracy and efficiency and freeing staff for higher-value work. We're optimistic about technologies, scaled across the system, will enable us to meet growing demand—within our allocated budgets.

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Delivering on the promise of AI in government

Government leaders recognize AI's potential, but scaling it requires unique strategies, workforce training, and balancing costs against public benefits

Government leaders around the world appear to be increasingly recognizing the transformative potential of artificial intelligence. But there is one problem: Realizing the value of that potential means adopting AI at scale, and government agencies may struggle to move beyond small-scale pilots. Generative AI, with its at-scale solutions still emerging, remains a work in progress.

Taking what *does* work and scaling up should include more than copying what companies are doing. With different incentives and risks than private industry—and, often, higher stakes for constituents—agencies may need to take a distinct path to scaling AI applications. Some government leaders are beginning to move forward in ways that are employee-driven.[1]

This path to scaling includes steps that agencies may find challenging. An employee-driven strategy relies on each employee having the necessary AI fluency, a level of training that will vary by their job, level, and role. And even more basically, any investment in AI should weigh the costs of implementation against the benefits to the public. This innocuous statement holds two difficult truths for government leaders: one, that a lack of technical expertise can obscure the true costs of AI making it appear either prohibitively expensive or unrealistically cheap; and two, that leaders need ways to measure the difficult-to-quantify mission outcomes of AI investments.

It's a case that leaders may not be able to afford to wait to make. The AI future is here; agencies should take the initiative in shaping how the technology can best help fulfill the public sector's mission.

Key challenges

- **Limited AI expertise.** In a recent Deloitte survey, only one-sixth of government leaders surveyed believed that their organization had high or very high gen AI expertise compared to 32% to 56% in industries.[2] This can make navigating the technical choices around model selection, cost, and data cleaning, storage, and security difficult.

- **Inverted interest in AI.** While much commercial interest in gen AI is top-down, with line-of-business executives promoting the technology, the picture is inverted for government: Workers may be eager to try gen AI while leaders are wary of risks.

- **Lack of access to gen AI.** Despite some bottom-up interest in AI adoption, only 1% of government leaders surveyed said that more than 60% of the workers in their organization had access to gen AI—a number that's orders of magnitude lower than commercial peers.[3]

Trend in action

The scaling paradox

AI's potential impact on the public good is truly monumental, even including all the usual caveats. But it's unlikely that an agency's tech-aided initiatives could make an impact without reaching scale in AI adoption. This could lead to a fundamental paradox that at-scale adoption requires widespread use, but widespread use can also introduce risks that government agencies need to manage.

Some places are already thinking along these lines: Buenos Aires, for example. After introducing an app chatbot in 2019, the city government steadily expanded its capabilities, until by 2022, residents could use the bot to access social services, apply for a construction permit, or even report infrastructure in need of maintenance. By the end of that year, the bot had processed more than 58 million interactions, allowing Buenos Aires residents to access critical services 24/7.[4]

But scale can mean more than having a large number of users—it can mean becoming central to an organization's operations. For example, the US Treasury Department has started using AI tools to locate potential fraud in government payments, preventing or recovering US$4 billion in improper payments—more than five times as much as in 2023. But the tools' real power comes from breaking down data silos between other agencies. The Treasury's "Do Not Pay" service has expanded to integrate with state unemployment agencies and the Social Security Administration's Death Master File, adding verification capabilities and saving money across federal payment systems.[5] And even greater data integration across organizational silos is underway.[6]

These examples underscore not only AI's potential benefits but the fact that, as agencies worldwide move to adopt applications, more government employees should be familiar with the technology and its expanding uses. Social service workers in Buenos Aires should understand the limitations of the AI chatbot so they can be sure it outputs valid information to users; employees in state unemployment offices should have sufficient AI fluency to use the Treasury's Do Not Pay service so that it can stop fraud but not delay legitimate payments to workers in need. To get to scale, agencies should have employees trained to work with AI and in using applications to find ways to make their daily work more efficient and accurate.

But government work is sensitive, and scaling AI should include managing risks of deploying AI widely in public arenas. Giving workers broad access to applications—especially those based in gen AI—can quickly uncover new areas in which AI could help agencies fulfill their mission, but it can dramatically increase risks. New AI solutions might fail to work as intended; far worse, they could generate inaccurate information and direct employees or constituents to make decisions based on that information. The question for agencies is how to get widespread, bottom-up adoption while controlling for risks.

Our research on AI adoption in government suggests strategies that can help with this paradox: Giving the right access to the right workers with the right skills, and measuring mission outcomes to stay on track.

The right access for the right workers with the right skills

Unlike commercial enterprises in which leadership often drives AI scaling, line employees in government may be poised to unearth transformative AI use cases. But to find and develop those use cases, workers should have access to the appropriate tools and level of training for their roles and occupations. Access to gen AI continues to be an issue, with only 1% of government respondents in a recent Deloitte survey reporting that 60% of their workforce had access to gen AI tools.[7] This is beginning to change, albeit slowly, as more governments give their workers wider access to gen AI tools.

Over a six-month period, the Digital Transformation Agency of Australia deployed an AI assistant to more than 7,600 employees across some 60 government agencies to assess gen AI's impact on employee efficiency and productivity. The initiative aimed to understand the efficiencies that the tool could bring to daily work—and identify opportunities for more tailored solutions. In the initial pilot, the tool saved each employee an average of one hour per day on administrative tasks.[8]

While government access to tools continues to grow slowly, leaders can move to address the AI-fluency issue. Not every worker needs to know how to fine-tune a large language model or build their own chatbot. While a few users should have detailed knowledge on how to build AI tools, others can benefit from mid-level knowledge on how to select tools, while still others need only basic knowledge on how to use tools. Our research suggests that a build-choose-use paradigm for AI fluency varies with a worker's occupation, level, and role. Occupations with higher exposure to gen AI—and higher *potential* exposure—should have more knowledge to take advantage of the technology's availability. Similarly, managers likely need more AI fluency than entry-level workers

who may just need to know how to use tools in a finite number of situations. Of course, those whose roles involve creating AI tools to enhance current processes and potential new ones should have more skill than those in technical- or end-user roles (figure 1).

These tiers of AI fluency can help the workforce gain the right level of AI knowledge for them. This can be important when setting expectations for what the experience of working with AI will be like. Expectations can be high for near-magical experiences, and one bad experience with AI can stall further experimentation for a whole organization. So making progress on AI depends on having the right fluency—both in terms of skills and expectations—for each individual.

Singapore's experience illustrates the direct relationship that investing in workforce AI fluency can have on scaling AI. In December 2023, the Singapore government revised its 2019 AI strategy, introducing National AI Strategy 2.0, emphasizing reskilling and upskilling the workforce for an AI-driven future and building the necessary infrastructure to support a thriving AI industry.[9] That focus on equipping the workforce with the right skills has been important in the nation's efforts to scale AI from the bottom up. One example is the "AI Trailblazers" initiative, which aimed to develop 100 generative AI applications in 100 days, with both government entities and businesses gaining access to third-party toolkits.[10]

With the right access to tools and the right skills, government workers can find new opportunities for AI to help benefit the public at an unprecedented pace and scale.

Measuring mission outcomes

Even when good AI use cases emerge, constrained budgets can stall progress toward scaling. Our research suggests that while government leaders are as, or even more, eager to invest in AI than commercial counterparts, they struggle to measure the impact AI is having on their agencies (figure 2).

For AI projects to compete budget battles, they should have to have clear understanding of the cost benefit. AI-fluency training can help government leaders uncover the often-opaque costs associated with choosing and operating an AI model. But on the benefit side, government leaders often struggle. Unable to cite the

quantitative metrics of sales and profit that commercial companies use, government leaders may need to work harder to define and measure mission impact. In the initial phases of AI adoption, when projects focus on increasing efficiency, metrics of time and dollars saved may help. But as agencies mature in their AI journey toward more impactful use cases, they could increasingly find a need for clear metrics for mission performance.

Having a solid understanding of the ways in which gen AI can create value for an agency is imperative: It can help indicate where to look for results and which metrics to choose to measure them. The pathway to value determines the types of metrics necessary to define success and even the relative levels of governance required.

- **AI automating work.** When AI automates single tasks, it can create value by making the organization more efficient. Metrics such as time and dollars saved are the appropriate yardsticks of success.

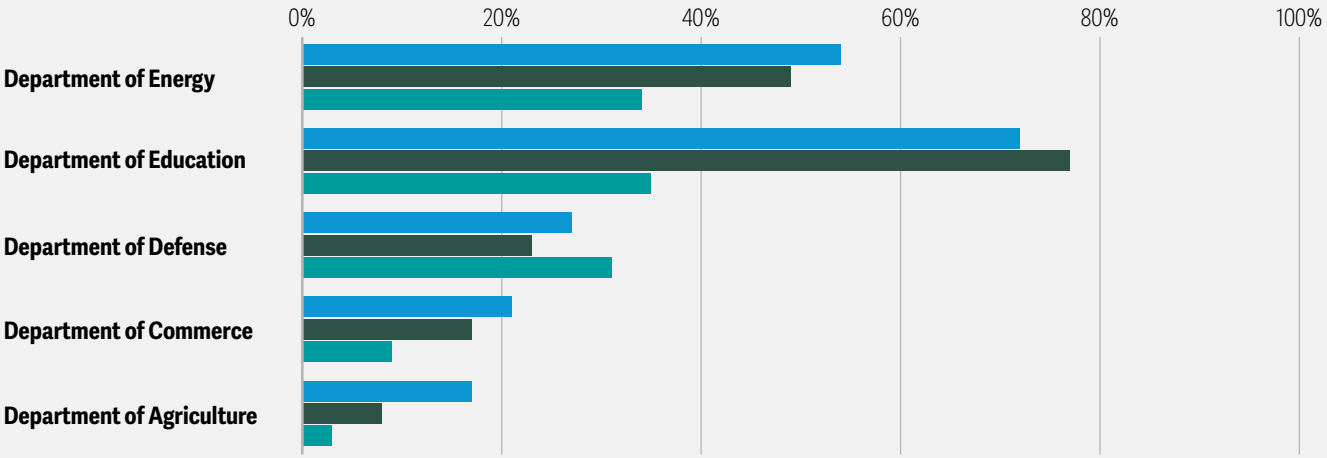
Figure 1

The level of AI fluency for workers varies based on their occupation, job level, and specific role in AI

Build Choose Use

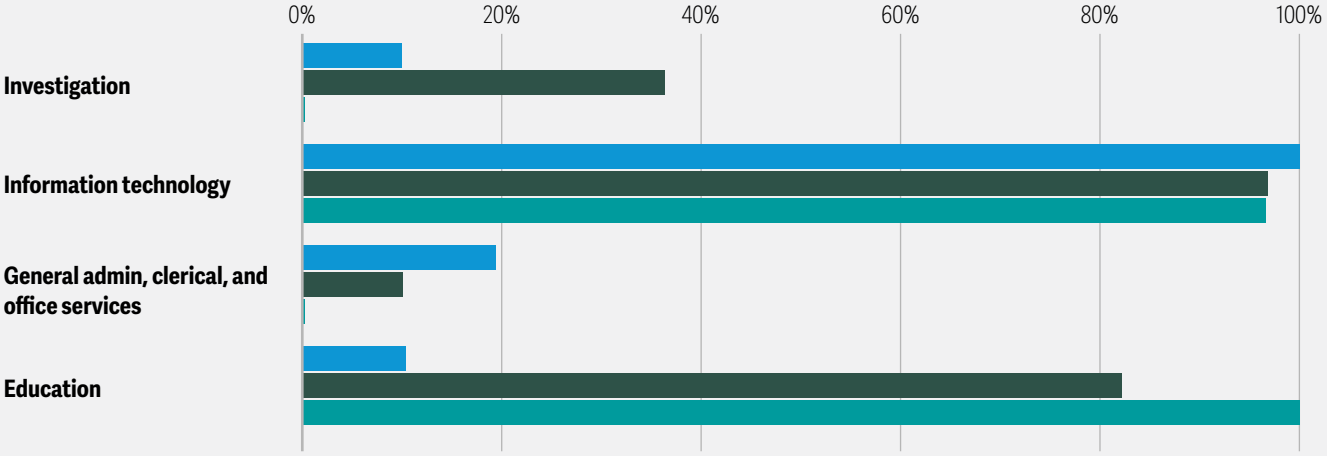
Every agency has unique needs regarding the amount of each level of training required

Percentage of each agency's workforce that needs high intensity of each type of training



Type and intensity of training also vary by occupation

Percentage of each occupation needing high intensity of each type of training



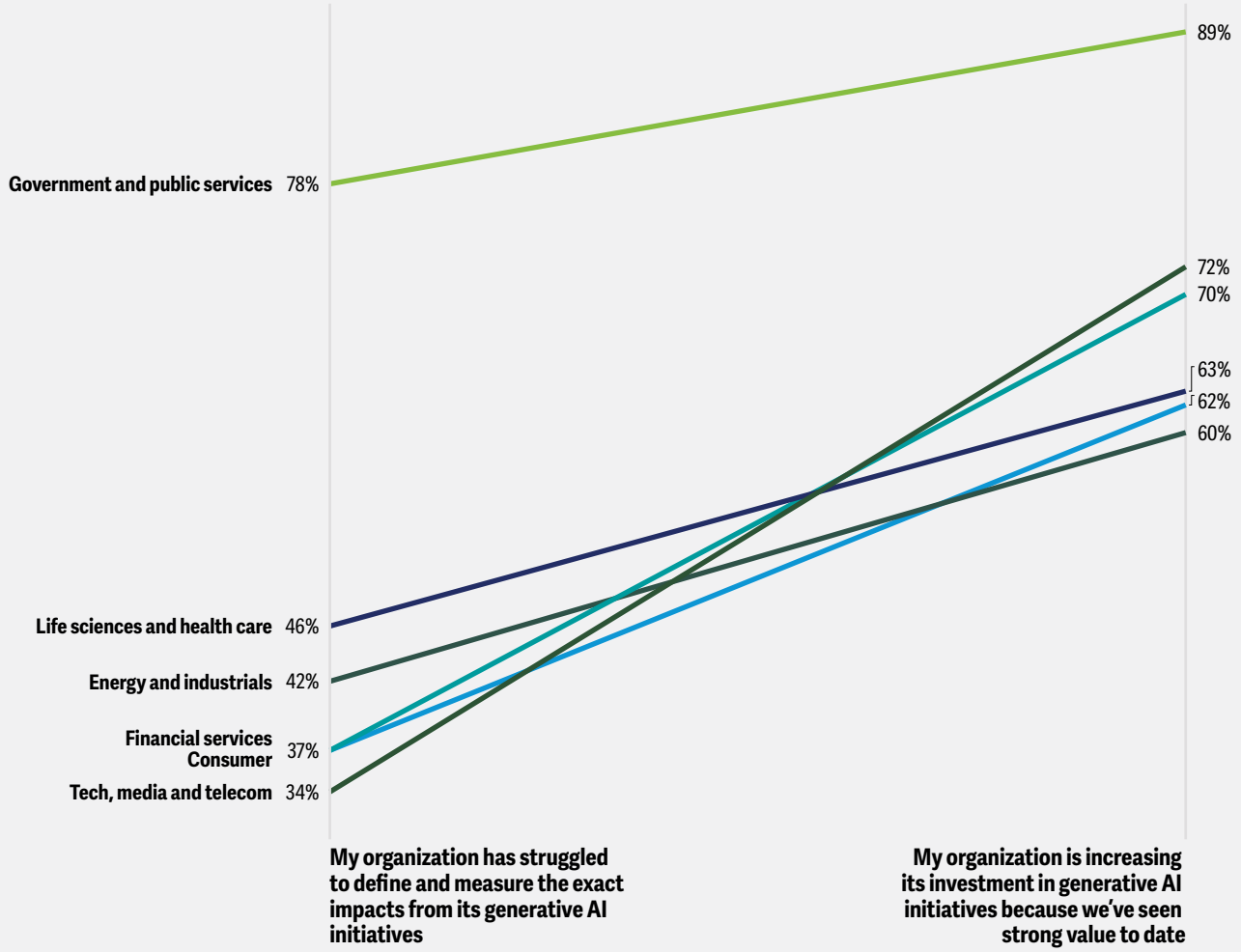
Note: Build: create AI tools; Choose: select appropriate tools; Use: operate tools.

Source: Based on the Deloitte Center for Government Insights analysis of US Department of Labor O*net data and Office of Personnel Management federal workforce data.

Figure 2

Government leaders have not been able to quantify the mission value of generative AI, according to respondents

Please indicate how much you agree or disagree with the following statements. If the question does not apply to you, choose "NA" or "Don't know." (Somewhat or strongly agree)



Note: n = 2,770 (consumer = 687, ERI = 439, FS = 518, LSHC = 347, TMT = 579, GPS = 200).

Source: Deloitte's State of Generative AI in the Enterprise, Q3 report, 2024.

- **AI augmenting work.** When AI is incorporated into a larger workflow, it can create value by improving that workflow's overall performance. In the commercial world, it can be easy to measure these performance benefits with metrics such as increased sales or decreased cash-conversion time; for government, it usually means finding metrics that get at mission outcomes such as decreasing crime, making benefits delivery efficient, or increasing community longevity.

These pathways to value can help with more than selecting metrics: they can also serve as signposts in selecting levels of AI governance. The more public impact that a gen AI use case has, the more validation and continuous oversight it needs. It's not whether a gen AI use case involves direct public interaction since some internal processes such as benefits adjudication can have a major impact on constituents' lives. So, understanding whether a use case is automating for efficiency or aiming to improve the outcome of the whole workflow can—when weighed alongside whether it is back-office or mission-focused—help determine how much oversight a particular use case needs.

Understanding how AI creates value can help select not only the right level of governance but which metrics can effectively measure success. For example, New Jersey's state government has launched an AI implementation strategy, centered on the "NJ AI Assistant" platform. Because this AI assistant touches public services, it should have significant governance. To maintain security protocols and data sovereignty, employees operate it exclusively on state infrastructure.[11] And because the AI assistant aims to improve mission effectiveness, leaders measure its success in terms of mission improvements. The New Jersey Department of Labor has seen a 35% acceleration in resident response rates through AI-enhanced communications, while the Division of Taxation's AI-powered call center analysis has boosted successful call resolution by 50%.[12]

Figure 3

Measuring value and governance needs for automation and augmentation use cases

			Governance needed for ...	
	Source of value	**Metrics**	**Back-office use cases**	**Mission use cases**
Automate	Efficiency	Dollars saved Work hours saved	Low	Medium
Augment	Efficiency or effectiveness	Dollars saved Work hours saved or mission outcome metrics	Medium	High

Source: Deloitte analysis.

Tools and strategies for delivering on AI

To help reach scale of adoption that can bring such significant benefits, government leaders should have the required strategies and tools to execute them.

Strategy: Build platforms to rapidly scale benefit

- **Tools: AI platforms and marketplaces.** A bottom-up path to scaling implies not only giving workers wide access to AI tools but having the ability to identify winning use cases and getting them in the hands of other workers as well. For some agencies, this could mean having an AI platform that brings together the technical capabilities needed to support widespread use of the technology with the organizational capabilities needed to screen and vet new AI solutions. The US Department of Defense's Joint Common Foundation is one example of a large-scale AI platform, but the State Department has also adopted a smaller-scale AI marketplace to help develop and quickly scale new AI use cases.[13]

Strategy: Build expertise to make informed choices

- **Tools: Existing AI certificates from academia and government.** Getting the right training in the hands of the right workers does not necessarily require a huge lift by learning and development staff. The Federal AI Institute and others in academia and government offer certificate-based programs that can quickly get workers to the right level of AI fluency.[14]

Strategy: Build with partners to manage risk

- **Tool: The expertise of technical partners.** AI is a rapidly changing space, and trying to navigate it alone can be challenging. Tapping into the expertise of technical partners can be critical for agencies to lay technical foundations and, ironically, be an important step toward avoiding vendor lock-in. This can be a two-way street. Not only can technical partners help government leaders gain the fluency they need to make appropriate AI decisions, but government can also shape how the tech industry approaches problems, creating demand for solutions such as sovereign AI that can address security and privacy problems for government.[15]

- **Tool: The expertise of other government leaders.** Government leaders face unique incentives, so where better to find advice that fits those incentives than from other government leaders? The expertise and advice shared in forums such as Chief AI Officer or CIO Councils can be instrumental in helping leaders navigate government's unique hurdles such as budget and election cycles.

My take

Scaling AI by empowering people

Ms. Alexis Bonnell, partnership manager, OpenAI, and former chief information officer and director of the Digital Capabilities Directorate of the Air Force Research Laboratory, Department of the Air Force[16]

As the Air Force Research Laboratory (AFRL) chief information officer, I've learned that scaling AI is not just about the technology—it's fundamentally about serving our people. Digital transformation is human transformation. The biggest issue we encounter at AFRL is the tendency to focus on the technology, the AI model, or the tool, while neglecting its purpose—to complement our incredible team. Our discussions must begin with people, thinking about how technology can enhance their capabilities.

When the AFRL introduced NIPRGPT, an experimental gen AI research platform, the focus was not only on experimenting and learning about the technology, security, and infrastructure but on human-machine teaming. Learning not only what people used AI for, but also what the adoption journey of a new technology looks like, and how they could help people find an aspirational vision of themselves as complemented by the technology—it was AI enabling you, not AI versus you.

The broader narrative around AI often paints it as overly technical and complex, inadvertently suggesting that people are not smart or ethical enough to handle it. Our approach to AI adoption and scaling starts from a point of trust. We understand that people are capable and have navigated every previous technological wave. This trust-first approach is fundamentally different. It really boils down to saying to people, "You're enough. You've got this. We trust you."

This approach to AI isn't just about taglines; it changes how we approach the process of adopting AI. We have delineated the AI journey into four stages: "ta-da," "uh-oh," "ah-ha," and "ho-hum."

1. The **ta-da** is about people experiencing gen AI for themselves. It requires access and the opportunity to experiment with new tools, encouraging exploration. NIPRGPT wasn't about crafting the ultimate tool; it was about providing a safe, secure space for discovery. Observing how people engaged with AI allowed AFRL to share with commercial and government teams how to design better initial AI experiences and drive AI literacy.

2. As people experience the ta-da moment, they move to the **uh-oh**—pondering AI's relevance to their roles. They ask, "Where does this fit in my life? How is this related to my role? How do I use this well?" These questions are anchored in the reality of the technology. This phase is critical for people to work through fears and anxieties. If the uh-oh comes before the ta-da, all people can do is repeat other people's fears and concerns. When it comes after the ta-da, they can actually explore their concerns by using the tool, which means they ask better questions that are more grounded in the reality of the technology and its role in their mission.

3. As these queries evolve, they culminate in the **ah-ha** moment, where users perceive tangible benefits in their daily work, such as pain reduction in their everyday tasks. When they find that thing that they can do faster, or more easily, and get minutes on the mission back, the tool finally has a place in their lives and work.

4. Ultimately, the goal is to reach the **ho-hum** stage, where the user experience becomes routine and there is comfort in the technology. As the CIO, my role is to help workers transition from being potentially intimidated by a technology to being comfortable and even bored by it as rapidly as possible. Because as soon as they reach being bored, they're ready for the next thing. In national security, in a tech-enabled age, we can forget that having the best tech doesn't matter if people don't use it or aren't comfortable with it. We capture and maintain strategic advantage when our people are able to adapt, demand,

and leverage the best technology. The faster and more successfully we can drive adoption, the faster we can outpace the adversary.

At the ta-da stage, we make sure you have a tool and AI-101 training, which focuses on the "why AI, why now, and why you?" Then, in the uh-oh stage, we make sure they have access to experts and others like them who can discuss concerns or best approaches. A key element of helping people move quickly on this journey is role-based training. Once we get past the basics, in the ah-ha stage, we focus on what the tool can really do for them. AI is an incredible tool because of its intimacy—it will be used differently by each person. In role-based training, we tell people, "Here is what you can do with the tool." For example, if you are in public affairs, here is what public affairs can do with the tool. A legal intelligence leader training will be different from manager training. In each of these role-based trainings, we answer, "What's in it for me? And how do I get an advantage?" Once people see that others just like them are using the tool, it reframes the thinking from "This tool threatens my job," to "Not using this tool threatens my promotion." They understand that colleagues are using these tools and to survive and thrive, AI is a catalyst to their future opportunities—not a roadblock.

An important outcome of this approach is that when we start with people, we allow them to organize their relationship with the technology. This inverts the typical power dynamic of technology. When someone gets to use AI on their terms, they become true curators, with intimate knowledge of their role, their mission, and their information. They start to adapt their process, rearchitecting work around AI, driving change in their work better than any centralized executive could. In this way, they proactively optimize their mission, ultimately ensuring a better return on taxpayer dollars.

We are entering an era where every person is a technologist, and that is an incredible opportunity. As a CIO, my job is to figure out how to get people moving on *their* AI journey and embracing themselves and their human-machine teaming potential. The happiest day for me is when my users say, "What's next?"

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16. The executive's participation in this article is solely for educational purposes based on their knowledge of the subject and the views expressed by them are solely their own. This article should not be deemed or construed to be for the purpose of soliciting business for any of the companies mentioned, nor does Deloitte advocate or endorse the services or products provided by these companies.

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Delivering on reducing government red tape

Governments can reduce red tape and enhance efficiency through continuous process improvement, workforce training, stakeholder engagement, and leveraging digital tools

When navigating rules and procedures, there's often a challenge: how to reduce red tape while maintaining the protections for which these regulations are intended—including keeping the public safe, protecting the environment, and ensuring that public funds are used prudently for the public good.

Regulatory agencies are being called upon to not only protect consumers from the negative effects of technology and economic shifts, but also to help catalyze innovation in areas such as energy, artificial intelligence, and digital access. The twin role creates a strategic tension for regulators: protecting consumers and citizens through regulation while ensuring regulations don't discourage innovation and growth.[1]

Regulatory requirements fall on everyone—individuals, businesses, and government agencies alike. Governments refer to this collective impact as "regulatory" or "administrative" burden and regularly measure—and attempt to reduce—the burden. For example, in the late 1990s, the Netherlands launched a high-profile campaign to alleviate administrative burden on companies.[2] Two decades ago, European governments undertook a major administrative burden reduction initiative across the European Union.[3] And numerous Canadian provinces have institutionalized red tape reduction going back to the late 2000s.[4]

Today, agencies are increasingly using innovative tools and emerging technologies to identify and reduce red tape. By leveraging innovative approaches such as behavioral insights, human-centered design, and AI-based technologies, governments can work to streamline processes without sacrificing safeguards.

Regulatory frameworks crafted many years ago tend to accrete over time. Many governments are revisiting these frameworks, looking for a balance between accelerating processes and guarding public interests by improving the overall experience of government interactions. By focusing on key outcome metrics, including time savings and broader societal impacts, government agencies can streamline requirements and simplify compliance.

Speed matters. When a bridge collapsed in Philadelphia in June 2023, Pennsylvania leaders put public utility first. By waiving permitting and procurement regulations, a busy section of the highway was rebuilt and reopened in a mere 12 days.[5]

In the Indian state of Goa, the Goa Industrial Development Corporation has launched a platform to help streamline business processes and enhance the ease of doing business in the state. The platform is designed to speed up technical clearances for industrial projects, significantly reducing processing time from several months to minutes.[6]

Reducing red tape can help agencies deliver on intended outcomes and create a more responsive, efficient, and effective government—one that can help build confidence in the public sector among the whole spectrum of constituencies. This trend focuses on how governments around the world are cutting red tape for businesses, citizens, and internal government processes (figure 1).

Figure 1

Reducing government red tape

Source: Deloitte analysis.

Key challenges

In launching initiatives to streamline bureaucracy, leaders cite several key challenges.

- Outdated laws and regulations, occasionally adapted through one-off changes over decades, can impede progress.
- Organizational and data silos, along with duplicative privacy safeguards, can hinder seamless integration and collaboration.
- An overly cautious compliance-heavy culture can slow innovation and efforts to streamline processes.
- Regulatory requirements spread across different agencies and levels of government in areas such as permitting can create bottlenecks and delays in projects.
- Accumulated technical debt in government systems can complicate efforts to streamline processes and implement new technologies.
- Accelerated changes in technology and business models in regulated sectors make it increasingly difficult for regulators to keep pace. The challenge is to better understand the changes and create rules and processes that continue to protect public interest in this rapidly evolving context.

Trend in action

Government to business: How simplifying the regulatory experience can help drive societal innovation

Monitoring and enforcement of complex regulations have long been cited by some in the business community as an inhibitor to growth and innovation.[7] Companies, large or small, often navigate overlapping rules imposed at various levels of government. A small business owner trying to expand their operations faces a myriad of permits and licenses, each with its own set of requirements and timelines—a process that's not only time-consuming but costly, leading to a disincentive to growth.

Governments can streamline the regulatory maze. It begins with agencies harnessing the power of generative AI, the principles of customer experience, human-centered design, and behavioral insights to help transform the regulatory landscape. By adopting these innovative regulatory approaches, regulatory agencies can protect public interest while ensuring sustainable market growth. The UK Regulators' Pioneer Fund, for example, aims to encourage such innovations by investing in regulatory projects that encourage business innovation.[8]

Applying a human-centered design lens

Viewing regulatory compliance through a human-centered design lens often means rethinking the entire process from different business perspectives. "Just going out and saying 'we're deregulating' can have a certain connotation," says Michelle E. DiEmanuele, Ontario's secretary of the cabinet. "But when you start working with industry, if you work with your consumers, and you start soliciting their thinking, you don't ask the question 'should we, or shouldn't we?' You ask the question 'how would you? What are the things you're worried about?' Good stakeholder conversations are critical."[9]

Regulatory excellence starts with considering the desired outcomes and the overall impact on companies, citizens, and the economy. This involves streamlining procedures, eliminating unnecessary steps, and leveraging technology to simplify interactions.

Singapore has established an interministerial committee to review current regulations, reduce red tape, and foster a more business-friendly environment. The committee engages with different business groups to understand their challenges and collaboratively find solutions.[10] A separate office has been established to help small- and medium-sized enterprises get through regulatory bottlenecks.[11]

Singapore's Civil Aviation Authority is one agency revisiting its regulatory framework for unmanned aircraft light shows. The authority requires each drone to carry an independent license, which can be cumbersome for shows that use more than 1,000 drones. After receiving feedback from a light-show company, the authority has recognized the need for a show-by-show approach instead of requiring individual drone licenses. This is expected to reduce licensing fees from more than US$20,000 to just a few hundred dollars for such events in the future.[12]

CASE STUDY: TRANSFORMING REGULATORY CULTURE IN NEW ZEALAND

The Ministry for Regulation in New Zealand aims to instill a culture where regulation is a last resort, intervening only when necessary.[13] This aims to address a historic increase in regulations over time, to a point where many are seen as counterproductive. To help with this, the Ministry has introduced seminars for regulatory policymakers to emphasize that their job is to help New Zealanders live their lives—not to impose unnecessary rules.

To tackle these concerns, the Ministry has implemented four mechanisms. First, there is a focus on new laws, working to ensure regulations align with established principles from the outset. Second, a recourse mechanism is meant to help individuals challenge existing laws they believe do not meet these principles; for instance, stakeholders who find a regulation unreasonable can present their case to the Regulatory Standards Board. Third, the Ministry conducts sector reviews, engaging with specific industries such as finance to evaluate regulatory grievances. Lastly, the Ministry maintains ongoing regulatory stewardship, requiring departments to continually assess regulations against established principles.[14]

Collaboration with stakeholders is an important part of the Ministry's success. In November 2024, the Ministry launched a red tape tipline that seeks input from various professionals including traders, farmers, teachers, chefs, and engineers.[15] Engaging with business leaders and organizations like Business New Zealand, the country's largest business-advocacy body, helps to identify and address regulatory concerns.

Measuring success involves three areas: compliance and administration costs, lost opportunities due to overly burdensome rules, and a cultural shift toward outcomes.[16] While compliance costs can generally be quantified, measuring the impact of delayed projects or the shift away from a compliance-driven mindset can be more difficult to measure.

Ultimately, the goal is to foster a culture of limited but effective regulation that can serve the public interest without stifling innovation.

Harnessing the power of generative AI to transform regulatory landscapes

Advanced technologies—notably, machine learning and generative AI—can help regulatory frameworks keep pace with ever-accelerating developments, streamlining existing regulations as well as enhancing their accessibility. Regulators are beginning to leverage gen AI to craft rules that are not only more user-friendly but support innovative applications for both citizens and businesses.

Consider the transformative potential of norm engineering:[17] This AI-aided approach can generate plain language, machine-readable versions of regulatory documents, ensuring that legal precedents are preserved while making regulations understandable to nonlegal readers. Democratizing regulatory information can help foster a more informed participation.

The state of Ohio exemplifies this transformation. In 2020, the state government's InnovateOhio and Common Sense Initiative programs began to streamline regulatory documents, deploying AI-based technologies to analyze the state's administrative code and draft a road map for regulatory reform.[18] The initiative identified 2 million unnecessary words and 900 redundant rules. Consequently, the program has removed 600,000 words from the state's building code and has eliminated several outdated requirements for paper filing and in-person appearances. The state anticipates that this initiative will save US$44 million in tax dollars and 58,000 hours of labor by 2033.[19]

Addressing housing affordability through reduced regulation

Governments around the world are streamlining approval processes for building projects to address housing affordability issues.[20] New Zealand has passed laws aimed at lowering building costs by easing access to overseas building products and allowing more remote inspections.[21] The Canadian province of Ontario, which has had a dedicated minister to cut red tape since 2022, claims that its efforts to slash regulations and administrative paperwork save developers hundreds of millions of dollars annually, speeding up housing construction.[22] At a local level, California has passed a law aimed at cutting approval times for new home construction in San Francisco from two years to six months.[23]

CASE STUDY: ALBERTA'S RED TAPE REDUCTION INITIATIVE

In 2019, the Government of Alberta committed to reducing regulatory challenges and administrative burdens by a third. A cross-government effort dubbed Red Tape Reduction has since helped streamline the administrative code and simplify legislation across more than nine ministries. Some of these efforts, such as electronic registration of vehicles, have made life easier for citizens; others have helped businesses drive economic growth by accelerating regulatory approvals to facilitate industry investment.[24]

Several factors have contributed to the program's success: vigorous stakeholder engagement with private industry; a focus on reducing burden rather than simply trimming the number of regulations; scaling the initiative and mindset across provincial government; and robust measurement of burden reduction.

The results have been impressive. In its first four years, Red Tape Reduction saved Alberta citizens, businesses, and agencies more than CA$2.75 billion.[25] In 2021, the Canadian Federation of Independent Businesses recognized Alberta with the province's first "A" grade in the 11-year history of the organization's annual Red Tape Report Card.[26]

Alberta has taken steps to address excess bureaucracy in a range of industries, including:

Chemical manufacturing: Reporting and regulating industrial emissions had often become a patchwork that could be both onerous and ineffective. Alberta has streamlined the process by implementing a one-stop inventory, reporting and modernizing minimum standard emissions inventory requirements. Preparing emissions inventories is now far simpler, and the new system's transparency makes information about industrial facilities' air pollutants available to citizens.[27]

Industrial manufacturing: The government's Regulatory Transformation Project is also working to cut red tape by shortening the environmental approval processing periods and clearing backlogs of water- and land-use applications.[28] Actions to lighten the load include: shifting from a rules-based system to an approach driven by outcomes and risks, speeding comparatively routine approvals, and implementing a consolidated online system for regulatory applications, approvals, and long-term environmental monitoring. Companies are still benefiting from the Ensuring Safety and Cutting Red Tape Act, 2020, which took an outcomes-based approach. For instance, it eliminated the requirement that employers record each worker's hours daily.[29]

Construction: The Builders' Lien Act aimed to align Alberta's contract payment rules—for example, invoicing timelines—with those of other provinces, making it easier for businesses that operate across borders. The New Home Buyer Protection Act meant that builders no longer needed to complete a Building Assessment Report for new condominiums, a requirement that duplicated protections in two other legislative acts.[30]

Government to citizen: A path to simplified access

Ideally, citizen interactions with a government program could be quick, efficient, and seamless. Of course, it doesn't always work that way: Individuals, families, and small businesses trying to get things done often face unnecessarily complicated forms, repeated requests for the same detailed information, and convoluted applications.

Emerging technologies can help eliminate extraneous steps, smoothing processes for both constituents and the workers trying to serve them. Agencies can enhance the user experience by simplifying applications, making it easier to access services.

Streamlining application processes

Simplifying application processes can make it easier for citizens to receive the services for which they are eligible and help reduce frustration. The UK government has launched a digital tool allowing constituents to complete forms online, eliminating the need for paper-based processes. GOV.UK forms seeks to facilitate access to services and aid applications.[31] The tool has already assisted more than 20,000 armed forces personnel in applying for veterans' badges.[32]

Integrating data sources to plug data gaps

Governments can integrate various data sources to reduce the need for constituents to repeatedly provide the same information. In Puerto Rico, a digital ID initiative called IDEAL uses an application programming interface layer to share information agencies already hold on a constituent. For instance, when applying for a housing voucher, applicants would previously have to compile and present a daunting collection of documents. Now, with the applicant's consent, IDEAL would allow departments to search the applicant's ID and find necessary documents.[33]

Leveraging technology to simplify workflows

AI-aided automation, ideal for handling repetitive tasks, can reduce the workload for both constituents and government employees. In the United Kingdom, Hertfordshire Community NHS Trust used robotic process automation to streamline Children and Young People Therapies Services for end-to-end patient referrals. Workers had been manually processing referrals based on emails, leading to inevitable errors and delays. The new system features a user-friendly online form with mandated fields and validation rules, significantly reducing incorrect or missing information. This automated process has lightened the administrative workload while improving efficiency, accuracy, and patient care.[34]

Setting the digital foundation for proactive service delivery

Governments are moving toward an integrated, frictionless, and proactive service delivery. Taking advantage of new digital technologies, behavioral insights, and making use of available data can enable agencies to provide services personalized to constituents' diverse needs. The Indian state of Karnataka uses data from Aadhaar, India's national digital identity platform, to proactively provide old-age pensions to eligible families with incomes below a certain threshold. Beneficiaries do not have to apply for the pension: It's automatically credited to their Aadhaar-linked bank account.[35]

CASE STUDY: ESTONIA'S FAMILY BENEFIT ALLOWANCE

Before 2019, 97% of new Estonian parents had to manually apply for one or more of 10 types of family benefits, a process that took officials about two hours per application to process. In October 2019, Estonia's Social Insurance Board launched a proactive family benefit service, eliminating the need for parents to apply. An automated IT system now queries the Estonian National Population Register nightly for new births and uses parents' digital IDs to gather necessary data from other registries. This system follows the principle of once-only, where users need to provide certain information to the system only once, avoiding repeated requests for information.[36]

The system pre-populates the benefits data on the family's self-service portal. Parents simply confirm the information, and the money is transferred to their accounts within 30 seconds. By 2022, the system automatically checked 99.99% of Estonian births for eligibility, resulting in a 91% service satisfaction rate and an 88% reduction in the need for parents to contact government workers.[37]

Government to government: Tackling the hidden costs of internal bureaucracy

As noted above, in recent years, agencies have worked to clear obstacles in government-to-business and government-to-citizen interactions. However, governments have paid comparatively less attention to reducing the burden of internal bureaucratic processes within agencies themselves.[38] This is hardly a minor oversight: It is a critical issue at the heart of governmental efficiency and effectiveness.

Harvard Law School Professor Cass Sunstein defines *sludge*, more broadly as "frictions that separate people from what they want to get."[39] While his exploration of the concept mainly pertains to consumer experience, sludge can be defined as any factor that hinders organizations from making decisions, fostering innovation, and enhancing both human and business performance outcomes. Without careful oversight, process and rules become more prevalent over time as an organization grows, expands, and becomes more complex. As Jenny Mattingley, who served at the US Office of Management and Budget prior to her current role of vice president of government affairs at Partnership for Public Service, states "Agencies are following policies written in the 70's and 80's. They still talk about faxing forms as a requirement because it's no one's job to say, 'How do we go back through everything and make it simpler?'"[40]

Internal government administrative requirements typically emerge out of good intentions: preventing fraud and abuse, guarding against bias, and ensuring rules and regulations are followed. These goals, however, frequently create administrative overload—committees, meetings, process choke points—that quickly outweigh

their benefits and long outlive the original problem's solution. The costs of this can be multifaceted: lost productivity, damaged employee morale, erosion of organizational capacity, blurred accountability, a detrimental impact on workplace culture, and a significant slowdown in innovation.[41]

"Every organization is in the business of starting, maintaining, and stopping things. Most are really good at starting and maintaining but poor at stopping," says Alexis Bonnell, former chief information officer and director of the Digital Capabilities Directorate of the Air Force Research Laboratory. "And workers are overloaded with toil, all the little tasks that take up time and attention."[42]

A report by project management tool Asana in 2022 found that workers spent an average of 257 hours annually navigating inefficient processes, and almost the same amount (258 hours) on duplicative work and unnecessary meetings. That adds up to 12 workweeks per year.[43] Similarly, according to our analysis, US federal government workers spend more than half a billion hours documenting and recording information.[44] These mundane tasks may be important, but if not done in an efficient manner, can lead to employee stagnation, burnout, and adverse wellness outcomes, ultimately distracting people from time that could be spent on work requiring motivation and creativity.

Listening to frontline workers

How can government leaders begin to root out these challenges? Consider listening to frontline workers, the most intimately acquainted with the inefficiencies and redundancies that can gum up agencies' daily operations.

That's what leaders in Ontario did when they embarked on their reform efforts. "When the front line said, this is burdensome … we changed it," DiEmanuele says.[45]

"We've changed so many of our internal processes to make it easier for our staff to do their work. Between 2023 and 2024, we saved US$12.4 million using lean recommendations, avoiding US$5.4 million in costs via in-house training and coaching ... and 17 years in time savings for citizens, businesses, and public servants," adds DiEmanuele.[46]

By empowering workers to identify improvements in real time, leaders can establish a continuous feedback mechanism to help cut red tape. Additionally, agencies can measure and incentivize workers to identify and eliminate inefficient practices that do not contribute to improved outcomes for the government or its constituents. For instance, the New South Wales Police Force is focusing on reducing "blue tape"—a term, originating from officers' uniform color, referring to administrative paperwork that hinder officers' ability to actively respond to incidents on the ground.

With assistance from the Police Association of New South Wales, a trade union organization, the force is working on efforts to reduce police workload by focusing on technology, policy, and legislation. The move resulted in a proposal of more than 100 potential changes to work, many of which are on the way to implementation.[47]

Launching friction reduction initiatives

In 1998, South Korea's Regulatory Reform Committee initiated an ambitious regulatory reform program that reduced over 50% of the country's regulations within one year to recover from the Asian financial crisis.[48] The program included initiatives such as the establishment of a mandatory regulatory registration system, requiring all regulations to be officially recorded and assigned unique codes, thereby eliminating hidden or outdated rules. The committee also mandated that new regulations could only be introduced if an equivalent number of existing regulations were repealed, which helped prioritize essential regulations and avoid unnecessary additions. Furthermore, sunset provisions were implemented to ensure regulations remained relevant in a rapidly changing society. Most of them were assigned an expiration date, typically five years, fostering periodic reassessment and preventing the accumulation of outdated regulations.[49]

More recently, in 2023, the United Arab Emirates introduced the Zero Government Bureaucracy program, focusing on the potential for reengineering processes, adopting commercial leading practices, reevaluating existing process controls, and leveraging digital tools to automate and expedite tasks.[50] Later that year, the government tasked ministries and government entities with the immediate execution of the program, including canceling at least 2,000 government measures and halving the time required for procedures by the end of 2024. The program aims to make government procedures simpler, quicker, and more efficient by consolidating similar processes and removing unnecessary steps.[51]

Employing generative AI to automate lower-value work

The advent of generative AI offers an avenue for further reducing this internal burden. AI-driven applications could potentially save frontline workers in government countless hours, freeing them to focus on more meaningful and impactful work.[52]

Traditionally, government acquisition processes are careful and slow, involving multiple layers of screening and approvals from various parties. It is slowed by manual procedures and outdated methods, such as filling out PDFs and paper forms. To combat this issue, the US Department of Defense's Chief Digital and AI Office is developing Acqbot, an AI-powered tool to write contracts and help accelerate the federal contracting process. The tool generates text with a goal of modernizing the largely manual contracting process. Acqbot makes no contracting decisions, and there's a human involved in reviewing and validating the AI-generated text at each stage of the process.[53]

CASE STUDY: BOOSTING THE PRODUCTIVITY OF PUBLIC SECTOR EMPLOYEES IN SINGAPORE

In 2023, Singapore introduced Pair, a suite of AI-based solutions aimed at helping government employees boost productivity by automating daily tasks and enhancing large dataset searches. Pair Chat aids in summarization, brainstorming, research, writing, and idea generation, with more than 11,000 employees across 100 agencies using it within the first two months.[54] Pair Noms—short for *notes of meetings*—focuses on tasks such as writing meeting minutes, transcribing, formatting, and generating high-quality minutes in under an hour.[55] Pair Search enhances the search experience for publicly accessible government records such as parliamentary debates, Supreme Court judgments, and legislation documents.[56]

The Pair suite has more than 20,000 weekly active government users, saving employees an estimated 46% of time on administrative tasks.[57] The system's AI models are trained on datasets contextualized for the Singapore government, with data stored securely on government-issued devices and logged onto the cloud.[58]

Embracing AI and automation smartly and responsibly, can help government agencies streamline operations, speed up processes, and free up human resources for higher-impact tasks. Beyond technology, agency leaders should look to clear challenges hampering operations and unlock new levels of efficiency, innovation, and employee satisfaction. The path forward should involve listening to those on the front lines, incentivizing the identification of inefficiencies, and embracing the transformative potential of digital tools and generative AI.

Tools and strategies to deliver on reducing red tape

By leveraging the following technology and business tools and strategies, governments can create a more efficient, transparent, and responsive regulatory environment, reduce red tape and enhance service delivery.

- **AI and generative AI** automate repetitive tasks, processes, and speed up administrative workflows.
- **Norm engineering** standardizes and simplifies regulatory frameworks, making compliance easier and more straightforward for both citizens and businesses.
- **Enhanced data-sharing** facilitates seamless information exchange between departments, reducing the need for redundant data collection and processing.
- **Red tape reduction audits** identify and eliminate unnecessary frictions in government, streamlining operations and improving efficiency.
- **Organizational flattening** reduces hierarchy, enabling faster decision-making and more direct communication channels.
- **Human-centered design tools** focus on user experience to redesign processes, making them more intuitive and less burdensome for citizens.
- **Behavioral insights and science** uses data-driven insights to design policies and processes and improve overall customer experience.

My take

Sludge reduction in New South Wales, Australia

James Bates, executive director, Customer, Data & Insights, and Dave Trudinger, director, Behavioural Insights Unit at NSW Department of Customer Service[59]

Since the 1980s and 1990s, New South Wales (NSW) has been on a journey to revolutionize government services. What began as a focus on administrative burden, competition, and user-centered design gradually transformed into a broader mission to enhance the customer experience of government. One of the pivotal moments in this evolution was the creation of the NSW Behavioural Insights Unit (BIU) in 2012. By July 2019, the BIU had found its home within the Department of Customer Service, with a clear mandate: to weave behavioral insights into the fabric of everyday policy and service design, ultimately improving outcomes for all residents of NSW.

Enter the "sludge audit"—a method devised to identify and quantify the barriers that hinder effective service delivery. This innovative approach, originally championed by academics like Dilip Soman (University of Toronto) and Cass Sunstein (Harvard Law School), tapped into the intrinsic motivation of public sector employees, who are often driven by a deep-seated desire to improve service delivery. In 2021, this culminated in the world's first sludge-a-thon.[60] Teams from across the department came together, armed with the sludge audit method, to reduce bureaucratic friction and enhance customer interactions, thereby improving mission outcomes. Since then, sludge audits have been taken up across NSW government agencies.

Consider the process of registering and obtaining a death certificate, a task that, for many, was a daunting prospect during an already difficult time. A sludge audit revealed that 20% of registrations experienced a three-day delay, with each additional problem taking 20 minutes for staff to resolve. Documentation errors alone generated over 7,000 calls and 14,000 emails to support annually. The solution? Simplified instructions to reduce errors, status updates to keep applicants informed, and automatic error alerts. The result? A remarkable 74% of surveyed individuals later rated the process as easy, with only some of these solutions implemented—and more to come.[61]

Early childhood development presented another opportunity for a behaviorally informed customer experience approach. In NSW, parents receive a "Blue Book" when a newborn leaves the hospital, outlining developmental stages and including eight health checks. While 90% of children receive their first check, only 10% complete the final check at age four. Mapping the overwhelming journey of new parents and then identifying opportunities to simplify instructions and provide reminders led to a 30% increase in the number of six- to eight-week check bookings, ensuring more children are developmentally on track and enhancing their potential.[62]

From a business perspective, reducing red tape can boost economic productivity. Take the process of applying for trade licenses, such as those for builders. By conducting a sludge audit, the team examined the applicant's experience, including waiting times and documentation collection, and identified key roadblocks. This effort not only lowered costs by reducing the number of inquiries about application requirements but also allowed employees to focus on more productive tasks.

Within the NSW government, sludge academies and sludge-a-thons have been organized to build capability among public servants to identify and eliminate barriers in service delivery. Teams learn to complete sludge audits, conducting a detailed analysis of service processes to identify and removing unnecessary steps, reducing friction and improving the overall experience. The iterative and innovation-oriented approach in applying behavioral insights has been key to success.

In 2023, NSW partnered with the Organisation for Economic Co-operation and Development to launch an International Sludge Academy.[63] Representatives from 16 governments came together with a shared goal: to boost citizens' satisfaction, trust, and access to government services. By applying behavioral science to their respective government processes, teams conducted sludge audits to identify complexities and frictions in public services, making it easier for citizens and businesses to interact with the government.

This is an example of the power of behavioral insights and the pursuit of a better, more inclusive, and more efficient government. It's a story of how small changes, when thoughtfully applied, can lead to improvements in the lives of everyday people.[64]

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Delivering on public service modernization

Governments are increasingly blending digital and physical services for improved public service delivery

Efficient and pleasant customer experiences often combine digital and physical services—and as companies' technology gets smarter, digital plays an ever-larger role in successful interactions. Customer expectations are rising.[1]

For government services, agencies may struggle to provide seamless experiences for citizens and meet those higher expectations. Many services—negotiating airport security, securing licenses and permits, and applying for a public benefit—may resist transitioning to more efficient digital-first systems; the human element remains significant, which can slow processes and introduce potential error. Many services involve some form of interaction, from onsite inspections to caseworker interviews.

The challenge is often in integrating digital and physical service delivery—for example, making the process of registering a car no more complex than the process of renting a car. A 2022 Deloitte global citizen survey found that satisfaction with online government services lags the private sector by more than 20 percentage points—56% to 77%.[2] The gap between public and private services for purely online services may be even higher for services with a physical component.

Agency leaders are fully aware that positive interactions can enhance citizen satisfaction and trust in government—and that metrics are key to making that happen. More than 70% of government chief information officers plan to increase investments by 2026 to measure the quality of citizen experiences.[3] Perhaps unsurprisingly, satisfaction with government services varies (figure 1).[4]

Making public service experiences more simple and intuitive takes careful design. Modernizing high-touch services is often about more than efficient service delivery—it can help rebuild trust between governments and the communities they serve. The stakes can be high. The examples featured in this report illustrate that it's possible to deliver high-touch services better, faster, and at a lower cost.

Key challenges

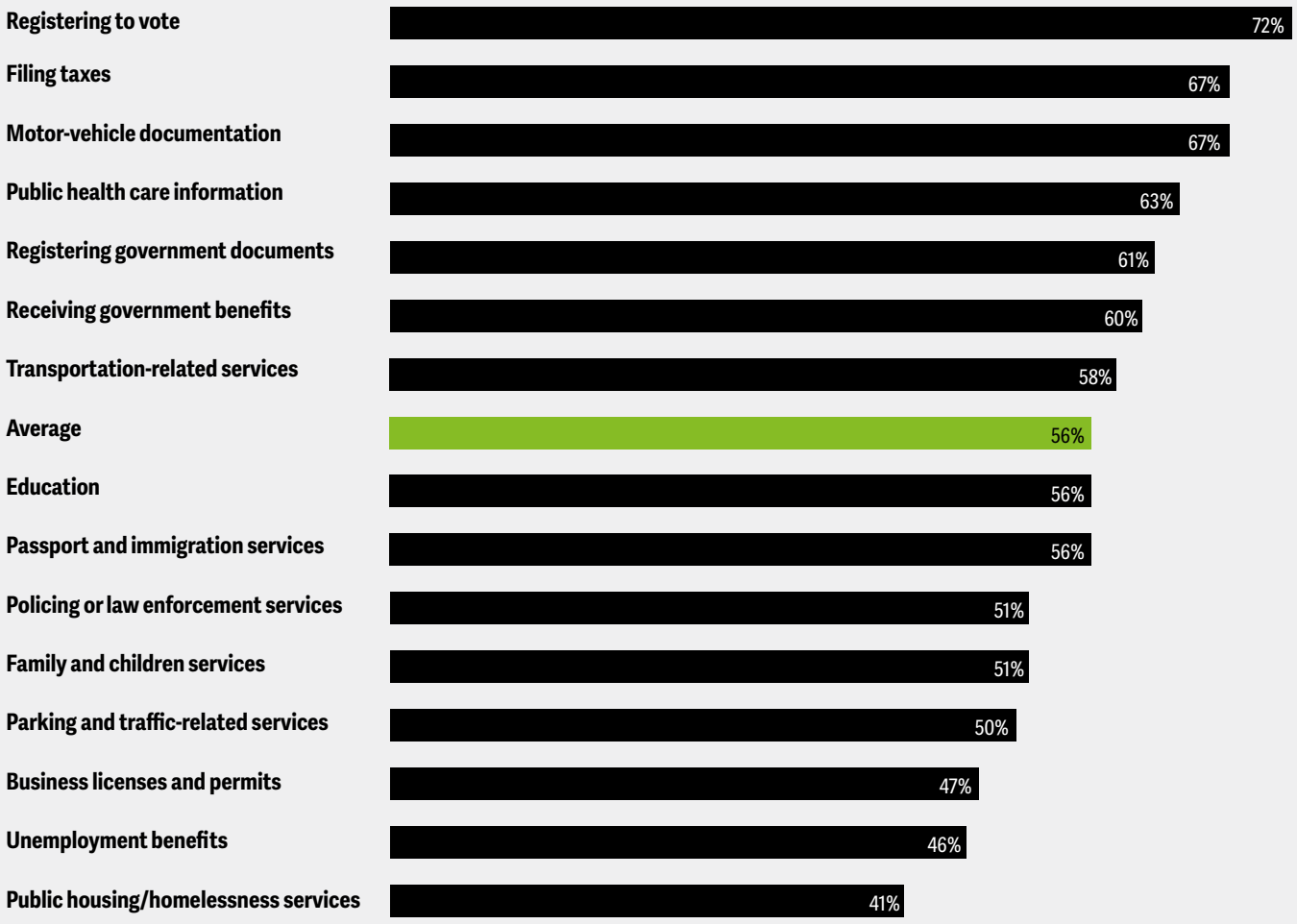
Usually, it's easier to patch a software program than to overhaul a city bus system. Physical public services—often reliant on expensive facilities, capital-intensive tools, and legacy processes that impede innovation—may resist digital upgrades. And the occasional delays and glitches that often accompany human involvement can take a toll on public opinion, particularly because these services are the ones with which many citizens interact often. A smooth passport renewal experience might improve one's perception of government competence,[5] while a frustrating experience transferring a car title can create resentment toward government functions that are completely unrelated to that activity.

Moreover, governments often need to address interconnected problems, such as poverty and low educational test scores, while catering to multiple, frequently conflicting stakeholders. Simple solutions may not only fail to address systems-level issues but can worsen them.

Figure 1

Satisfaction level of respondents with a variety of online government services

Online government services (satisfied and very satisfied)



Source: 2023 Deloitte Digital Citizen survey.

Tackling complex systems presents common challenges:

Behavioral challenges. Resistance to change is often expected, among both employees and constituents. Modernizers can face challenges like, ingrained organizational cultures and deeply integrated legacy systems. Adapting to new systems may require training that some employees find time-consuming, costly, and frustrating. Citizens, too, may resist digital channels—a mandatory switch from a familiar fill-in paper form to a confusing smartphone app may not be welcome. A digital transition should center on the user—even if the user is a citizen who needs an analog option for a while before being won over to digital. It's important to acknowledge the variety of needs of various citizen segments, including those with language barriers and accessibility challenges.

Technological challenges. Some government services depend on legacy systems, including outdated programming languages, which complicates updates as the programmers who understand it retire.[6] The difficulty of translating old technology to new systems can impede efficient, modern solutions. Nearly half of the public sector's C-suite level executives identify legacy systems as a barrier to embracing change.[7]

Data access. Agencies aiming to modernize delivery should utilize data effectively. Legacy systems often trap key management data in silos, making it difficult to access and analyze. By harnessing data effectively across agencies, governments can anticipate needs, allocate resources more efficiently, and enhance accountability. Data also fuels the use of emerging tools such as artificial intelligence and predictive analytics.

Coordination and decision-making challenges. Government often answers to a complex variety of stakeholders, each with its own complex mix of incentives. The different incentives motivating agencies, private partners, and citizens can slow the pace of strategic prioritization of modernization. Within government as well, coordinating efforts across multiple departments becomes a challenge, since each department may have its own priorities, processes, and timelines. Lack of coordination in execution can result in duplicated efforts, wasted resources, and delays in implementing initiatives.

Trend in action

Despite common challenges, each government service has a unique set of challenges. Some services, involved in complex networks of cause and effect, may need a holistic overhaul. Others can improve by broadly rethinking a process. And in some cases, smaller, easier changes can achieve significant benefits.

Governments often lack the initial investment needed to improve internal systems for larger change initiatives. One reason is the challenge of justifying the initial cost and eventual return on investment, with benefits often measured in time saved or improved constituent satisfaction rather than boosted revenue or saved costs. Investing in broad, holistic changes—from cybersecurity systems to automated toll collection—has often driven significant long-term benefits.[8]

Faster service delivery

Some agencies have used several approaches to reduce wait times, including embracing new technologies and processes, discarding outdated rules and regulations, and finding the right balance between speed and staffing levels.[9] A spirit of innovation can drive a more responsive, agile government that exceeds the expectations of citizens, fast.

India offers an example of rapid service delivery. By leveraging digital identity technology, the government has transformed the way public welfare services are distributed, speeding the process and boosting efficiency. The country's national identity program, launched in 2010, and refined over the years, has digitized the delivery of public welfare services, providing citizens with a unique digital identity for secure authentication. During the COVID-19 pandemic, Aadhaar enabled direct deposits of US$3.9 billion to 318 million beneficiaries, revolutionizing service delivery for millions of Indians.[10]

Even in processes that demand some level of human review, improving a process's digital aspect can boost speed. In the United States, passport renewals following the pandemic were seeing significant wait time, in part because the largely manual process struggled to keep pace with a flood of applications amid a lingering staffing shortage.[11] The State Department has since transformed the renewal process into a more seamless, faster experience. In 2021, the department introduced an online program for adult US citizens to renew expired passports. It enabled users to pay, upload photos, and apply entirely online.[12] By October 2024, the State Department reported that it had issued 24.5 million passport books and cards in fiscal year 2024, marking an increase of approximately 500,000 from the previous year.[13]

Merging digital, mobile, and even in-person models can make services more user-friendly, offering users services at their preferred location. A seamless experience could allow someone to begin an application on a laptop, use a phone to upload a picture of a key document, and maybe if they run into trouble, even go into an office for help, picking up right where they left off—no delays, no rework; just the services they need, when they need them. In 2020, the Arizona Motor Vehicle Division launched a modernization initiative. It implemented a digital driver's license on cell phones and rearchitected

digital payments. Other innovations included a streamlined check-in process using digital IDs at kiosks and an electronic car-title–transfer station, which improved efficiency and expanded access to over 30 services online.[14]

Reducing costs

Many government organizations, today, seems to be feeling some level of budget constraint, making cost reduction a priority. Modernization tools can become a cornerstone of cost-reduction efforts as governments move from short-term efficiencies to long-term gains. Tools such as artificial intelligence and digital payments can reduce operating costs over time while simultaneously improving customer service. Although investments in efficiency may require an up-front expense, the results can yield substantial cost savings year over year.

Cloud computing can help agencies move away from spending money on physical data centers. Better data access can help agencies make informed decisions and cut down on inefficiencies. For example, the Washington State Department of Social and Health Services combined data from 10 different agencies to serve 2.4 million public assistance beneficiaries. The broad change enabled more detailed interventions. With shared data, it could meticulously evaluate the factors influencing health outcomes for high-risk Medicaid recipients. The resulting changes led to US$68 million savings through reduced nursing facility use and hospitalizations.[15]

Another way governments can streamline complex processes is to embrace effective change-management strategies and transition to modern technologies. Abu Dhabi's TAMM 3.0 digital platform utilizes AI to streamline around 800 government services. Residents can access everything from licenses to utility payments through a user-friendly app. The automated service delivery saves 100,000 hours of work each month. This holistic integration not only enhances efficiency but also fosters data-driven decision-making, helping leaders better measure citizen needs and departmental success.[16]

These changes can improve citizen experiences by cutting through bureaucratic sludge and streamlining processes.

Leveraging advanced technology can enhance infrastructure management, cutting costs while ensuring reliable services for communities. Washington, D.C.'s water treatment facility embraced AI to help with the detection of water pipeline defects. D.C. Water deploys autonomous robots to capture video footage of pipes, then utilizes an AI-based neural network to identify defects. Inspection costs dropped from US$7 to US$9 per linear foot to just US$2 to US$3. This approach not only saves money but catches defects more accurately, ensuring a more reliable water supply for the community.[17]

Similarly, the city of Raleigh, North Carolina, implemented a new pavement management system to analyze large amounts of data to inform decision-making. The system improved the overall condition of its road network and saved US$8 million to $9 million in annual maintenance costs.[18]

Improving the quality of services

Speed, cost savings, and quality of services often influence each other. In a digital era, focusing on one could improve at least one of the other two. So rather than looking at savings first, some governments have asked how they can best serve their citizens—and then harvested efficiencies as by-products.

When services are crafted with the user at the center, they can naturally become intuitive and accessible. High-touch services can benefit from this approach. Thoughtful design can reduce the necessity for extensive support and follow-ups, and can make the service experience smoother and more enjoyable. A user-centric approach can not only elevate the overall experience but also streamline operations, resulting in quicker service delivery and reduced costs. As business leaders and government CIOs likely both know, customer satisfaction pays off.

SINGAPORE'S LIFESG APP: KEEPING CITIZENS AT THE HEART OF PUBLIC SERVICE DELIVERY

One example of governments modernizing public service delivery is Singapore government's LifeSG app. The app is a testament to the power of digital innovation in public service. The thinking behind LifeSG is simple: The less time citizens need to spend transacting with the government, the more time they get to focus on the things they love.

Launched in 2018 as "Moments of Life," the rebranded LifeSG app is designed to provide citizens with a seamless, personalized experience when interacting with more than 400 government services. Once users log in through their unique digital identity using Singpass, LifeSG creates a dashboard that personalizes recommendations for content and services and supports users through significant life events. For example, the app streamlines the birth registration process—including applying for the nation's Baby Bonus and opening a Child Development Account—from 60 minutes to just 15 minutes.[19] Singaporean parents now register 7 in 10 eligible newborns with the app.[20]

LifeSG's human-centered design aims to help users navigate the interface intuitively. By answering a few simple questions, citizens can view the list of government support programs for which they are eligible and estimate the benefits and support they can receive. The app sends out proactive, personalized notifications so users don't miss important deadlines or eligible benefits.[21]

Easing processes for citizens can help improve their overall experience and satisfaction with the service. Children's of Alabama, a children's hospital, demonstrated the power of enhancing service quality by transforming the experience itself. In 2022, the hospital faced challenges with disruptive patients in its busy X-ray suite. Recognizing that complaints about long wait times often reflect a frustrating experience, but unable to conduct X-rays any faster, the hospital transformed the atmosphere for waiting patients. It equipped the X-ray room with an ambient experience, integrating dynamic lighting, sound, and video to create a soothing environment—a small change that boosted patient compliance and satisfaction.[22]

Governments are transforming service delivery to address complex societal challenges, such as homelessness, by simplifying complicated processes and applying experience-focused approaches. Previously, the New South Wales government's assistive outreach program for the homeless relied on a paper-based note-taking system that required already vulnerable individuals to speak to multiple staff members and repeat their stories. To address this, the government partnered with experts to develop the "Journey on Home" mobile app. The app has allowed for significantly improved homeless support services, ensuring the most vulnerable receive the right service at the right time without repeating their story to different staff members. The reduction of manual data entry significantly freed up time for staff, allowing them to focus on providing support to clients and reducing time spent on reporting by 80%.[23]

(For more information on the holistic transformation of service quality, dive into our in-depth exploration of digital transformation in government*.)*

Tools and strategies to deliver on public service modernization

While there is no one-size-fits-all strategic approach to public service modernization, agency leaders may want to consider a number of strategies when looking to make services with significant physical and digital components better, faster, and cheaper.

Define your objective. Are you trying to cut costs? Reduce wait times? Cut the error rate? Improve service quality? Understanding who can benefit the most and knowing what you are aiming for can help you choose the right path.

Demand reduction. Taking steps to lower demand can be a win-win. Can you shift renewals from annually to every two years?

Offer enhanced digital, mobile, and self-service options. Making "lower touch" options easier for your constituents can encourage them to forgo inefficient in-person visits or phone calls.

Work with partners for broader improvements. Look to channel partnerships to make service access more convenient—for instance, having service kiosks within

retail settings like grocery stores so customers don't have to visit a different location, or partnering with banks so customers can use banking information to verify their identity and access government services.

Consolidate for user convenience. Someone opening a new restaurant will likely need several different types of permits, licenses, and inspections; combining these can make the user experience far less onerous. Canada, Australia, and other countries have experimented with consolidating services into one-stop shops.

For greater benefits, upgrade your digital infrastructure. Multiple agencies can leverage a robust digital infrastructure—one with a unique digital identity, shared process applications, and cloud-based data-sharing—to improve constituent services. It's also important to account for potential cybersecurity, privacy, and records management risks from the outset, ensuring these considerations are integrated into the design rather than an afterthought.

My take

Modernizing public services: A path to better service delivery

Michelle E. DiEmanuele, Ontario's Secretary of the Cabinet[24]

To modernize public service delivery is to understand both the current needs of citizens and to anticipate their needs in the future. It requires evolving and questioning the status quo to continuously improve. If a citizen can withdraw cash from an ATM in 35 seconds, why can't they access government services just as easily? Questions like this fuel my passion for enhancing public services. Modernizing means not only meeting public needs but delighting those we serve and earning their trust.

Delight comes from excellent service and a consistent approach the public can rely on. We achieve this through people, process, lean design, and technology, alongside a robust change management strategy. This ensures that we can support the public through service transitions, recognizing that sometimes the public is eager for change, while at other points, they may need more time to adapt. To do so requires us to guide our organization through change while also supporting the public to change.

A big part of building public trust comes from accountability. ServiceOntario demonstrated this by introducing North America's first ever money-back guarantee for government services. The initiative was born out of a need to address the lengthy nine-month wait time for birth certificates in 2005. By employing technology and changing processes, ServiceOntario was able to significantly reduce this wait time. Since 2007, over 2.47 million families have used the online newborn registration service, with most receiving their baby's birth certificate within five days. The money-back guarantee symbolized the public service's commitment to delivering reliable and timely services, matching private sector standards.

Over the last 20 years, public service changes have largely been driven by automation, technology, and people-centered design. Today, we use more of an iterative process that leverages design thinking, lean methodologies and a focus on data security. For example, instead of launching everything at once, we introduce an app with basic functionality and add more over time. There is also a stronger predisposition to standardization. AI is a great example, where everyone is looking to leverage it as a transformative tool, but it requires skill-building, bias reduction, and data protection. It is much more complicated than previous technologies but presents great opportunities to serve the public and build an economic engine.

Critical to the modernization of public service is seeding the change with the public. It involves engaging with stakeholders and validating the work being done. Effective stakeholder and public engagement is crucial, focusing on how to implement changes as well as on policy and engagement frameworks. Prototyping and proving the efficacy of new initiatives is essential. Public services play a vital role in people's lives. As we modernize and improve, measuring risks while making progress is essential in design. Soliciting feedback continuously serves to remain relevant as we work to meet expectations for those we serve.

Ultimately, these advancements require a willingness to challenge the status quo and drive change. Recent initiatives, such as integrating ServiceOntario capabilities into retail spaces, demonstrate how public services can adapt to meet public needs more conveniently and build upon past successes. It requires proactive leadership, stakeholder engagement, and a commitment to continuous improvement. Above all else, it requires remaining relevant by focusing on the people we serve and how we can meet their needs now, and in the future.

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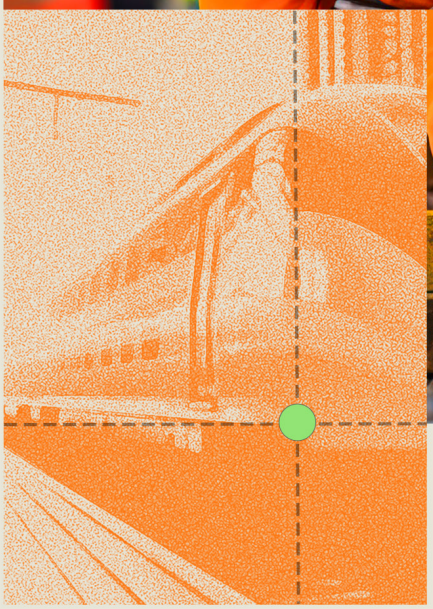


Delivering future-ready infrastructure on time and on budget

Governments are increasingly embracing new technologies and processes to optimize every stage of infrastructure development

Infrastructure underpins *everything*. The bridges, roads, rail transit, subways, cables, transformers, sewers, and water treatment plants that governments have installed over the decades—and constantly work to maintain and upgrade—are what make modern life possible.

Large public works projects have had world-changing impacts, from the Panama Canal's rerouting of global maritime supply chains[1] and the US interstate highway system's changing an entire national culture,[2] to the England–France Channel Tunnel enhancing regional connectivity.[3] Countless smaller projects, of course, are in progress in every state, county, city, and town around the world, helping businesses operate, commuters get to work, and households function.

However, too many projects exceed their budgets, fall behind schedule, or both. In fact, research suggests there are multiple factors that lead to cost and time overruns in infrastructure projects, including inadequate scoping and planning, labor shortages, technology changes, funding and budget shortfalls, and lack of coordination among different stakeholders.[4]

Finding the money to get things built is one thing. But keeping everything operating is a perpetual challenge—and it's getting harder. In planning projects for the years to come, governments face new environmental threats that make future-proofing critical infrastructure an immediate priority. According to a 2023 report from the Coalition for Disaster Resilient Infrastructure, the global average annual loss of infrastructure due to changing weather patterns is between US$732 billion and US$845 billion.[5] Extreme weather events are threatening bridges, dams, power plants, and other historically safe structures, even as acute heat adds stresses no builder anticipated.[6]

There are also growing demands on existing infrastructure, which often needs upgrades today to manage future growth. For instance, analysts expect the growing ubiquity of artificial intelligence and generative AI to drive exponential growth in data centers over the next decade, which will, in turn, strain the grid and power infrastructure.[7] While hyperscalers will likely build out much of their power infrastructure, grid modernization must match this growth.[8] Governments need to support these modernization efforts and adopt agile regulatory approaches while exploring an ever-broader range of energy sources, such as nuclear small modular reactors.[9]

This trend focuses on how governments are addressing these new and perennial challenges in delivering infrastructure fit for future purposes. Doing better means not only taking threats into account but also changing processes to accelerate traditional timelines. Too often, infrastructure projects are overtaken by technological advances, shifting demand forecasts, and even new construction methods.[10] Forward-thinking leaders are looking to new technologies, processes, governance, and funding mechanisms to ensure that essential and critical infrastructure is not only delivered on schedule and within budget but also capable of responding to the intricate and ever-evolving demands of society and the environment.

Key challenges

- **Weather and other man-made threats like cyber-attacks on infrastructure:** Risks and threats to infrastructure are increasing in severity and unpredictability, requiring heightened security measures, physical bolstering, and more redundancy planning, which all exacerbate budgetary challenges.

- **Cost and time overruns:** Infrastructure projects often face cost and time overruns due to engineering complexity, changes in political leadership, divergent stakeholder interests, budget constraints, evolving technology, talent gaps, and supply chain issues.

- **Funding and financing gap:** Global investment in infrastructure is far below needed levels, with a US$15 trillion funding gap projected through the 2030s despite annual investments exceeding US$5 trillion.[11]

- **Aligning stakeholder interests:** Misaligned stakeholder interests can cause delays, especially as the private sector often shies away from financially risky projects without clear revenue models.

- **Talent shortages:** With projects increasingly drawing on technology and advanced skills along with large-scale construction work, governments and economies often face a widespread talent shortage.

Trend in action

Infrastructure projects are massive, complex undertakings designed to serve large groups of people over the long term: powering homes, transporting people and goods, supporting critical services such as health care, enabling digital communication, and more. The scale demands collaboration among government agencies, contractors, financiers, and skilled workers while tapping into global supply chains.

Speed of delivery will likely always be an issue since governments must adhere to a broad set of public commitments and proper stewardship of public money, obligations that inevitably slow decision-making and delay permitting. Additionally, divergent interests of diverse stakeholders—such as citizens, businesses, nonprofits, and other public agencies—although important, can stall projects further. Leaders must work within those parameters to get tomorrow's infrastructure underway as efficiently as possible.

Embedding resilience in project scoping and planning stages

Of course, every infrastructure project should be planned effectively. However, the process is often challenging because of such projects' inherent complexity, including the need for planners to forecast usage and maintenance years into the future. This complexity is further compounded by the increasing frequency and severity of extreme weather events, which place additional strain on already demanding planning processes.

To speed up the planning process, governments are increasingly using new technologies to collect and analyze large volumes of disparate data to enhance the effectiveness and efficiency of those planning processes. Additionally, they are embedding resilient design principles at the core of their planning processes, helping projects be better equipped to withstand future environmental uncertainties.

Using emerging technologies to improve planning and building resilience for changing weather patterns

Officials in Raleigh, North Carolina, are using AI-based technology to bolster the city's water and sewer systems. Sensors detect early signs of blockages and forecast flooding and overflows during storms. Machine learning helps predict water main breaks, directing the municipal water utility on where to perform preemptive maintenance.[12]

Raleigh officials are also using a digital twin to guide development. Microclimate modeling is enabling them to avoid development that can create heat islands—an increasingly critical initiative as the region anticipates more frequent extreme heat events in the future. This approach addresses the challenge of extreme heat and its impact on residents and future infrastructure development. The simulation ingests developers' new permits and building designs, allowing officials to visualize how these developments will affect shade and wind flow in the area.[13]

CASE STUDY: USING DIGITAL TWIN TECHNOLOGY TO INFORM REGIONAL PLANNING EFFORTS

In Broward County, Florida's second-most populous county, the Broward Metropolitan Planning Organization, responsible for coordinating transportation policy for 31 municipalities and 1.9 million residents,[14] is developing a digital twin platform to improve infrastructure planning decisions as congestion, economic, and flooding threats rise. The platform, SMART METRO, will integrate data from various sources—on housing, zoning, population, transportation, and more—with geospatial visualization tools, allowing planners to ask questions in natural language and tap into a single source of truth.

The digital twin's data exchange will allow the organization to understand current economic, transportation, and social needs, as it prepares to plan projects. An analytics layer enables predictive capabilities to forecast congestion conditions, land use patterns, and flood projections. Additionally, a simulation layer uses models to inform transportation, land-use, and resiliency planning, map and visualize future project development, and analyze relative cost-benefit impacts from different scenarios.[15]

Broward Metropolitan Planning Organization officials are planning to use the platform for several upcoming projects, including analyzing the impacts of a redevelopment program in the City of Miramar, focused on transportation infrastructure and the need for additional investment in roadways and public transit. Analysis based on flood prediction and simulation data helps planners locate public transit stops and routes.[16]

Beyond enhanced decision-making, the platform is helping to build collaboration between municipalities that often operate independently. The digital twin facilitates better collaboration by providing a unified platform for data-sharing, communication, and scenario analysis, thereby enhancing regional planning efforts.[17]

Adopting resilient design principles

Infrastructure is built to endure, and many of the systems we rely on daily—highways, railways, and power grids—have served us well for decades. However, the rising frequency and intensity of extreme weather events are increasingly testing these systems. From wildfires that devastate power and water infrastructure to floods that paralyze transportation networks, the resilience of infrastructure is under strain like never before.[18]

This isn't due to poor design or planning. Decades ago, no one could have anticipated the scale and severity of today's environmental challenges. Now that the risks are understood, it's important to plan and build with the future in mind, helping to ensure that the infrastructure constructed today can withstand the next century, even as environmental conditions worsen.

Around the world, infrastructure planners are increasingly adopting design principles that enhance resilience to extreme weather. A cornerstone of extreme weather-resilient infrastructure design is accurate weather data—both current and forecasted. By utilizing precise weather forecasts, planners can assess the long-term impacts of changes in weather patterns on infrastructure, prioritize investments, and implement adaptive strategies that ensure these critical systems remain functional in the face of future challenges.

The Sydney Metro, the largest urban rail investment in Australia's history and intended to last 100 years, integrated extreme weather resilience into its core design, prioritizing adaptation at every stage. From the outset, risks were assessed across three time horizons: short term (2030), medium term (2070), and long term (2100). Leveraging long-range climate models, Sydney Metro identified high, medium, and low risks for various parts of the system and adjusted the infrastructure design to address them.[19]

For example, the north-west section of the network—the first stage of the project in operation since 2019—was identified as highly vulnerable to flooding and heat waves. To mitigate these risks, critical equipment was placed in temperature-controlled rooms capable of withstanding extreme heat. Ventilation systems in tunnels and stations were specifically designed to maintain customer comfort on the hottest days. Additionally, water-sensitive urban design features, such as permeable surfaces, were incorporated to reduce flood risks during heavy rainfall.[20]

A key element of extreme weather-resilient design principles is the use of materials capable of withstanding the increasing frequency and intensity of extreme weather events. Governments are collaborating with universities, research institutions, and the private sector to assess how such events will impact infrastructure over its lifespan. This insight allows for the design of infrastructure that incorporates materials specifically engineered to endure and mitigate the effects of extreme weather.

For instance, transportation and infrastructure planners in Virginia are using modeling created by the Virginia Institute of Marine Science at the College of William & Mary to design more resilient infrastructure. These models, which forecast sea-level rise through 2050, enable planners to assess how extreme weather will affect infrastructure. For example, they analyze the effects of rising salinity on bridges and culverts, determine changes needed in metallurgical standards for structures, and identify suitable materials for coastal roads that are increasingly vulnerable to flooding.[21]

Streamlining permitting and improving transparency

Policymakers often craft laws and regulations with the best of intentions: to ensure infrastructure projects meet high standards, minimize ecological harm, protect marginalized communities, and gain the support of diverse stakeholders. However, well-meaning safeguards can create barriers to development, with projects tangled in policy webs spanning local, state, and national authorities. It's challenging to lower barriers once raised, but some leaders are taking the initiative to streamline processes to get things done.

Making business-to-government interaction easier

For businesses, navigating government regulations and permitting processes can be challenging. With different rules and procedures and various government entities involved, project implementation can be impacted and lead to additional costs, extended timelines, and hesitancy from the private sector to partner altogether. Efforts to simplify the permitting landscape seek to minimize applicants' challenges to obtain the full range of necessary permits.[22]

In our previous trends report, we highlighted how governments are increasingly embracing a "single-window" approach to licensing and permitting. In Denmark, the Danish Energy Agency now serves as a single point of contact, coordinating with relevant public authorities to provide all key wind farm licenses.[23] The country can now process wind farm permits in just over 10 days, enabling businesses to install an offshore wind project in only 34 months, compared to timelines of up to eight years in other European Union nations.[24]

Building transparency into the permitting processes

Governments worldwide are enhancing transparency in the permitting and licensing processes. The Michigan Infrastructure Office has developed a publicly accessible dashboard that displays major state infrastructure projects selected for a coordinated permitting process. Similar to the Danish Energy Agency, the office collaborates with state departments to identify the necessary permits and determines the most efficient order to process permit applications.

Applicants can use the dashboard to track the necessary permits for a project, their current status, and an estimated timeline for completion.[25] And, in the interests of transparency and accountability, the dashboard also allows the public to monitor the state's progress in reviewing and expediting permits.[26]

Building consensus with diverse stakeholders

Stakeholder engagement and consensus-building are critical components of successful infrastructure projects. Engaging stakeholders allows planners to identify the specific needs, objectives, and pain points of those affected by a project—an understanding crucial for aligning project goals with community and other stakeholder expectations and requirements.

Participatory planning and engagement with communities and other stakeholders

The Economist Impact's Infrastructure for Good barometer highlights the critical need for participatory planning and stakeholder engagement in early-stage assessments.

The barometer examines the infrastructure ecosystems of 30 countries and benchmarks their capacity to deliver efficient and quality infrastructure that addresses economic, social, and environmental needs. It indicates that only half of the countries surveyed engaged in participatory planning and need assessments in the early stages of a project.[27]

Infrastructure Victoria in Australia is an example of participatory planning and deep engagement with communities to assess future infrastructure needs. Victoria Infrastructure Strategy, the organization's 30-year regional plan (2021 to 2051), views infrastructure development as a system rather than an amalgamation of individual projects. It projects the region's needs over a long period, creating a blueprint for what needs to be refurbished and what needs to be built at the system level. The plan was developed by making residents and communities co-owners in planning and needs assessments and by establishing a thorough consultation and engagement process.[28]

Water infrastructure is another critical area that often does not receive as much attention as other infrastructure projects. Watershed management and resilient water infrastructure development affect a wide variety of stakeholders, from businesses to communities. The Chesapeake Bay Program provides a glimpse into methods that find common ground between different stakeholders and pave a way forward to solve the critical issue of watershed management. The program is a public-private partnership dedicated to protecting and restoring the Chesapeake Bay watershed, the largest estuary in the United States and the third largest in the world, spanning six states and home to more than 18 million people and 3,600 species of plants and animals.[29]

Founded in 1983, the program aims to align federal, state, and local goals in a collaborative water management strategy. Using written agreements that include periodically updated collective value principles, it engages federal and state agencies, local governments, nongovernmental organizations, businesses, academic institutions, and communities in a holistic approach that addresses water quality, habitat restoration, community engagement, and industry improvement around the Chesapeake Bay.[30]

Using new tech-driven tools to drive stakeholder engagement

Understanding the motives and aspirations of different stakeholders is crucial, as is engaging with them meaningfully. Helsinki, Finland, has been at the forefront of utilizing digital twin technology for enhanced urban management and boasts one of the world's longest-running digital twin programs. The city is currently leveraging this technology to enhance citizen engagement and participation.[31]

By providing access to the city's digital twin tool in the Kalasatama neighborhood, Helsinki offers a highly visual platform on which stakeholders, including current and prospective residents, can view project information and provide input, including via mobile devices. The initiative serves as a model for future projects throughout the city and illustrates how digital twins can help meet the growing needs of urban environments over time.[32]

Incentivizing private-sector participation in infrastructure

Agencies, often short on manpower and financial resources, routinely collaborate with companies to make large-scale infrastructure projects happen. However, corporate objectives may not align with national infrastructure goals, and delays or rising revenue risks can stymie large projects. To help counter this, some governments are adopting strategies to reduce financial risks for private investors, making risky or unviable infrastructure projects more appealing.

Deploying derisking strategies

Financing costs, driven by the cost of capital, represent a significant portion of the expenses involved in constructing and operating infrastructure projects, whose diverse risks can elevate the cost of capital—and the overall project cost—as investors and lenders demand higher returns to offset these uncertainties.

The risks associated with infrastructure projects can be broadly categorized into four categories: macro, market, technical, and financial.[33] Governments have begun deploying a mix of derisking strategies designed to manage risks across all categories, helping reduce the cost of capital and, subsequently, the overall project expenditure. The reduced risk and lower financing costs can also enhance the projects' initial commercial viability and sustainability.

Collaborating with multilateral agencies can help governments of developing nations derisk infrastructure investments. For instance, the World Bank's Multilateral Investment Guarantee Agency offers political risk insurance to protect investors in infrastructure projects within developing countries from losses due to political risks, including currency inconvertibility, transfer restrictions, expropriation, war, terrorism, civil disturbances, breach of contract, and non-honoring of financial commitments.[34] Similarly, the Global Infrastructure Facility, a G20 initiative, provides funding and advisory services to governments on how to select, design, structure, derisk, and bring high-quality infrastructure projects to market.[35]

According to a Deloitte estimate (figure 1), employing a tailored mix of derisking strategies—including favorable policies, guarantee mechanisms, offtake reliability, the development of domestic capital markets, and leveraging blended finance—could drive a US$40 trillion reduction in energy transition costs by 2050.[36]

Rebalancing the financial risks between the public and private sector

The high risk of delays and cost overruns in infrastructure projects can deter private developers and lenders, particularly when revenue models are unproven. To encourage private-sector involvement, many governments are adjusting how financial risks are distributed, taking on a greater share of the financing and revenue burden. The construction of highways in India serves as a powerful case (see "New revenue models to accelerate road development in India").

CASE STUDY: NEW REVENUE MODELS TO ACCELERATE ROAD DEVELOPMENT IN INDIA

The National Highway Authority of India has long faced an uphill battle in attracting companies to build and operate national highways. The hesitation is understandable: Such projects come with hefty price tags, can be delayed by everything from red tape to legal entanglements with various groups, have uncertain revenue models for new routes, and historically have given investors little control over cash flow.

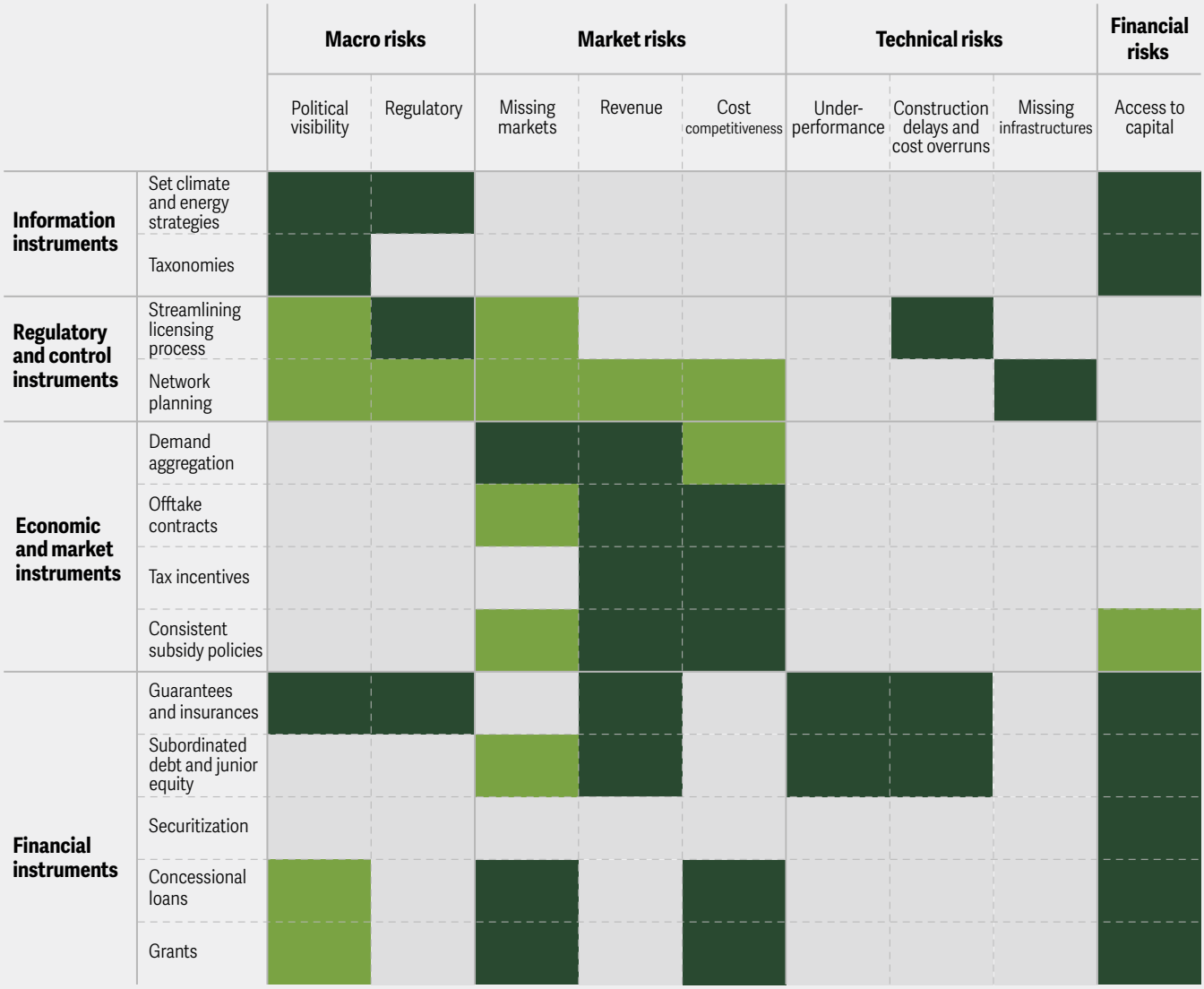
To stimulate private-sector involvement, the highway authority introduced the Hybrid Annuity Model (HAM) in 2016 to contract private developers to build highways. HAM represents a public-private partnership structure that redistributes financial risks between the government and the private sector. Under this model, the government shares the financial risk by infusing 40% of the project cost during the construction period. It also manages revenue collection, primarily through tolls, and assumes the risk of revenue shortfalls. Additionally, the government provides inflation-adjusted payments to the private sector for construction, operation, and maintenance. The approach, by having the government contribute a fixed percentage to the project costs, also disincentivizes contractors from *low-balling* bids to win contracts.

The model has been successful in catalyzing road development—delivering more than 8,000 kilometers of Indian highways since its inception—and diversifying the contractor base to include a wider range of developers. HAM's success has prompted the government to test the model to attract private players to develop infrastructure projects in additional areas such as water and sanitation.[37]

Figure 1

Derisking strategies for green transition projects and their effectiveness

Full mitigation **Partial mitigation** **No impact**



Source: Bernhard Lorentz et al., "Financing the green energy transition: Innovative financing for a just transition," Deloitte Center for Sustainable Progress, May 2024.

Building supporting infrastructure

Infrastructure relies on interconnected systems to function effectively. For instance, the electrification of transport requires an extensive network of charging stations, expansion in power generation, advanced battery storage systems with rising capacity, and transmission lines to connect power generation sites to the national grid. Private companies often hesitate to commit resources to projects when the necessary supporting infrastructure—critical to ensuring their success—is not yet in place.

Governments have particularly struggled to find willing private partners for renewable energy infrastructure projects. In most cases, locations with abundant energy sources, such as solar or wind, are remote and lack ready connections to existing grid infrastructure—and, therefore, may attract little commercial interest. The challenge lies in the prohibitive costs for individual developers to not only build a plant but also invest in connecting it to the grid dozens or hundreds of miles away.

Australian state governments aim to address the investment issue with renewable energy zones, which are designated semi-remote areas with abundant renewable energy resources. Each renewable energy zone clusters large-scale renewable energy projects, such as wind and solar farms, alongside dedicated storage and transmission infrastructure.[38] State governments have committed to installing long-distance transmission lines to connect these zones to the existing grids.[39]

The concentration of multiple large-scale plants in a single location enables economies of scale, while the energy storage and transmission infrastructure curtail transmission losses and ensure integration into the national grids—an approach that can make it commercially viable for private companies to develop energy plants in remote locations. Australia has identified nearly three dozen locations across the country as possible renewable energy zone sites.[40]

Bridging the talent gap

The talent and skills gap in infrastructure is a challenge that can affect agencies' ability to implement projects effectively. At the market level, workers are increasingly scarce in construction, engineering, renewable energy, and other emerging areas.[41] Moreover, there is a growing talent gap within governments to drive tech-aided infrastructure development and other softer skills, such as cross-sector collaboration.[42]

Funding upskilling and reskilling of workers

The widening skills gap is impacting infrastructure development across regions. Infrastructure is a labor-intensive industry: Projects simply do not get built without a steady supply of skilled engineers, architects, crane operators, electricians, construction laborers, solar energy technicians, cybersecurity professionals, and many more.

The Construction Training Fund (CTF) in Western Australia illustrates how an industry and government-funded statutory authority can drive upskilling and reskilling in the construction industry. For more than three decades, the CTF has administered a training levy on building and construction work. The state then pours the revenue back into the industry via a range of training grants and subsidies.[43]

The CTF coordinates with employers, government, and training providers to align training programs with industry needs. It also conducts deep research and labor market needs-demand analysis to understand the current and emerging labor market.[44]

The CTF drives skilling efforts through apprenticeship and traineeship grants,[45] which employers can use to offset their costs up to AU$34,500 per apprentice or trainee.[46] The program offers participants bonuses on completion and additional payments for each further year of training.[47] For existing construction workers, it incentivizes upskilling by providing a rebate of up to 80% of the total cost of training. In the fiscal year 2023 to 2024, the CTF allocated AU$24.1 million toward apprenticeship programs and an additional AU$ 2.9 million for upskilling existing workers. Consequently, more than 16,000 workers trained with CTF support joined the infrastructure workforce. A survey of employers indicated a nearly 90% satisfaction rate with the quality of CTF training, underscoring the enhanced skill levels within the workforce.[48]

CLOSING THE CYBERSECURITY TALENT GAP IN THE UNITED STATES

As digital technologies play an ever-larger role in physical infrastructure, agencies expect the demand for cyber talent to increase exponentially. In 2024, the global cyber workforce gap was at 4.8 million—up 19% from 2023—with critical infrastructure and government more likely to report a cyber skills gap than other sectors.[49] Indeed, the US Cybersecurity and Infrastructure Security Agency (CISA) estimates that there are more than 570,000 open cybersecurity jobs in the United States alone.[50]

With the National Cyber Workforce and Education Strategy, the federal government has aimed to strengthen cyber skills in the workforce as well as the public sector.[51] To plug the cyber talent gap within the federal government specifically, CISA runs the Federal Cyber Defense Skilling Academy, helping train federal civilian employees in cyber defense skills in a three-month full-time program.[52]

The National Science Foundation funds the US$24 million CyberCorps Scholarship for Service program, designed to train the next-generation cyber workforce for the federal, state, local, and tribal governments. The program provides three years of scholarship support to cybersecurity undergraduate and graduate education, with the condition that recipients work for the government for a period equal to the length of the scholarship after graduation.[53]

Universities, both large and small, are playing their part in filling the cyber talent skills and demand gap. The National Security Agency has recognized Dakota State University as a Cyber Education Center of Excellence and routinely sends employees for specialized learning opportunities alongside the thousands of students in cyber-focused programs.[54] In 2023, Dakota State entered into a partnership agreement with the agency, allowing students to earn academic credit by working on classified projects. Furthermore, National Security Agency employees can collaborate with faculty and students, providing valuable insights and keeping students informed about the latest trends in national security defense.[55]

Building public sector capacity to deliver on infrastructure

The private sector is invariably involved in delivering large public infrastructure projects, often through partnerships. But, given the growing complexity of developing infrastructure, public-private partnerships increasingly require innovative structures.[56]

To help public officials envision and implement new structures, the World Bank created the Infrastructure Finance Academy, offering resources and tools to support infrastructure financing. The academy provides multiple online courses that deliver training in key areas, such as creating an enabling environment to attract private capital, using different financial instruments, and preparing transactions to meet market requirements.[57] The program also maintains a database of 6,400 public-private infrastructure projects from 137 low- and middle-income countries, illustrating a wide range of cases for public officials and policymakers.[58]

Helping smaller governments to help themselves

Without support from regional governments or the right partners, smaller local governments can struggle to deliver on large infrastructure projects. In fact, the challenge often begins in applying for competitive grants available from state and national governments. Philanthropic partners and even national governments can step in to help make sense of complex grant-making processes.

For instance, proficiency in writing and applying for grants is essential for local governments, as stronger applications increase the likelihood of receiving funding. Bloomberg Philanthropies' Bloomberg City Network helped to bridge this specific skills gap through its Local Infrastructure Hub, which supported more than 700 small- and medium-sized cities through grant application boot camps. These programs trained city officials to develop competitive grant applications and improve technical writing, enabling them to tap into funding sources.[59]

Tools and strategies to deliver on infrastructure

Governments worldwide are exploring, piloting, and reimagining multiple tools and strategies to tackle the infrastructure delivery challenge. Given the scale and complexity of large infrastructure projects, time and cost overruns are often inevitable. The following portfolio of tools and strategies can serve as considerations for government leaders as they look to deliver resilient infrastructure fit for future purposes.

- **Digital twins and AI-driven scoping and planning:** Collect and analyze vast amounts of data, providing planners with insights, simulations, and virtual renderings for better decision-making.
- **Permitting process improvements:** Deploy innovative approaches such as a "single-window" system to streamline the complex permitting landscape.
- **Systemic transparency:** Incorporate transparency in infrastructure projects by developing publicly accessible dashboards that display details of infrastructure projects under review.
- **Stakeholder analytics:** Analyze various stakeholders' motives, priorities, and aspirations to help improve consensus-building on large, complex infrastructure projects.
- **Derisking strategies:** Address various risks affecting an infrastructure project, with the objective of reducing financing costs.
- **Financial risk rebalancing:** Distribute risk between the public and private sectors for high-risk projects, with governments assuming a larger portion of the financing and revenue burden.
- **Networked infrastructure development:** Prioritize the development of interconnected networks of infrastructure that depend on one another for optimal functionality rather than concentrating solely on isolated projects without the necessary supporting infrastructure.
- **Critical skills workforce training programs:** Fund and develop skills training programs that align with industry standards and requirements by partnering with the private sector and academia.
- **Public-sector workforce upskilling:** Develop and deliver training programs designed to enhance the capacity of the government workforce in effectively implementing infrastructure projects.

My take

UDOT's digital transformation efforts can help improve infrastructure project delivery

Carmen Swanwick, director of project development, Utah Department of Transportation[60]

The Utah Department of Transportation (UDOT) is undergoing a major business systems modernization effort to replace legacy, homegrown systems with more efficient, integrated technology solutions. The first phase of the systems in focus spans Capital Planning, Project Management Information Systems, Right of Way, and Contracting. Currently, UDOT relies on legacy systems that are low on functionality and efficiency, often forcing staff to work outside these systems just to complete tasks. UDOT's goal is to transition to fully integrated best-of-breed software-as-a-service solutions—all integrated via an AI-driven enterprise data backbone that will deliver critical business insights needed to deliver the infrastructure projects that will power Utah's future.

For instance, the UDOT handles vast amounts of information, much of it unstructured and inconsistent. To ensure accuracy and reliability, UDOT is cleaning, organizing, and standardizing data across project delivery, capital planning, cash flow processes, and project management. By establishing clear guidelines for data formatting and labeling, UDOT will make information more accessible and usable for internal stakeholders and external contractors and vendors.

The business systems modernization effort complements UDOT's Digital Delivery model, which is already transforming the department's delivery of infrastructure projects. The model helps make design, construction, and asset management more efficient by delivering digital data in more consumable formats for surveys, field applications, and decision-making for downstream users. This transformation is also reshaping design, inspection, and construction workflows. Instead of relying on printed plans in the field, inspectors can now leverage advanced tools to interact directly with digital models, thus streamlining workflows and improving accuracy.

Historically, even projects on the same corridor required redundant surveys and utility assessments. By centralizing data and ensuring continuity, we aim to eliminate these inefficiencies, allowing future projects to build on existing models rather than starting from scratch.

Additionally, the capture and integration of data from design, construction, and asset management can help the UDOT to create advanced functionalities like digital twin models to support decision-making and improve work processes across multiple disciplines. While the UDOT's IT modernization is still in its early stages, it will require workforce upskilling and training to ensure the widespread adoption of digital tools within the department.

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Delivering on a better quality of life

Governments worldwide are addressing affordability, accessibility, and civic engagement challenges to improve the quality of life for their residents

Governments often measure success through many metrics—gross domestic product, life expectancy, maternal mortality, and deaths of despair—but most of the time, what they're trying to discern from those numbers is quality of life. Today, dozens of indices assess quality of life, including data on health, education, income, and self-reported well-being. Multiple factors such as demographics, culture, and regional circumstances influence quality of life.

A global survey of 33,000 people in 28 countries reports that only 36% of respondents believed that things will get better for the next generation; this number was only 20% for developed countries.[1] The US Federal Reserve's latest report on the economic well-being of US households found that about 72% of adults were at best "doing okay" financially. The financial well-being gap was more severe when viewed through the lens of educational attainment, race, and family structure.[2]

Economic pessimism appears interlocked with stagnating wages and elevated inflation levels.[3] Although inflation is slowing down globally,[4] the cost of living continues to rise. The Economist Intelligence Unit's Worldwide Cost of Living 2023 survey pointed out that, on average, prices had risen by 7.4% year over year.[5]

Another area of concern is that some citizens feel as though they do not have a say in what government does. The Organisation for Economic Co-operation and Development (OECD) found that the trust gap between citizens who report having political agency and those who say they do not is 47 percentage points.[6] A 2024 Pew survey found that a majority of respondents (74%) across 24 democracies expressed skepticism about their government's concern for their opinions.[7] When people feel that they lack a voice and influence in government decision-making, trust levels tend to decrease.[8]

Perceptions of crime and safety continue to affect some. While some data sources around the world point toward a declining crime rate over the past decade (with a U-shaped dip and rise during the 2020 and 2021 pandemic years), the global Safety Perceptions Index points toward an increasing sense of "ambiguous risk" citizens experience—the feeling that risks exist around them but cannot be defined well.[9] This perception could be aggravated by rising rates of anxiety, depression, uncertainty about the future, loneliness, and the rise of social media as a news source.[10]

Away from the public eye, a growing trend threatens to turn into a challenge—loneliness and social isolation. The World Health Organization's data on loneliness reveals that 1 in 4 older adults experience social isolation, while 5% to 15% of adolescents report feelings of loneliness.[11] In countries like China, India, the United States, and across Europe and Latin America, 20% to 34% of older adults grapple with loneliness.[12] This can often be accentuated further by digital and social media platforms. The tools designed to bring people closer can sometimes drive them apart. Social media platforms can lead to feelings of social isolation and loneliness, especially among teenagers.[13] Australia recently passed a law that will ban social media for children under the age of 16 by the end of 2025. The law will fine social media platforms up to 50 million Australian dollars (US$33 million) for failing to prevent children under 16 from having accounts.[14]

The year 2024 was a massive election year, and political landscapes shifted worldwide.[15] Governments face a Herculean task: create economic and social conditions that allow all citizens to thrive. Left unaddressed, these challenges could lead to growing discontent among citizens.[16]

Some governments are actively working to improve quality of life by tackling affordability, making services more accessible, and designing physical and digital infrastructure to better serve constituents. There is a concerted effort to rebuild a sense of purpose and feeling of belonging among citizens by fostering stronger social connections. These mutually reinforcing approaches are important for a more resilient and engaged society.

Key challenges

- **Affordability:** A thriving society can afford basic needs such as housing, transportation, health care, and utilities. The COVID-19 pandemic, corresponding economic crisis, rising inflation, housing scarcity, and health care costs have pushed some individuals and families to their financial brink.

- **Economic pessimism:** Affordability is just a part of the story; the other challenge is the growing sense of economic pessimism driven by stagnating wages, the rising wealth gap, and the dawn of a new technology era.

- **Rising disconnect and loneliness epidemic:** In an era characterized by unprecedented connectivity, it is paradoxical that, today, we face a rising epidemic of loneliness and social isolation. Social bonds and community ties are weakening amid a sense of alienation.

Trend in action

Policy interventions designed to improve affordability

Housing costs represent the largest expense for most households. Over past decades, median home prices and rental costs have consistently risen, while household incomes have not kept pace (figure 1). In OECD countries, one in three low-income tenant households and one in four low-income homeowners with a mortgage spend 40% of their disposable income on rent or mortgage payments.[17] In the United States, nearly half of renter households spent 30% of their income on housing costs in 2023.[18] That year also saw America's largest annual real increase in gross rental costs since 2011.[19]

Transportation is often the second largest household expense. In many countries, transportation and housing account for approximately half of average household budgets.[20] Housing and transportation costs reflect the built environment—density, land use mix, and overall accessibility—which, in turn, influences public health and other quality-of-life parameters.

Some governments are retooling their public policy toolkit to improve affordability in housing, transportation, health care, and essential services like internet connectivity. Interventions can manifest in many ways, including shaking up zoning, rethinking rent control, reducing transit deserts, and developing affordable broadband infrastructure.

(Re)zoning to increase the housing stock

Governments, looking to boost housing supply, are updating their regulations. New zoning laws often allow accessory dwelling units like backyard cottages or basement apartments.[21]

The city of Minneapolis, Minnesota, revised its zoning rules to allow more buildings downtown and near public transit, ended single-family zoning, and eliminated requirements on how many parking spaces each building must provide.[22] These zoning changes led to a 12% increase in housing stock between 2017 and 2022.[23] In those five years, rents rose just 1% in the city, while rising 14% in the rest of Minnesota.[24]

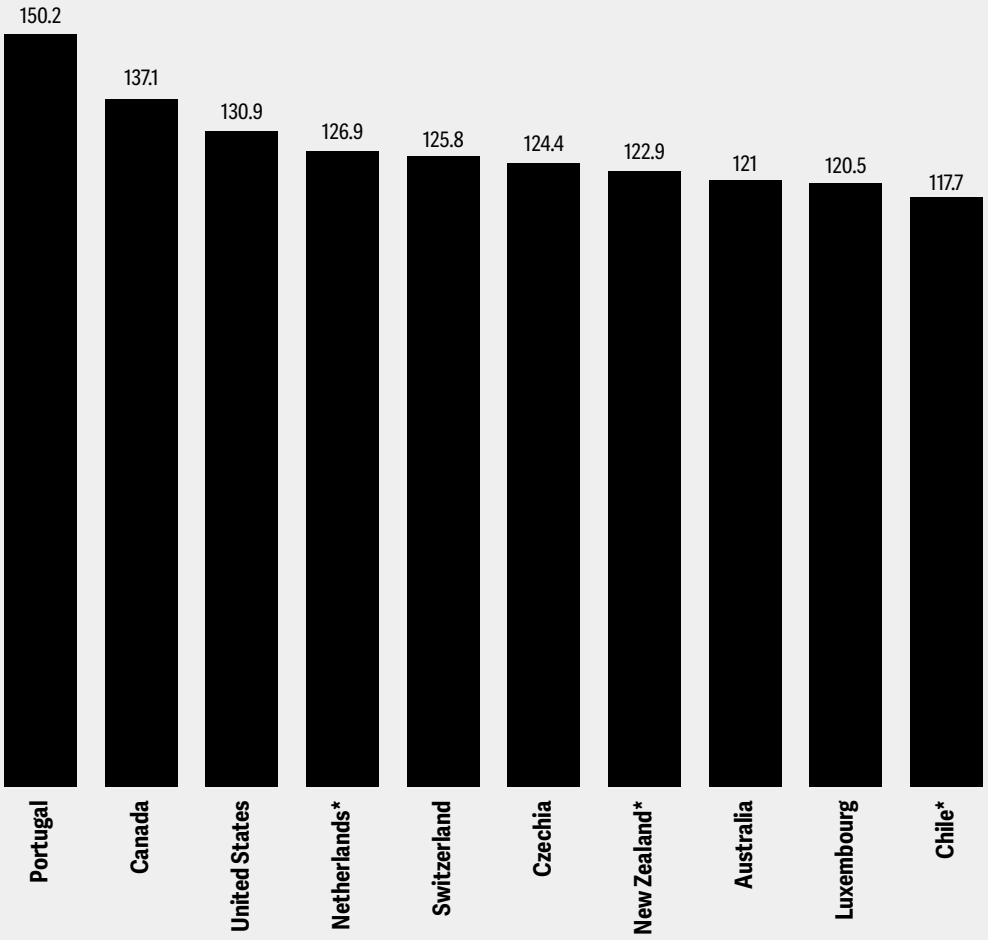
In Toronto, Canada, about 70% of the land is zoned for single or semi-detached homes, restricting additional suites and rental opportunities. The city's Expanding Housing Options in Neighborhoods (EHON) initiative aims to broaden zoning laws to include multifamily units and accessory dwellings.[25]

Asian countries were early proponents of mixed zoning policies that permit both commercial and residential developments and mix high- and low-income

Figure 1

House-price-to-income ratio continues to remain high in most OECD countries, 2024

Top 10 countries



All other countries

117.6	Ireland
116.8	Slovenia
116.5	Austria
116.2	OECD countries
116.1	Spain
115.8	Estonia
114.6	Greece
114	Hungary
113.8	Japan
108.9	Norway
107.8	Germany
107.3	Slovakia
107.2	Lithuania
106.4	Denmark
105.2	United Kingdom
105.1	Euro area (17 countries)
101.1	Poland
99.3	Latvia
98.7	Belgium
96.8	Sweden
94.2	France
91.6	Croatia
90.3	South Africa*
89.9	Bulgaria
89.9	Colombia**
87.7	Italy
83.6	Korea
81.5	Finland
55	Romania

Notes: The index measures the development of housing affordability and is calculated by dividing nominal house price by nominal disposable income per head, with 2015 set as a base year when the index amounted to 100. An index value of 120, for example, would mean that house price growth has outpaced income growth by 20% since 2015. * denotes 2023 data, ** denotes 2022 data.

Source: Statista, "House-price-to-income ratio in selected countries worldwide in 2024, by country," May, 2025.

housing. Singapore, in particular, pioneered a social mix housing policy in the late 1960s. Almost 8 in 10 Singaporeans now live in subsidized housing, which 90% of renters eventually buy.[26] The neighborhoods have high-quality playgrounds, parks, markets, community centers, and schools.[27]

Increasing rental housing supply

Rent control has been a prominent social policy in many countries since World War I.[28] Decades of research have shown that rent controls have proven effective at making rents affordable, slowing rent hikes, and thereby reducing rental burdens. But they also lead to reduced housing quality, lower mobility, higher rents for uncontrolled units, and less rental housing supply.[29]

Housing policies should be flexible to match changing markets. Over the years, many cities and regions globally have used different types of rent controls, including rent controls on older dwellings, cap rental increases, and pair rent controls with restrictions like eviction protection.[30]

Argentina repealed its rent control laws in 2023.[31] Over time, the country's rent controls had reduced rental home supply, created inflexible lease agreements, and increased pressure on tenants during economic crises. The new laws introduced flexible lease terms and market-driven pricing, which in turn led to a surge in new rental homes. Rental housing availability in Buenos Aires increased by 195% within months, stabilizing or even lowering prices in some neighborhoods.[32]

Affordable housing finance innovations to support homeownership

Owning a home can seem out of reach for some households. Approximately 1.6 billion people globally lack adequate housing; this number could rise to 3 billion by 2030.[33] Housing them also requires affordable financing mechanisms.

Vancouver, Canada, is the third-most expensive city in the world.[34] Housing researchers call it "impossibly unaffordable."[35] To help reduce that burden, the province of British Columbia worked with the First Nations of Musqueam, Squamish, and Tsleil-Waututh (the MST Nations partnership) to help finance homebuyers at 40% below market value at a housing development in Vancouver. As a part of the initiative, the buyer pays 60% of the market price of the unit and the province covers the other 40%. The buyer pays back the 40% contribution to the province when the home is sold or after 25 years, whichever comes first. The MST Nations partnership provides the land, and the British Columbia government provides the financing.[36]

CASE STUDY: BUILDING AN AFFORDABLE HOUSING AND FINANCE ECOSYSTEM IN INDIA

India's Pradhan Mantri Awas Yojana (PMAY; Prime Minister Housing Initiative), launched in 2015, provides affordable housing to the urban and rural poor. As of June 2024, the initiative had built over 34 million houses, which come equipped with basic amenities like toilets, cooking gas, and electricity.[37]

Building homes addresses one end of the housing problem, but financing those homes can become tricky for millions of "unbanked" Indians with no credit history. Financial market reforms are helping—the latest Global Findex Database report shows a remarkable leap in financial inclusion in India, from 53% in 2017 to 78% in 2021.[38] Still, a significant portion of India's population remains unbanked.[39] This is where affordable housing finance companies (AHFCs), private corporations supported by government policies, can play a key role. AHFCs make housing credit more accessible to individuals who otherwise would not qualify due to lower incomes or the lack of formal income documentation. AHFCs cater to self-employed individuals with low and informal sources of income, offering smaller loans with lower loan-to-value (LTV) ratios due to the higher perceived risk. Recipients, often new to the formal economy, may also receive financial literacy programs and a relationship manager from the AHFC to provide personalized support.[40]

Government supports the affordable housing finance market by providing interest subsidies on home loans, enhancing the liquidity of these companies through a national housing bank, streamlining permits for land use and housing projects, tax incentives for real estate developers, and incentivizing rural housing. These measures have had a multiplier effect on the affordable housing finance market in India, which grew 27% year over year in fiscal 2023 and is expected to grow at a compound annual growth rate of approximately 30% in fiscals 2024 and 2025.[41]

Rethinking public transit to help make it affordable and financially sustainable

Public transit systems in developed economies are struggling to restore pre-pandemic ridership levels. Transit's long-term financial sustainability depends on riders, who may abandon an underfunded or unreliable system, which can set off rate hikes or service cuts. A poorly functioning public transportation system can impact economically disadvantaged communities.

Australia has the third-most expensive public transport system in the world, behind Switzerland and the Netherlands.[42] To help remedy this, the state of Queensland is experimenting with a flat fee of 50 cents across all public transit options in its Translink network, which includes buses, trains, ferries, trams, and on-demand services.[43] This initiative is a part of the broader cost of living action plan that also subsidizes energy bills, reduces vehicle registration costs, and subsidizes children's activities like swim lessons.[44]

Meanwhile, in 2022, the city of Lisbon introduced free public transport for all residents under the age of 18, students up to the age of 23, and seniors over 65.[45] The effort aims to improve affordability for certain population groups and promotes greater access to transport and mobility for city residents. The move helped bring 33,000 additional commuters into the public transportation system within a year, an increase of nearly 60%.[46]

Heavy subsidies and free public transportation are not new.[47] But a flat fee plan aims to address shifting mobility choices by improving affordability for riders who depend on public transport and bringing back leisure riders post pandemic by offering them a cost-effective alternative.[48] That said, accessibility can remain a challenge, especially in transit deserts (see "Micro-transit to improve first-mile and last-mile connectivity" in the next section).

Partnering to build connectivity infrastructure

Internet connectivity is a basic need in today's digital economy. This need has put pressure on governments to extend internet infrastructure into rural and hard-to-reach areas. And the private industry's interest in connectivity can set up a win-win scenario for broadband expansion.

In West Virginia, Indiana, Ohio, Iowa, and Nebraska, for example, Meta's subsidiary Middle Mile Infrastructure is laying hundreds of miles of fiber optic cables to connect the company's data centers. The company plans to lay approximately 275 miles of fiber optic cable through West Virginia's western border and another 160 miles of fiber infrastructure in Indiana along the I-70 corridor.[49] Buildouts like these are possible through continual efforts and coordination between state agencies, state legislatures, federal agencies, and private industry.[50]

While this infrastructure was intended to connect data centers, excess capacity can be leased to broadband providers, speeding up broadband to previously unserved areas. Public-private partnerships can also share physical infrastructure. In October 2023, the California Department of Technology announced a partnership with Lumen to build 1,900 miles of fiber optics by laying new fiber in Lumen's existing conduit.[51]

ADDRESSING PERCEPTIONS AROUND CRIME AND SAFETY

Addressing perceptions around crime and safety can be a tricky area for governments. But it's necessary to help improve the public sense of well-being and quality of life.

Public or neighborhood disorder could mean different things in different regions and cultures. Homelessness and encampments, public defecation, public drug use, drunken behavior, petty thefts, motor vehicle thefts, and other such behaviors can be visible signs of disorder.[52]

These incidents can impact public perception. In the United States, the crime rate, based on Federal Bureau of Investigation and Bureau of Justice Statistics data, declined between 1993 and 2023. However, concerns about crime and safety have consistently grown.[53]

Governments worldwide have tried to tackle the issue of petty crime and disorder in many ways, including redesigning the built environment to improve safety,[54] interventions like better lighting to help make streets safer,[55] and community-based policing.[56]

However, some governments may need to do more, as decades of research has shown that social and physical disorder in urban neighborhoods can negatively impact the well-being and overall quality of life of constituents.[57]

Expanding access

Some governments are making significant strides toward increasing access to public services. This includes investing in infrastructure, designing for user convenience, and transforming back-end operations to improve both physical and digital access to services.

Digital identity–driven access to government services

Digital identity lets individuals prove their identity securely online, eventually enabling citizens to access government services without logging into multiple websites. As of mid-2022, 186 countries have some kind of digital identity program.[58] India's **Aadhaar program** represents the largest global digital identity project, with over 1.3 billion digital IDs. More than 1,700 state and federal government initiatives use Aadhaar to provide benefits and services. During the COVID-19 pandemic, linking bank accounts to Aadhaar enabled the Indian government to transfer US$3.9 billion to 318 million beneficiaries.

CASE STUDY: BUILDING AN ECOSYSTEM AROUND DIGITAL ID IN MAEBASHI, JAPAN

In 2016, Japan introduced My Number cards for all its residents. Each person has a unique 12-digit number, linked to their digital identity, and a chip card. Phone-based ID cards are also available. Citizens can use these cards to verify activities, receive government services, open bank accounts, and access health insurance.[59] Regional and city governments build their own identity and services ecosystem on this foundation.

A public-private corporation Mebuku Ground Corporation and Maebashi Inc. have used the My Number system as a starting point. They built a digital identity ecosystem called Mebuku ID. Mebuku ID works on the principle of self-sovereign identity—individuals control the use of their data. Mebuku ID has myriad uses including facilitating cashless transactions, child-care support benefits directly, and providing personalized recommendations based on user interests and location. By the end of June 2024, the app had been downloaded over 28,000 times—or by roughly 10% of citizens.[60]

Community or place-based approach

Community-based approaches embed services within the very communities they aim to serve. These programs build on a community's unique strengths.

Logan Together uses a place-based approach for families in Logan, Queensland, Australia. Logan Together unites early-childhood and prenatal community programs, and connects families with resources, building early childhood education opportunities around local indigenous elders and following the community's lead when deciding what services to offer. As of 2022, Logan reported a 42% decrease in birthparents receiving inadequate care, and a 7% decrease in substantiated cases of child abuse in children under the age of 5.[61]

Micro-transit to improve first-mile and last-mile connectivity

Accessible transportation is tricky because of the classic "last mile" problem. A train, highway, or subway moves

citizens quickly—until it's time to exit the system and get home. First-mile and last-mile connectivity is often a challenge in transportation networks.

Jakarta, the capital of Indonesia, is one of the most congested cities in Asia.[62] But starting in 2017, the city launched the Mikrotrans service, integrating informal private bus operators called *angkots* into the city's formal public transportation TransJakarta network. The micro-transit network, which now makes up 60% of the total network, helped the city double its public transportation coverage to 82% by 2022 and increase daily ridership from 300,000 to over a million during the same period.[63]

Improving social connections and social capital

A growing feeling of social isolation and loneliness is becoming more common.[64] The digital era exacerbates the problem.[65] Designing for social connections could mean reimagining the built environment to encourage more community connections, making communities not just livable but also lovable, and creating avenues for residents to contribute and cocreate with the government.

Building human connection in communities

Urban planners often discuss cities in terms of livability and smartness. Livability refers to a city's ability to meet practical needs like safety, mobility, jobs, education, public space, and political stability. Smartness involves using connectivity, Internet of Things, and artificial intelligence to help manage traffic, enhance safety, and provide digital services. But statistics can overlook a third dimension: lovability. Lovability is driven by human connection—a city's ability to foster community and evoke a sense of belonging.[66]

The Lovable Singapore project, led by the DesignSingapore Council (Dsg), is the city's first effort to understand how to make Singapore more lovable. It involves public agencies and private organizations and aims to balance economic and cultural pursuits for a diverse population.[67]

Dsg surveyed 2,500 citizens about what makes Singapore lovable and how it can improve. The study identified four personas mapped to six "lovability" connections: unloved but attached, loving but disengaged, loved and engaged, and loved but disengaged. Dsg used these insights to identify interventions, such as addressing a lack of vibrancy in public spaces caused by over-curation and regulation[68] (see "My Take: Leading with Design to foster a sense of belonging in Singapore").

Data and evidence-based approach to individual well-being

Traditionally, governments have tried to meet the needs of citizens by distributing benefits. However, a shift toward data-driven and evidence-based policy measurements is inspiring more targeted interventions.

New Zealand was an early pioneer of the evidence-based social investment framework which is seeing renewed focus and institutional commitment.[69] The social investment framework considers populations across multiple cohorts: individuals in crisis, individuals with complex but manageable needs, and individuals with stable or simpler needs. The framework uses data, evidence, and modern analytics to determine interventions. These can help break cycles of dependence and intergenerational poverty.[70]

In the 2024 budget, the New Zealand government earmarked an initial US$6.25 million and an additional US$51 million to support the strategy.[71]

Addressing loneliness and social isolation in society

A teenager can be connected to social media but feel disconnected from society. A young mother may struggle to find her place among her peers. A grandfather could feel alone after the death of his partner. Social isolation and loneliness can affect anyone. In 2023, the World Health Organization officially recognized loneliness as a global health priority.[72] In 2019, the United Kingdom appointed a loneliness minister, with Japan following suit in 2021.[73]

The human need to be social is part of our neurobiology, which can shape how we think, feel, and behave. The scale and severity of social isolation and loneliness are challenges, but they are also opportunities for governments to reimagine and redefine how societies can overcome this barrier to quality of life.

The United Kingdom was the first country to introduce a loneliness strategy in 2018. It focused on destigmatizing loneliness and helping organizations that connect people. In 2021 to 2022, the government introduced the Loneliness Engagement Fund to provide over 260,000 pounds in grants to support groups most affected by loneliness.[74]

Similarly, Mount Sinai Hospital in Toronto debuted a targeted effort toward reducing loneliness among the elderly. The hospital launched a clinical trial called "How R U" that aims to reduce loneliness in older hospital patients by facilitating social video calls between patients and volunteers.[75]

Tools and strategies to deliver on quality of life

Improving affordability

1. **Easing housing restrictions:** Streamlining and simplifying housing regulations can help lower construction costs, speed up the development process, and provide more affordable housing.

2. **Improving access to finance:** Enhancing financial access through affordable loans and subsidies can help more people afford homes.

3. **Strengthening public-private partnerships:** Collaborating with private entities can help government agencies leverage additional resources and expertise to bear in the development of housing and infrastructure projects.

Increasing accessibility

1. **Building the foundation of digital identity systems:** Establishing robust digital identity systems can help streamline access to various essential services and benefits.

2. **Embracing a place-based approach:** Focusing on local needs and conditions can help ensure that solutions for basic services are tailored and effective for specific communities.

Improving social capital

1. **Adopting an evidence-based social investment approach:** Governments can optimize their investments to improve community well-being using data-driven strategies.

2. **Improving micro-community networks:** Building strong micro-community networks can strengthen citizens' sense of connection and inclusion.

My take

Leading with Design to foster a sense of belonging in Singapore

Dawn Lim, executive director, DesignSingapore Council[76]

Design is a transformative force—it can generate impactful outcomes for our communities, economy, and the country. DesignSingapore (Dsg) champions and uses design thinking to foster a sense of belonging and emotional resonance within our communities. A few years back, Dsg embarked on The Loveable Singapore Project,[77] to dive deeper into the various aspects that make a city lovable, and developed a framework for understanding why and how people resonate with a place and feel they belong to it.

Our Design 2025 Masterplan further aims to help fulfill Singapore's vision to be an innovation-driven economy and a loveable city.[78] Instilling a design mindset in public services, businesses, communities, and individuals enables their full potential to be harnessed to shape a better future.

Design interventions that drive a sense of belonging. As a City in Nature, Singapore has always designed for livability. From the void decks and open-air plazas in public housing blocks to urban parks, the spaces serve as nodes for social interaction and engagement. Design can be used in ground-up movements. A group of resident volunteers in Queenstown estate attended a half-day bootcamp led by Dsg's School of X—a program that encourages applying design thinking to solve community or business challenges. During this bootcamp, the volunteers developed the idea of building a "community without walls," which led to the creation of Queenstown Kakis (Kaki is a local Singaporean term to describe close friends or companions). The community first started using an empty grass patch to gather and play games, create art, and do gardening. Since then, it has facilitated activities such as mural painting, supported struggling small businesses, and fostered social connections.[79]

Equipping the public service with a design mindset. Singapore is known for its good governance. Public service is evolving, going beyond efficiency to be more empathetic and citizen-centric. The aspiration is for every public servant to become a designer in their own right and use design-thinking principles to address complex challenges for Singaporeans. Dsg supports hands-on training programs with several public organizations such as the Ministry of Social and Family Development and the Public Service Division, to help public servants solve real problems, and keep the needs of the people at the forefront. This approach ensures that technology and design are used to create meaningful and impactful solutions for the community. By embedding design into the fabric of our public service, we can create a more inclusive, empathetic, and lovable Singapore for everyone.

Driving inclusive and empathetic design. In many instances of built environment development, design is increasingly employed to shape lives and foster positive social impact. For example, Lien Foundation and Asian Women's Welfare Association, working closely with Lekker Architects, created Singapore's first inclusive preschool Kindle Garden at Enabling Village, a community building for people of all abilities. Kindle Garden admits both typically developing children and those with special needs. Classrooms are designed for free-form learning without chairs and tables. Spaces are embedded with therapeutic elements, and interior spaces are calibrated with colors that do not aggravate visual sensitivities.[80] Such initiatives help build a sense of empathy and understanding from a young age.

My take

Making Portugal more accessible and affordable for residents

Miguel Pinto Luz, Minister for Infrastructure and Housing, Portugal[81]

One of the most pressing issues today is housing affordability, not just in Portugal but also across Europe. Housing is a fundamental right, and working to ensure its affordability is a multifaceted challenge. Our government has adopted a dual approach to tackle this issue. On one hand, it is making significant public investments, with 4.2 billion euros allocated and a pipeline of over 70,000 new houses to be constructed by 2030. This initiative aims to increase the public stock of housing, which has historically been below the European average.

On the other hand, government is engaging the private sector and residents by offering tax incentives to both buyers and developers, streamlining the licensing process, and making land available at low prices for affordable housing projects. The government is also providing the collateral needed to give 100% support on capital to younger residents and first-time homebuyers in Portugal. Previously, banks would only lend up to 80% of the asset value, but now the government covers the remaining 20%, mitigating the risk for banks and making it more affordable for the younger generation to buy homes.

Transportation infrastructure is another critical component of our strategy. Implementing a 20 euro green pass for unlimited train travel and investing in high-speed rail connections is making it easier for people to live in affordable housing outside metropolitan centers while maintaining access to urban amenities.

The quality of life extends beyond housing and transportation. Education and health care are paramount, and the government is investing heavily in these areas to ensure that families have access to top-notch facilities. Additionally, the immigration policy is designed to attract talent and support families, fostering social cohesion and growth. The aim is to create an inclusive and prosperous Portugal, where every citizen has the opportunity to thrive.

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Delivering an energy-resilient future

Focused investments in infrastructure and clear policies are vital to ensure energy resilience and security amid rapidly growing global energy demand and diverse energy alternatives

The global energy landscape, from production to consumption, is experiencing a profound transformation. The world's demand for energy continues to skyrocket driven by shifts in transportation and manufacturing and technological advancements like artificial intelligence. Meanwhile, the integration of diverse sources—clean energy and low-carbon options such as solar, wind, hydrogen, hydroelectric, geothermal, and nuclear—into existing infrastructure not originally designed for such variability intensifies the strain on critical systems.[1] This dual challenge of rising demand and evolving energy systems offers an opportunity to build energy resilience and security, all the way from the national level down to local communities.

Overall demand for nonconventional energy sources has risen substantially over the past decade, yet these sources still account for less than one-fifth of total global primary energy consumption (figure 1).[2] Some analysts expect the transition to accelerate globally further in the years and decades ahead.[3]

The urgent need to generate more energy, including by diversifying sources, can create an opportunity for governments to support investments and efforts toward building a more varied energy portfolio. A diversified energy mix does not just bolster generation capacity—it also strengthens resilience against supply disruptions. Additionally, some emerging energy systems come with unique requirements, such as the need to develop and scale up energy storage solutions, which are resilience enhancing. Energy storage systems, for example, provide greater flexibility to balance energy demand and supply.

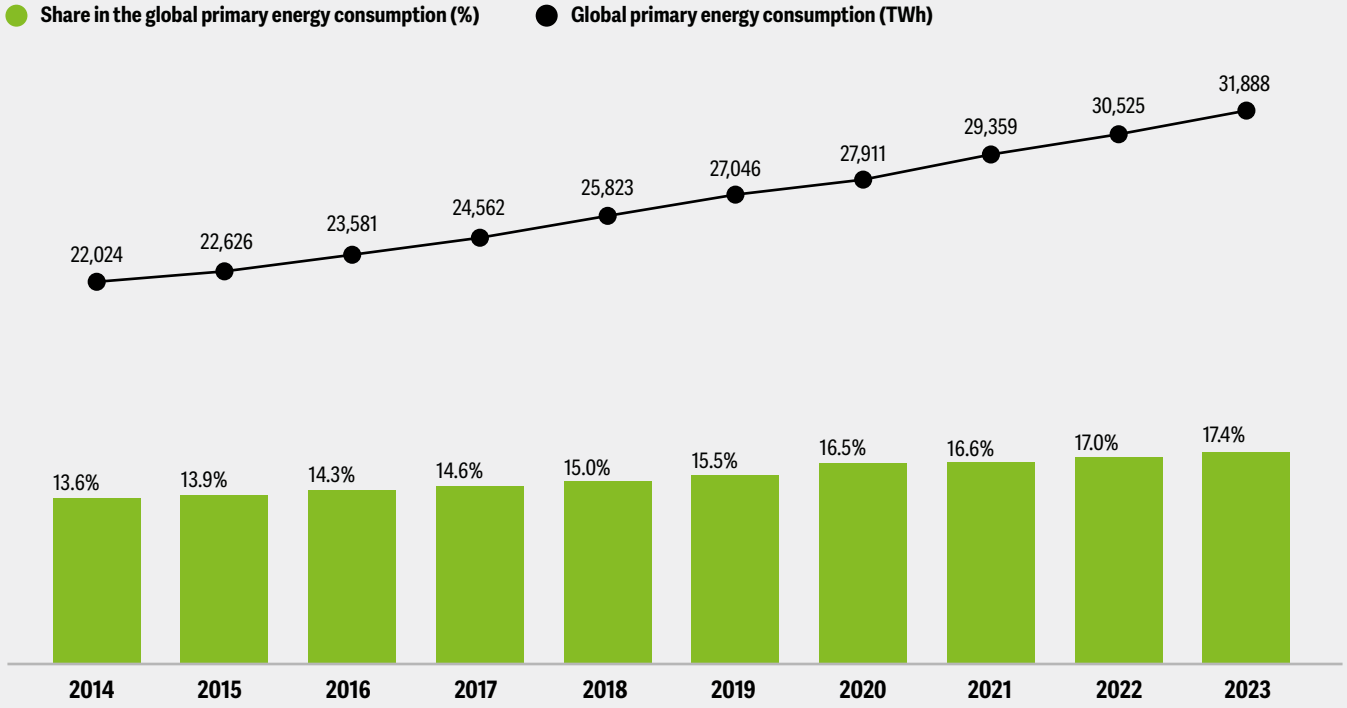
The challenge is monumental: transforming a highly complex and interconnected energy infrastructure built incrementally over decades to power well-established industries. Grids, which transmit electricity from producers to end users, will require substantial upgrades to support a more diverse energy mix, meet rapidly rising energy demands, and remain online in the face of disruptions, both familiar and unanticipated.

Incorporating new energy sources could necessitate entirely new infrastructure and the adoption of cutting-edge technologies in some regions; in others, retrofitting and modernizing existing systems may suffice. Regardless of the approach, making it happen will demand significant capital investments, time, and the development of innovative technologies, processes, and management systems.

Some governments are seeking to leverage diverse energy sources available to bolster energy security by investing in future-ready energy infrastructure, strengthening energy resilience at the community level, and aligning their energy strategies, policies, and regulations.

Figure 1

Global primary energy consumption from nonconventional sources of energy



Note: Nonconventional sources include biofuels, solar, wind, hydropower, nuclear, and other renewables. Conventional sources include gas, oil, coal, and traditional biomass.

Source: Hannah Ritchie and Pablo Rosado, "Energy mix," Our World in Data, January 2024.

Key challenges

- **Exponential growth in electricity demand:** Some nations may be struggling to keep pace with accelerating power demand, driven by the surging needs of data centers, new factories, electric vehicles, and air-conditioners. In October 2024, the International Energy Agency revised its 2035 demand forecast to be 6% higher than its estimate only a year earlier.[4]

- **Fragile grid infrastructure:** Existing grid infrastructure is ill-equipped to manage rising electricity demands or accommodate the influx of diverse new energy sources connecting simultaneously.[5] Modernization efforts can be further complicated by the current knowledge gap in managing volatile and evolving energy demands across the network as new energy sources vary their contributions to the grid.

- **Persistent funding gaps:** Despite global energy investment rising sharply to exceed US$3 trillion in 2024, it remains short of what's needed. Few developing nations have energy infrastructure capable of handling future demand, and even developed nations will need substantial capital outlay to scale novel technologies and revamp infrastructure to fully support increased energy demand.[6]

- **Increasing frequency and diversity of disruptions:** The energy sector faces escalating threats, such as extreme weather events,[7] cyberattacks aimed at paralyzing operations,[8] and supply chain disruptions due to geopolitical conflicts.[9]

Trend in action

Some governments are rethinking national and regional energy strategies and regulatory and policy approaches, as well as attracting new financial investments to help spur innovation in various sectors. They are prioritizing the strengthening of energy infrastructure, including by establishing new systems needed for clean energy alternatives and low-carbon sources and by retrofitting and modernizing existing systems.

With extensive public and private efforts and investments set to transform energy systems in the coming decades, leading governments are taking steps to ensure that these resources and efforts enhance long-term energy resilience and security.

Building national- and regional-level strategies for future energy mix

When it comes to energy mix, one size does not fit all. Each country or region has distinct needs and demands that shape their respective energy-mix strategies. Different regions and countries are exploring varied strategies to become more energy resilient. These strategies have decades-long time frames and aim at diversification and distribution, with implications for regional planning and how energy portfolios intersect with economic development strategies.

Economic security and resilience to external shocks

With fossil fuels highly concentrated regionally,[10] most nations have long relied on imports to meet their energy needs, so diversifying their energy mix is increasingly imperative as energy demand rise.

Research shows that renewable energy is more evenly distributed,[11] which can help mitigate some countries' concerns related to high import costs or disruptions in critical supply. As such, many nations are accelerating investments in new energy sources. China, the world's largest oil importer,[12] has made significant strides in clean energy development. Currently, non-fossil energy accounts for more than 21% of China's primary energy production mix, nearly doubling its share within a decade.[13] Even nations rich in fossil fuels, such as the United States, are progressively incorporating low-carbon sources into their energy portfolios. In 2023, non-fossil sources contributed over 16% of the US primary energy production mix.[14]

Balancing sustainability and economic realities

Some governments worldwide are increasingly prioritizing sustainable growth and reducing carbon emissions.[15] Governments are balancing sustainability goals with practical realities. The result: The transition to a low-carbon future will be gradual. Many countries will continue to use fossil fuels even as they increasingly prioritize clean energy and low-carbon sources. Consider India, whose energy supply remains heavily reliant on coal (46%) and crude oil (24%), much of which is imported.[16] As the world's most populous nation, India faces the challenge of balancing sustainability with economic stability. While it is actively diversifying its energy mix by expanding clean energy sources, particularly solar power, fossil fuels will likely remain a critical component of its energy strategy for the foreseeable future to avoid hindering economic growth.

Playing to strengths

Beyond economic and sustainability drivers, countries continue to explore particularly suitable energy sources. It's no surprise, for example, that India and China—with massive territory and abundant sun—have turned to solar power.[17] By contrast, when Denmark sought to diversify its energy base during the 1970s oil crisis, it zeroed in on wind energy due to its coastal geography and consistent strong winds.[18] Denmark has developed a comprehensive energy policy; it has introduced certain taxes and incentives, removed specific legislative barriers, built innovation ecosystems, and carried out permitting and regulatory reforms—all focused on developing wind energy infrastructure.[19] In 2023, wind energy supplied half of the country's electricity demand, with the goal of reaching 60% by 2030.[20]

Catalyzing energy-mix strategic choices

Governments can make the strategic choice to develop a road map for a future energy mix. To help diversify an energy base by increasing the share of low-carbon energy alternatives in the energy mix, countries may need actions on both the supply and demand side to enhance both the generation and end use of clean energy.

On the supply side, governments can consider streamlining regulations, upgrading grid infrastructure, supporting domestic manufacturing of clean energy equipment and components, and funding research and development. On the demand side, they can incentivize industries to decarbonize, promote broader electrification in transportation, and simplify the permitting process for energy connections to local grids.

Government leaders should combine industrial policies, regulatory approaches, incentive structures, and other policy nudges to help build long-term energy resiliency and security.

Strategic investments catalyzing clean energy growth

Governments often play a crucial role, both directly and indirectly, in shaping energy resilience efforts, marshaling private sector investment, and ensuring that systems work together.

In the United States, data indicates that recent industrial policies have served as force multipliers for advancing new energy sources and related technologies, such as biofuels, clean hydrogen, and nuclear energy.[21]

The European Green Deal aims to make the European Union climate-neutral by 2050 and has set a 2030 target of reducing emissions by 55% compared to 1990 levels. Clean energy deployment is a key goal, intensified by a regional gas crisis created in the aftermath of Russia's invasion of Ukraine.[22] In 2023, EU countries invested US$110 billion in clean energy generation, an increase of 6% from the previous year.[23] The European Union aims to guide its energy transition via clear sectoral and economywide standards.[24] China is focusing on investment, putting US$676 billion toward energy transition projects in 2023.[25]

Regulatory sandboxes to accelerate innovations in new energy solutions

Testing innovative technologies in real-life settings with fewer restrictions can help shape regulatory frameworks while developing breakthrough solutions.[26] Singapore's Energy Market Authority sandbox allows temporary regulatory waivers to test new products and services in a safe space[27]—for instance, setting up and exploring virtual power plants: digital platforms that bundle distributed energy systems to operate as a single power generator.[28] Similarly, the Northern German Living Lab tests innovations in clean energy sources, including testing hydrogen energy in the industrial and mobility sectors.[29]

The Intermountain Power Agency's Intermountain Power Project, currently reliant on coal to power parts of Utah and southern California,[30] aims to phase out coal in favor of natural gas and, eventually, hydrogen. The project looks to use clean energy sources to split water into oxygen and hydrogen, storing the latter in underground salt caverns to be used as fuel for electricity-generating turbines. The project aims to begin with 30% hydrogen fuel and transition to 100% by 2045 as technology improves.[31]

Supporting industry-led efforts to manage new energy demands

Few technologies have had such a rapid and profound impact on energy systems as artificial intelligence. Initial estimates put the energy demand of AI-driven data centers worldwide to be as high as Japan's annual energy usage by as early as 2026.[32]

While continuous innovation within the industry is enhancing the energy efficiency of AI solutions—a trend expected to accelerate in the coming years[33]—government support can further catalyze innovation in critical areas. For instance, the US Department of Energy has allocated US$68 million to fund 43 projects across national labs, universities, and businesses to develop more energy-efficient AI hardware and algorithms.[34]

Just as governments are addressing the demand side of AI's energy needs, they are also managing the supply side by supporting industry-led efforts. Take, for example,

Project Stargate in the United States, a joint venture involving leading American tech firms and SoftBank Group (a global investment holding company).[35] The partnership plans to invest US$100 billion of entirely private sector funding, with the potential to scale up to US$500 billion, to create computing infrastructure designed to support AI. To ensure this infrastructure has the energy required to function effectively, the venture will support both the construction of data centers and the development of the electricity generation capacity needed to power them.[36] In January 2025, the US federal government pledged its support for the venture, committing to intervene when necessary to accelerate progress.[37]

Regulators in some jurisdictions are putting guardrails around Al's energy consumption. The European Parliament has introduced requirements for Al systems to log their energy consumption throughout their life cycle; such regulations enhance transparency and accountability, encouraging technology companies to prioritize energy efficiency.[38]

At the same time, there is a growing realization within the public sector that, despite AI's strain on energy resources, it could also help enhance energy resilience. Hyperscalers and data centers are increasingly securing long-term purchase agreements with clean energy producers.[39] These agreements not only guarantee a consistent energy supply for technology companies but also provide critical funding for new clean and low-carbon energy projects. Furthermore, they enable electricity providers and innovators to test and scale advanced energy technologies by offering a dependable source of capital.[40]

Moreover, AI itself can make energy systems more efficient. It can help utilities make electric grids more cost-effective, reliable, and efficient by enhancing weather and load forecasting, optimizing grid management and clean energy asset performance, accelerating storm recovery, improving wildfire risk assessment, and more.[41]

Expanding energy infrastructure for the future

Infrastructure and ecosystem build-up around a new energy source

To diversify their energy base, countries likely need a parallel development of infrastructure and ecosystems that enable both the generation and use of new energy. Governments can consider a range of actions, such as financial incentives, regulatory changes, and building manufacturing and talent capacity.

With projections indicating that the hydrogen market could show strong growth and meet up to 24% of global energy demand by 2050, several countries are ramping up investments in hydrogen production. In Canada, the Government of Alberta has launched the Alberta Hydrogen Roadmap, a CA$30 billion initiative designed to accelerate hydrogen production in the province.[42] "Our goal is to develop a thriving commercial hydrogen market—one that powers homes, fuels transportation, and supports industrial processes," said Larry Kaumeyer, Deputy Minister of Energy and Minerals for the Government of Alberta.[43] The plan focuses on supporting manufacturing, building supporting infrastructure, and driving innovation through a combination of incentives, regulatory adjustments, and public-private partnerships.[44]

GREEN HYDROGEN ECOSYSTEM BUILD-UP IN INDIA

In 2023, the government of India initiated a US$2.3 billion program to boost domestic green hydrogen production. The National Green Hydrogen Mission, which aims to boost the country's annual green hydrogen output to 5 million metric tons by 2030, is fostering the development and commercialization of production technologies such as water electrolysis, steam methane reforming, and biomass gasification.[45]

The project provides financial incentives and technical support to Indian companies and research institutions engaged in green hydrogen development. Approximately 90% of the budget is designated for financial incentives for the manufacturing of electrolyzers and the production of green hydrogen. One goal is to enhance hydrogen's utilization as a fuel across various sectors, including transportation, industrial processes, and power generation, with budgets allocated for pilot projects in priority areas.[46]

Alongside financial incentives, the mission is designed to support hydrogen production and utilization by fostering a favorable policy and regulatory environment, establishing production and distribution infrastructure nationwide, and developing a skilled workforce.[47]

In 2025, supported by the mission, construction began on India's first Green Hydrogen Hub. Once completed, the US$21.4 billion hub, spanning 1,600 acres, will have the daily capacity to produce 1,500 tons of green hydrogen and 7,500 tons of derivatives, including green methanol, green urea, and sustainable aviation fuel.[48]

Catalyze private sector funding to expand and modernize the grid infrastructure

Two intersecting forces are contributing to the pressing need to expand and modernize grid infrastructure. First, global energy demand is projected to rise by 150% by 2050, with the potential for even greater growth fueled by rising consumption from data centers, artificial intelligence, and the cryptocurrency sector.[49] Second, the rapid adoption of new generation sources, including clean energy and distributed energy sources, is transforming electricity demand profiles. These sources are altering electricity flows and introducing supply intermittency, making grid operations increasingly complex.

A significant financing shortfall is hindering progress. By 2050, a US$14.3 trillion gap in global grid investment is projected, alongside an annual infrastructure (transmission and distribution lines) expansion deficit exceeding 2 million kilometers (1.24 million miles).[50]

While some governments have committed significant funding to grid upgrades, private sector involvement is crucial to bridge the global funding gap.[51] Many governments worldwide are deploying a range of financial incentives to attract private capital and accelerate investment in grid modernization (see "Partnering to upgrade and expand Australia's electricity grid").

PARTNERING TO UPGRADE AND EXPAND AUSTRALIA'S ELECTRICITY GRID

Like many countries, Australia designed its electricity grid around centralized power plants and urban centers, with little consideration for clean energy sources such as solar and wind.[52] Many of these legacy energy assets, such as coal-fired power stations, have become increasingly unreliable and are slated for closure in the coming years.[53]

As the nation continues to grow its clean energy portfolio, expanding and modernizing Australia's grid infrastructure is important. The proposed capacity for clean energy already exceeds what the existing grid can handle. Upgrading and expanding grid infrastructure is a costly, time-intensive endeavor that often struggles to attract adequate private sector investment.[54]

To address this challenge, the Australian Department of Climate Change, Energy, the Environment, and Water launched the Rewiring the Nation program in 2024. With an AU$20 billion budget, Rewiring the Nation aims to make grid modernization more attractive to private developers by providing concessional financing.[55] The initiative seeks to create a modern grid capable of transmitting clean electricity safely, reliably, and affordably by driving private sector investment in critical areas such as transmission lines, long-duration energy storage, electricity distribution networks, and distributed energy resources.[56]

Rewiring the Nation demonstrates a collaborative, whole-of-government approach: The Clean Energy Finance Corp. manages the program's financing, the Australian Energy Market Operator provides technical guidance, and the Australian Energy Infrastructure Commissioner offers support and advice to communities concerned about energy infrastructure projects.[57]

Curating policies aimed at enhancing energy storage system installations

The International Energy Agency predicts that renewables' share in electricity production will rise from 30% in 2023 to 46% by 2030.[58] Integrating low-carbon sources into the electricity mix requires a parallel expansion of energy storage systems. Unlike traditional power sources, clean energy such as wind and solar are unpredictable, fluctuating with weather and seasons. These systems can store excess energy generated during favorable conditions and release it later based on demand.[59]

Furthermore, introducing storage systems facilitates the development of microgrids that can function independently during grid failures, enhance power quality through frequency regulation and voltage support, reduce transmission losses by storing energy closer to use, and support decentralized energy systems, thus reducing outage risks.[60]

In the United States, about a third of states have adopted policies promoting energy storage, broadly categorized into five areas: procurement targets, regulatory adaptation, demonstration programs, financial incentives, and consumer protections.[61]

- *Procurement targets:* These policies mandate utilities to procure a specified amount of energy storage by a set deadline.[62]
- *Regulatory adaptation:* States are revising regulations to create opportunities for energy storage, including updating resource planning requirements or enabling storage projects through rate proceedings. Many states now require utilities to include storage in integrated resource plans, which outline strategies to meet long-term energy demand.[63]
- *Demonstration programs:* These initiatives authorize and sometimes fund energy storage projects to test operations and gather data.[64]
- *Financial incentives:* Policies such as tax credits and subsidies have been shown to encourage energy storage adoption.[65]
- *Consumer protections:* These policies are meant to ensure rights for customers installing storage systems.[66]

Building energy-resilient communities

The energy infrastructure built and scaled at the national level should percolate to the community level to help meet needs and guarantee access to uninterrupted, reliable, and affordable energy. In 2022, 91% of the world's population had access to electricity, compared to 73% just two decades earlier. But 2022 was also the year when COVID-19 pandemic supply shocks, geopolitical tensions, and extreme weather events halted decades of progress, leaving 10 million more people without electricity access than in 2021.[67]

While many governments are developing strategies to improve national energy security and resilience, an equally important task is embedding energy resiliency in communities.

Empowering communities to build energy emergency preparedness

Agencies should have robust energy emergency preparedness and resiliency plans in place to help communities—urban, suburban, or rural—be prepared for energy disruptions and recover efficiently. Enhancing these plans often involves reinforcing energy systems and ensuring infrastructure can withstand and quickly recover from disruptions.

Rural electric cooperatives—member-owned, nonprofit utilities that serve rural communities in nearly every US state[68]—operate under a model that emphasizes local control and member engagement. This enables them to address their communities' specific needs. By investing in resilient infrastructure and coordinating with state

energy officials, rural electric cooperatives can also help ensure a reliable power supply during emergencies and natural disasters.[69]

Regional governments can help bolster energy resiliency in communities. The Missouri Department of Natural Resources collaborated with the cities of Stockton, Rolla, and St. James to craft a Roadmap to Resilience, aimed at equipping communities with essential resources, leading practices, and tools to fortify critical infrastructure. One component of this initiative focused on enhancing energy efficiency in buildings and homes, aiming to mitigate the impacts of natural disasters.[70]

Multilateral agencies also have a significant role to play. The World Bank and the International Finance Corporation, through their US$220 million Ghana Energy and Development Access Project, are working to improve energy access for isolated communities in Ghana. Five mini-grids are helping convert solar power into continuous electricity for these remote areas, impacting approximately 10,000 people.[71]

Mitigate risks to energy infrastructure from extreme weather events

Changing weather patterns and more frequent extreme weather events can affect all types of power generation sources.[72] In May 2022, a thunderstorm shut off electricity to 1.1 million Canadians[73]; in 2024, a Melbourne windstorm knocked out power for more than half a million customers[74]; the January 2025 Los Angeles wildfires knocked out power to hundreds of thousands of customers.[75]

With extreme weather becoming more common globally, enhancing electric grid resilience will be critical. The European Union, as part of its efforts to modernize the energy sector, has funded various smart grid projects through its research and innovation program, Horizon 2020, and its funding program for energy infrastructure, Connecting Europe Facility.[76] In 2021, the US Virgin Islands used federal emergency management funds to bury electric lines underground and build wind-resistant composite poles. Along the same lines, Connecticut's Climate Resilience Plan Grants funded walls protecting power substations from flooding.[77]

Build and deploy microgrids in communities

When storms or power outages shut down the main electricity grid in an area, microgrids can switch away from the main grid and continue to power homes, businesses, and critical services.[78] Planned effectively, microgrids can power entire communities or single sites such as hospitals, bus stations, and military bases. In India, Chhattisgarh State Renewable Energy Development Agency has installed and operates more than 500 solar microgrids.[79]

Microgrids also empower smaller communities to achieve self-reliance. In Japan, the town of Mutsuzawa has established a decentralized microgrid system that uses locally produced natural gas and solar energy. Partnering with a private company, Mutsuzawa manages an energy business through a self-sustaining power system, with any energy shortfall supplemented by purchasing electricity from external sources.[80]

PLACING ENERGY RESILIENCE AT THE HEART OF DISASTER PREPAREDNESS IN ODISHA, INDIA

Odisha, a state in eastern India, is in one of the world's most cyclone-prone regions—the Bay of Bengal. Cyclones disrupt life en masse, displacing communities and damaging critical infrastructure, including energy systems. In response to these challenges, Odisha established the Odisha State Disaster Management Authority, the country's first dedicated disaster management authority, to adopt a proactive and systematic approach to disaster preparedness and response.[81]

Mitigating risks to energy infrastructure is one of the Odisha State Disaster Management Authority's priorities. Dividing different areas along the state's 480 kilometers (298 miles) coastline into four different risk zones, the agency developed specific plans to fortify energy infrastructure in the highest risk zone by undertaking multiple proactive efforts, including installing underground cabling for critical infrastructures such as water supply, hospitals, railways, airports, bus stations, and telecommunication infrastructure. Power substations were raised above the maximum recorded flood levels; power transmission poles were fortified to withstand high wind pressures.[82]

Tools and strategies to deliver energy resilience

Energy is the foundation of modern society, powering everything from basic lighting to advanced semiconductor manufacturing. Reliable access to energy is essential for sustaining human civilization and driving economic growth. As global energy demand rises and supply dynamics shift, governments are seizing this evolving landscape as an opportunity to build broad energy resilience. The following portfolio of tools and strategies can help maximize the impact of their efforts and investments.

- **National and regional energy strategies:** These strategies can act as a North Star to help guide investment, regulatory, and policy decisions toward long-term energy resilience.

- **Strategic alliances and partnerships:** Forming energy-focused alliances with like-minded peers can provide multiple alternative paths to energy, especially during times of heightened geopolitical tensions.

- **Federal and regional financial instruments:** Financial tools—including direct funding, tax credits, subsidies, and R&D funding to test new technologies—can enhance private sector participation, establish new energy markets, and catalyze radical innovation.

- **Market-making strategies:** In addition to financial tools, governments can employ a mix of nonfinancial programs—such as establishing support systems, promoting data-sharing, offering upskilling initiatives, and instituting favorable energy policies—to create and develop infrastructure, research, supply chains, manufacturing, and talent capacity around new energy sources.

- **Regulatory sandboxes for energy innovation:** Allowing for the testing of new technologies in real-life settings can encourage innovation.

- **Community-driven energy resiliency:** Initiatives can empower regional, local, and hyperlocal communities to build robust energy resiliency plans, including disaster response, development of microgrids, and fortifying energy infrastructure.

Building a resilient grid for a brighter future in Alberta

David James, deputy minister of Affordability and Utilities, Government of Alberta[83]

Alberta's electricity market is a for-profit, deregulated system. Unlike other provinces, the Government of Alberta does not own a public utility. Instead, electricity supply is driven by a competitive, market-based system that encourages private investment from independent power producers, who have the freedom to choose their generation sources. This approach fosters private sector innovation and allows the system to rapidly adapt to technological advancements, shifting demand, and policy signals. As a result, Alberta's electricity mix has diversified significantly over the past decade, with the end of coal-fired generation and a notable shift to natural gas, wind, and solar.[84]

Yet, as clean energy's share in the mix has grown, it has exposed the province's grid to new risks. Unlike conventional power plants, wind and solar are weather-dependent and fluctuate with the seasons and time of day. The consequence of the rapid rise in intermittent energy sources within a loosely interconnected jurisdiction was risks to the reliability of the system.

To restore the balance between reliability and sustainability, Alberta has been focused on strengthening the grid through a series of market and policy reforms that will also ensure energy remains affordable for both industry and everyday consumers. These changes are being designed to ensure the grid's long-term resilience while providing efficient investment signals for dispatchable energy resources and clear policies to allow clean energy projects to continue to develop and operate within the system.

Additionally, the province is advancing regulatory changes to support further industrial-scale demand response and energy storage technologies. Energy storage solutions help balance supply and demand by storing excess power generated during peak conditions and releasing it when needed. Alberta currently has 260 megawatts (MW) of battery storage online, with another 378 MW worth of projects that have met the necessary regulatory requirements and can proceed to construction.[85] In Alberta's deregulated market, battery developers have an opportunity to leverage the ability to provide reliable, dispatchable power to meet the rising demand for electricity.

Finally, the Alberta Electricity System Operator is working to deploy "dynamic line rating" technology. This system allows transmission operators to adjust the capacity of power lines based on real-time weather conditions, such as wind speed and temperature. By optimizing transmission capacity when conditions allow, this innovation enhances grid efficiency without compromising safety.[86]

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Delivering on the jobs of the future

Governments worldwide are working to reskill millions of workers to meet the demands of a rapidly evolving job market shaped by emerging technologies

Aligning tomorrow's workforce with employers' shifting needs is a significant economic and social challenge of our time. As smart technologies reshape the landscape, government, businesses, and educators are striving to reskill millions of workers for the jobs of the future.

No one knows exactly how emerging technologies will reshape the future of work and skills. Despite some conflicting forecasts, the changes will likely be significant. Emerging technologies like artificial intelligence are expected to create millions of new jobs while simultaneously causing skills shortages and disrupting existing roles.

- The World Economic Forum predicts that, by 2027, AI and machine learning specialists will see a 40% rise in job openings, with increases of at least 30% for roles including data analyst, big data specialist, and information security analysts—together adding approximately 2.6 million jobs.[1]

- The ongoing transition to alternative energy could create shortages of specialists, including solar panel installers, electricians, and others.[2] Other technological shifts, such as the long-predicted boom in autonomous vehicles, could transform entire industries and employment categories.[3]

Preparing workers for future jobs is a daunting challenge, but some governments are taking steps to tackle this issue, such as:

- Refining their ability to foresee workforce skills shortages and collaborating with businesses, educational institutions, and individuals to close the skills gap

- Evolving higher education systems to be more responsive to emerging workforce needs

- Revisiting policies such as worker transition support systems to protect livelihoods during disruptive career shifts and enable upskilling in new roles, thereby ameliorating worker shortages

Key challenges

- **Legacy institutional structures:** Universities, companies, and government agencies have evolved organizational structures designed to train workers for a slowly evolving economy—not today's whitewater rapids. As a result, there is often a mismatch between labor supply and demand, resulting in the inability of companies to fill certain skill positions, on the one hand, and underemployed workers, on the other.

- **Rapidly shifting skills:** Many organizations that develop talent face the challenge of preparing workers for jobs that don't yet exist. In an era of shifting technology, this will be an enduring challenge.

- **Second-order effects:** While some impacts of AI are foreseeable, second-order effects can be more difficult to predict. AI is likely to create entirely new job opportunities with novel skill demands.

- **Limits of human adaptability:** Technology may be advancing faster than humanity's ability to keep pace. While it is relatively easy to train for a specific skill, it is harder to train a human to be highly adaptable.

Trend in action

Getting ahead of the curve

One of the biggest challenges in preparing people and organizations for future jobs is the uncertainty of what those jobs will be. Rapid technological advancements make it difficult for even employers to forecast the shape of their industry's job market in the next five years and beyond. Predictions about the future job market vary, ranging from extremely positive to extremely negative. This uncertainty complicates government efforts to prepare workers for the future.

To help with this uncertainty, some governments are using data analytics and strategic partnerships to stay ahead of disruption rather than merely reacting to it.

Using data to decode the future of work

Data-driven workforce planning is important for governments to anticipate and prepare for future skills needs. Some agencies are making efforts to democratize labor market data by putting it in the hands of job seekers, employers, and training providers. This will help them understand their position in the labor market and identify emerging opportunities, enabling job seekers to overcome adjacency biases and explore opportunities beyond their personal experience.

Additionally, some governments are supporting real-time labor market information and evaluating education programs' return on investment to understand which degrees can better prepare students for jobs.

North Carolina conducted an evaluation of 765 undergraduate and 599 graduate programs within the University of North Carolina system. The evaluation examined costs, student outcomes, and return on investment, which is defined as lifetime earnings minus college costs. Undergraduate degrees showed a median incremental lifetime ROI of US$494,091, while graduate degrees had a median ROI of US$930,515.[4] Universities responded by eliminating a number of degree programs with comparatively low ROI,[5] steering students toward degree programs with more lucrative career prospects.[6]

Some governments are also leveraging AI and skills-based matching to create more efficient labor market connections while gathering valuable workforce data.

- Singapore's MyCareersFuture platform uses AI-powered job matching to connect citizens with relevant employment opportunities. The system displays "job fit scores" that compare the skills entered by users against those identified in job descriptions, making it easy to see how well someone matches a position. The platform leverages big data and algorithms to analyze real-time labor market information, helping predict future skill requirements. Used by 200,000 citizens weekly and hosting over 40,000 active job listings, the platform is free and available to Singaporean citizens and permanent residents.[7]

Higher education evolution and innovation

Colleges and universities globally are experiencing pressure to adapt to changing circumstances. Concerns about the high cost of higher education and the burden of debt may be prompting some potential students to question the ROI of paying for college.[8] Student expectations may be shifting as well. A 2024 survey found fewer students view higher education's purpose as delivering a well-rounded liberal arts education and more as providing credentials for future professional success.[9]

Colleges and universities are expected to play a key role in preparing workers with the skills needed in the future. Rapid shifts in technology are contributing to a shorter half-life of skills, suggesting that education might benefit more mid-career workers. Some policymakers recognize

the role that higher education can play in reskilling these older workers, and some companies are increasingly seeing benefits in forming connections with higher education. After all, these institutions need students, while the economy needs skilled workers.

Some colleges and universities are shifting their business models to be more student-centric, seeking to accommodate the needs of diverse learners at different stages of their lives.[10] Updates include online programs, flexible scheduling, and offerings that go beyond traditional two- and four-year degrees. Delivering education in a manner that suits busy older workers appears to be resonating: Nearly 70% of students surveyed prefer fully online, hybrid, or blended learning options, compared to around 30% for face-to-face learning.[11] Perhaps, as a result, online-only or online-first institutions are growing at a rapid pace. The largest US degree-granting institutions by enrollment—Utah-based Western Governors University and Southern New Hampshire University—are mostly online.[12]

How can universities innovate to strengthen the connection between education and professional success throughout one's career? A 2023 survey revealed that 75% of administrators saw public-private partnerships at their campus expanding with interest in collaboration with organizations outside higher education (figure 1).[13]

The move toward modular credentials and customized upskilling signals an emerging shift in higher education: a need to connect learning more directly with professional success. Beyond providing flexible and personalized learning options, some institutions are collaborating with industry to align their offerings with real-world demands.[14] This approach aims to enhance the relevance of academic programs, help graduates gain in-demand skills, and support lifelong learning.

Modular credentials for customized upskilling

Colleges and universities can take steps to meet people where they are and align with rapidly changing industry needs. The evolution includes offering more flexibility in how and when courses are offered, and expanding a variety of credentials beyond the traditional two- and four-year-degree model. Institutions also offer stackable credentials, making continuous, lifelong skill development more achievable.

- India's Ministry of Education launched the **Academic Bank of Credits** (**ABC**) in 2020 to serve as a digital storehouse for students' academic credits. The ABC facilitates academic mobility by allowing students to transfer between institutions mid-course and carry forward their credits. It also provides flexibility in completing degrees, enabling students to drop out and later rejoin the same or a different institution.[15] Universities and colleges registered with the ABC can seamlessly access students' academic scores. As of January 2024, more than 30 million students have registered on the ABC platform.[16] Singapore and France offer similar credit systems for lifelong upskilling.[17]

- **Georgetown University's Flex Program** allows students to balance work and school by offering the same faculty, courses, and degree as the traditional academic program but with flexible completion times, ranging from two to five years. The program breaks degrees into smaller, usable credentials that provide evidence of skills, and creates easy on/off ramps for students to combine work and learning.[18] In 2021, 47% of Flex MBA students reported taking on new work responsibilities since starting the program, and 45% achieved an increase in seniority.[19]

Aligning higher education and labor market demands

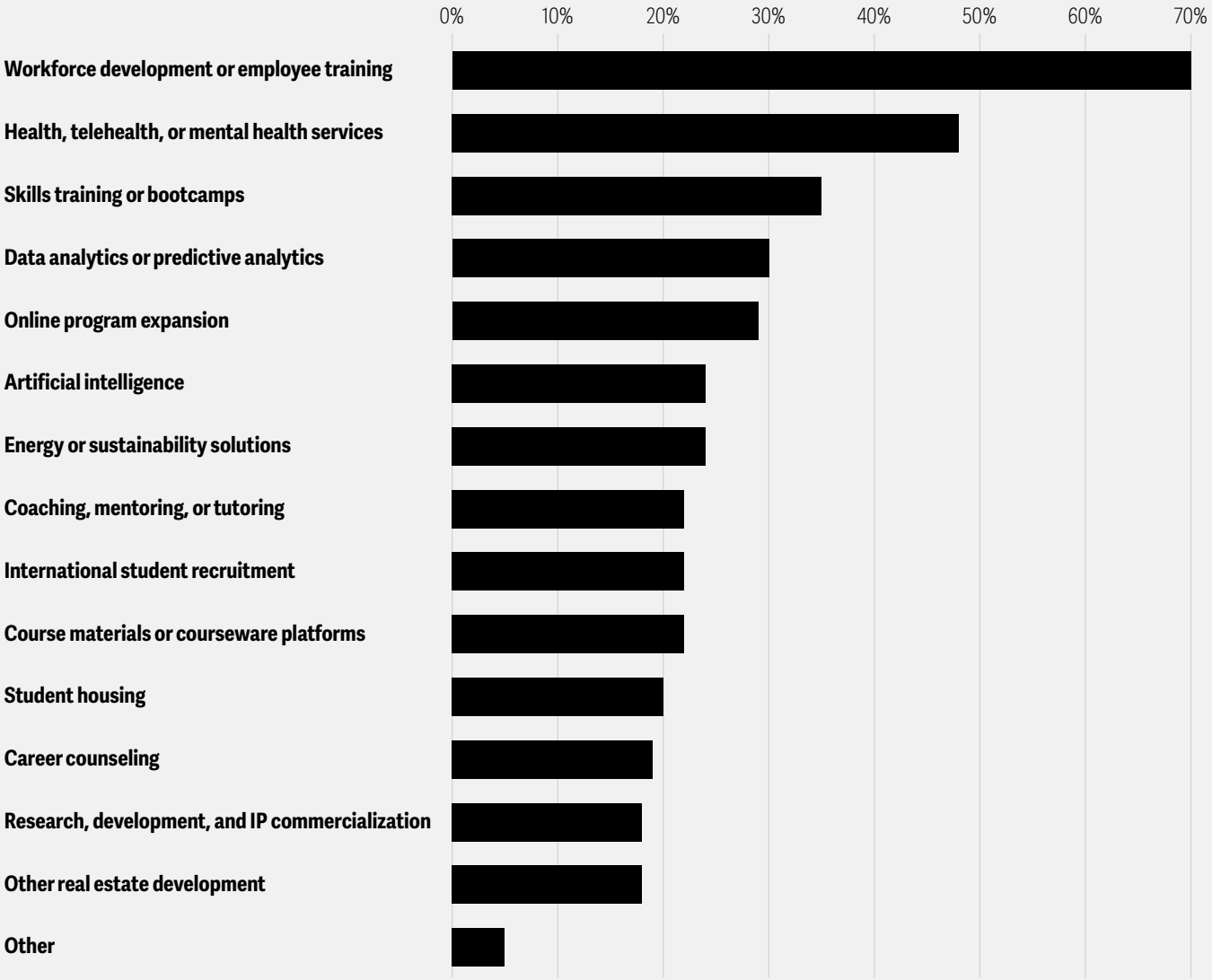
Some colleges and universities are forming deeper relationships with industry to improve curriculum relevance and employment outcomes. These programs vary but generally include flexible academic programs, sometimes including internships, that meet the needs of both workers or learners and an evolving labor market.

- Texas House Bill 8 introduced an outcomes-based funding model for community colleges, aligning financial incentives with student success metrics such as degree completion and job placement in high-demand fields. By shifting from enrollment-based to performance-based funding, House Bill 8 encourages colleges to continually update their curricula

Figure 1

Higher education leaders increasingly recognize the value of collaboration with the private sector and express interest in pursuing public–private partnerships across a broad range of areas

Areas of interest in partnering with private companies



Source: The *Chronicle of Higher Education* and P3 EDU, 2023 Public-Private Partnership Survey.

in partnership with industry to meet evolving labor market needs. The bill also supports an initiative facilitating seamless transitions for students into workforce-relevant programs—a reform that confirms educational offerings are directly responsive to the skills employers need, boosting graduates' employment prospects.[20]

- In August 2024, the Arizona Office of Economic Opportunity launched the ReadyTechGo program to standardize technical education in community colleges and prepare students for jobs in the state's manufacturing sector. The program teaches automated industrial technology through a flexible curriculum that ranges from two-week introductory certificates to a two-year associate degree, with specialization paths in electric vehicles, semiconductors, medical devices, and aerospace. Four participating schools share a curriculum that allows student transfers between locations. Training takes place in facilities equipped with industry-standard equipment that mirrors real factory environments, where students learn to operate, repair, and maintain automated electro-mechanical systems, product assembly lines, and process control equipment.[21]

- Coventry University's Institute for Advanced Manufacturing and Engineering integrates academic teaching with live manufacturing operations. This university-industry collaboration—known as the "UK's First Faculty on the Factory Floor"—began as a research consortium and evolved into a joint venture that manufactures high-performance electric vehicle batteries. The facility now supports both degree-level education and workforce capability development for the growing UK electric vehicle supply chain, demonstrating how "learning factories" can bring together academic research, skills development, and commercial manufacturing.[22]

Meeting the worker shortage through industry partnerships

Industries around the world are facing mismatches between available skills and labor force needs—and foreseeing widening gaps. US manufacturing faces a shortage of 1.9 million workers by 2033, India's semiconductor sector needs an additional 250,000 to 300,000 professionals by 2027, and Japan's construction industry demands at least 1.3 million skilled workers by 2025.[23] Skills shortages in emerging fields such as AI could exacerbate the problem.

Seeming to recognize this challenge, some leaders are forging partnerships where businesses co-invest with government agencies and higher education institutions to train workers in emerging skills throughout their careers. Whether through undertaking apprenticeships, designing course curricula, or partially funding the cost of training, businesses partnering in skills training can help workers acquire the skills that businesses need. This collaboration can increase the chances of workers finding employment and make it easier for businesses to access the skilled labor they require. Additionally, some governments are employing several workforce skill strategies to help meet worker shortages, many involving an element of business co-investment.

Encouraging apprenticeships for in-demand industries: While apprenticeships have traditionally been associated with the skilled construction trades, modern programs are helping to address workforce shortages in many sectors.

- Ireland has significantly expanded its apprenticeship system beyond traditional trades. From 2014 to 2023, the National Apprenticeship Office increased programs from 27 predominantly construction-focused apprenticeships to over 70 programs spanning sectors such as biopharma, information and communication technology, finance, insurance, and logistics. These programs provide €2,000 per apprentice annually for nontraditional sectors and are administered centrally through a digital platform that manages registration, tracking, and communication between stakeholders.[24] An additional initiative helps small employers with mentoring, certification, and guidance. As of December 2023, the system supported 27,470 apprentices and 9,200 employers.[25] Looking ahead to 2030, Ireland aims to register 12,500 new apprentices annually, with a particular focus on the construction and craft sectors to help meet national housing and climate action goals.[26]

- The German Dual Vocational Training System combines theoretical education at vocational schools with practical training at industry workplaces. This

dual-track "experiential learning" approach typically spans two to three and a half years.[27] The system promotes regulated collaboration between small and medium-sized companies and publicly funded vocational schools to confirm that training directly aligns with industry needs. Currently serving approximately 330 recognized occupations, the program is continuously updated through input from employer organizations and trade unions to maintain relevance in light of emerging technologies.[28] This model can allow companies to train potential employees in company-specific skills while significantly reducing recruitment costs and minimizing hiring risks.[29]

Partnering to deliver relevant training

Workforce transformation can benefit from strong partnerships across sectors. As a result, public-private collaboration has emerged as a key strategy to develop training programs that align with industry needs.

India's Project AMBER (Accelerated Mission for Better Employment and Retention) trains learners for future-resilient job roles identified through industry demand assessments. This collaborative initiative between the Ministry of Skill Development and Entrepreneurship, the National Skill Development Corporation, the Generation India Foundation, and private partners under the World Bank's Skill Acquisition and Knowledge Awareness for Livelihood Promotion program.[30] The program features a blended finance model with 50% private sector contributions, helping with employer engagement from the start.[31] In the three months after the first class graduated, 73% of the nearly 26,000 graduates found jobs, with 85% of those jobs linked to training and paying higher wages.[32]

Some regional workforce development programs are also actively partnering with industry. For example, EARN Maryland funds training programs for in-demand job skills based on strategic industry partnerships. Employers collaborate with other companies with similar talent needs to define needs and propose training programs to the state. Since its inception in 2014, EARN has funded 60 strategic industry partnerships and helped more than 9,000 job seekers find employment.[33]

Bridging workforce transitions

- Employees impacted by disruptions, such as technological obsolescence or other factors, may require public assistance. Implementing programs that offer training in essential fields can help these individuals transition from reliance on assistance to fulfilling vital roles within the workforce. Canada has launched a CA$30 million retraining initiative designed to assist workers affected by mass layoffs.[34] The program activates when an organization permanently lays off 50 or more employees within a four-week period. Local organizations—including nonprofits, municipalities, and educational institutions—deliver the program by assessing local needs, organizing retraining programs, providing career counseling, and coordinating job placement services. The funding supplements existing federal and provincial employment programs and operates based on local labor market conditions and workforce needs.[35]

- Victoria, Australia's Gippsland region, which has historically supplied 90% of Victoria's electricity through coal power, is undergoing a major workforce transition as 5GW of coal generation is set to close in the next 15 to 20 years, beginning with Yallourn Power Station in 2028.[36] To help address this challenge affecting more than 500 skilled workers, a detailed transition guide has been developed in collaboration with the government of Victoria, Latrobe Valley Authority, and industry partners. The guide shows how coal industry workers can transfer to offshore wind sector jobs with minimal additional training. For example, boilermakers can become blade repair technicians or fabrication supervisors, while mechanical fitters can transition to wind turbine technicians or marine engineers. Many certifications are available through local institutions and require only two weeks to six months of training. The plan can help workers stay employed while supporting Victoria's target of generating 9GW of offshore wind capacity by 2040.[37]

- Singapore is implementing an approach to support mid-career workers in their professional upskilling journeys, particularly targeting those of ages 40 and

older. The centerpiece is the SkillsFuture Level-Up Program, which combines several components: a S$4,000 subsidy for course fees, access to heavily subsidized full-time diploma programs, and an allowance providing up to 50% of previous income (capped at S$3,000) for those undertaking full-time training. In 2023, about 520,000 individuals and 23,000 employers participated in training programs supported by SkillsFuture Singapore (SSG).[38]

Singapore's implementation strategy operates through several interconnected programs and agencies working in close coordination. A career transition program forms the foundation, offering industry-relevant training courses with substantial subsidies—up to 70% baseline for all Singaporeans and enhanced to 90% for those of ages 40 and older.[39] Officials vet these courses, which are provided by polytechnics and accredited institutions, to verify strong employment outcomes, particularly in growth sectors such as health care, digital technology, and renewable energy. This is complemented by a career conversion program that provides structured on-the-job training with funding of up to 90% of employee salaries during training periods of 3 months to 24 months.[40] Supporting these programs are career services through grocery retailer NTUC FairPrice's Employment and Employability Institute and Workforce Singapore's Career Matching Services, offering one-on-one career coaching, job fairs, résumé writing support, and personalized guidance through the transition process.[41]

Tools and strategies to deliver on jobs of the future

- **Implement real-rime labor market intelligence.** Governments should consider investing in dynamic platforms that provide job seekers and employers with up-to-date data on job trends, skills demand, and salary benchmarks across localities. These systems can suggest relevant upskilling pathways and inform policy decisions, moving beyond generic data to actionable insights for individuals and strategic workforce planning.

- **Drive job-centric reskilling initiatives.** Shift from broad reskilling programs to targeted initiatives that can address the needs of diverse groups across all career stages. Focus on future-proof skills and leverage analytical tools using public and private data to forecast evolving labor demands, verifying that training is directly aligned with upcoming industry needs and is promoting adaptability throughout working lives.

- **Build support ecosystems.** Address economic inactivity by establishing wraparound services that can enable participation in education and training. Offer support such as child care, transportation, financial aid, and career counseling to remove barriers and ensure individuals can fully access opportunities for skills development and career advancement.

- **Promote collaborative workforce partnerships.** Encourage structured partnerships that promote collaboration by integrating labor supply stakeholders (for example, universities) and private sector leaders into governing boards of relevant institutions. This can help with shared accountability, resource pooling and curriculum innovation, and can foster an approach to workforce development that meets evolving industry demands.

- **Champion flexible and accessible work models.** Proactively address the evolving preferences of the workforce by promoting policies that support diverse work arrangements, including part-time and flexible roles. Recognize and facilitate opportunities for older workers and those seeking work/life balance, fostering a more inclusive and adaptable labor market that maximizes participation and economic contribution.

- **Establish standardized skills frameworks and digital credentials.** Develop national or international standardized skill taxonomies to create a common language across industries and educational institutions. Complement this with digital credentialing platforms that issue verified, stackable credentials. This can help individuals to showcase their evolving skills and support lifelong learning, facilitating clearer pathways for career progression and recognition of competencies across multiple career journeys.

My take

Virginia is closing the skills gap

Nicole Overley, commissioner of Virginia Works[42]

The defining feature of the current economic landscape is the rapid rate of change—in technology, in industry, and in how we work. This rapid change is creating a growing global "skills gap," a mismatch between the skills that individuals have and the skills that employers are seeking to fulfill their business needs.

With the creation of Virginia Works, the Commonwealth's new agency dedicated to workforce development, Virginia is closing that gap. Virginia Works is focusing the Commonwealth's broad workforce ecosystem on our dual customers—which we see as the individuals looking to improve their skills as well as the businesses that are seeking skilled workers. Meeting the needs of these customers, by understanding both and translating between them, is the agency's North Star.

With respect to individuals, it's important to pay special attention to those who may have been left behind in the job market and need upskilling or support to attain their best job. Indeed, many of the federal funds that help sustain Virginia's efforts specifically target certain populations, such as veterans, those receiving public assistance, and the formerly incarcerated.

To focus on the jobs that employers seek to fill, we rely on a list of high-demand occupations produced by the Virginia Office of Education Economics. Virginia Works then ensures that the skills providers who are part of the workforce ecosystem—the job training programs, Virginia's community college system, and others—are striving to equip individuals with the specific skills that align with those high-demand occupations.

For example, Virginia's G3 program (short for "Get Skilled, Get a Job, Give Back!") offers tuition assistance for qualifying residents at Virginia's public community colleges who are studying for a degree in a high-demand field such as IT, public safety, or manufacturing and skilled trades. In 2023, over 12,500 students received US$20.5 million in tuition assistance through the G3 program.[43]

One aspect of Virginia's approach is our commitment to measuring outcomes for all workforce programs, not just metrics. We focus not just on the number of people who have received a certain training, but the job placement, wage growth, and retention that result. Virginia Works, as the agency responsible for collecting this data across more than 70 workforce programs in the Commonwealth, coordinates the sharing and baselining of outcomes goals for programs and tracks change over time, helping us to better understand which approaches work best.

Looking ahead, as AI continues to transform industries and the rate of change of technology continues faster than ever, we are committed to skills development approaches that build in adaptability, resilience, and change readiness and help every individual identify the transferable skills that can help them pivot to the ever-changing set of skills that will be needed for the jobs of tomorrow.

My take

Preparing students for the future of work

Scott Pulsipher, president of Western Governors University[44]

There is a transformation taking place in higher education as innovative institutions embrace solutions to meet the needs of an evolving student body and economy. At Western Governors University (WGU), we believe universities can take part in this shift in three distinct ways: first, by putting the student at the center of every decision; second, by leveraging technology to deliver a more personalized learning experience, at scale; and third, by aligning learning outcomes to the world of work.

Higher education can fulfill multiple roles, but its primary purpose should be connecting students with opportunity—arming them with the knowledge, skills, and abilities needed to thrive in the future of work. While models will necessarily vary across institutions, here's what that looks like at WGU:

Student-centered: For education to be a pathway to opportunity, it has to work for everyone, not just those it has traditionally served. To better meet the needs of today's learners and their unique circumstances, WGU reimagined higher education from the ground up—designing a model that is flexible, affordable, and personalized.

Because WGU is an online institution, students can progress through their coursework whenever they are available, wherever is most convenient. Enrollment occurs every month, instead of twice a year, and our flat-rate tuition model allows students to take as many courses as they like, during each six-month term. This student-centered approach has helped WGU significantly expand its reach; WGU currently serves more than 185,000 students nationally.

Tech-enabled: Since its founding more than 25 years ago, WGU has used technology to deliver high-quality instruction at scale. Now with advances in artificial intelligence, it's possible to dramatically personalize instruction with the aim of every student having a high probability of success.

For instance, we leverage machine intelligence to better understand how each student is doing at a given moment, drawing on indicators such as how they're interacting with learning resources, the extent to which they're engaging with faculty, and how they're progressing. By identifying when students are in greater need of support, faculty can design personalized interventions at the moments when students need them most.

Workforce-aligned: WGU's learning outcomes are tightly aligned with industry needs, equipping students with the skills they need to succeed at work. WGU also maintains close relationships with employers to identify the most in-demand skills, and seeks regular feedback from them to help ensure students are meeting expectations in the workplace.

As the pace of change accelerates, providing individuals with the skills needed for the future economy will be a central task of higher education. WGU's student-centered design, embrace of technology, and workforce-aligned approach offer a pathway forward.

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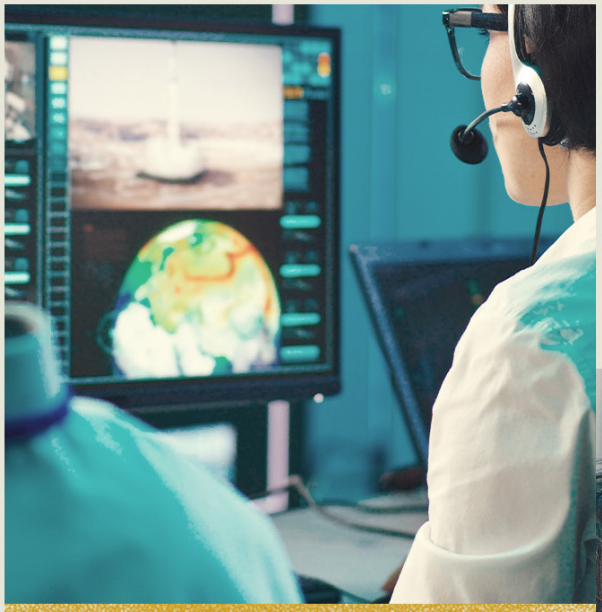


Delivering on space development growth

The space industry could be worth US$800 billion by 2027, but it must tackle multiple issues, like regulatory reform and space debris, to sustain this growth

Today, the space industry is expanding at a steady pace, offering benefits to countries and citizens around the world. A thriving space economy contributes to technological progress, economic growth, and strategic advantages. For example, innovations such as the Global Positioning System—developed in the United States—have become a catalyst for global economic progress.[1]

Many countries are increasing their investments in space exploration because of the advantages it provides, leading to more collaborations and advancements in space technology. Between 2007 and 2022, the total value of space activities worldwide more than doubled, and some estimates suggest that the value could reach nearly US$800 billion by 2027. Meanwhile, the total number of objects launched into orbit each year has surged (figure 1).[2]

Space-based technologies and services are important across various sectors—from agriculture, finance, and transportation to weather monitoring and insurance—and the economic opportunities are expanding as well. New space activities, like in-orbit manufacturing, hold an additional promise for more growth and new innovations.

More than the economic benefits the space industry provides, a military's sophistication can be measured, in part, by its space capabilities. Modern military operations across the globe rely on satellite-based communications, navigation, and intelligence services. The importance of space capabilities for military operations has been, and will continue to be, a source of fuel for industry growth.

However, commercial and government pursuit of a larger and more capable space industry can also present challenges that could stunt progress. The government will need to balance industry growth against potential industry challenges, like the possibility of losing access to critical earth orbits due to space debris or military conflict that extends into space. The benefits of a robust space sector are growing as new space industry innovations, like larger launch vehicles, more sophisticated earth-imaging satellites, and entirely new activities, like manufacturing in orbit, mature. The opportunity for governments and industry is there for the taking.

Key challenges

- **The investor calculus is changing.** Several years of what appear to be overly optimistic industry projections have led to less-attractive returns for some investors, encouraging greater risk aversion and a better understanding of the space industry's investment dynamics.

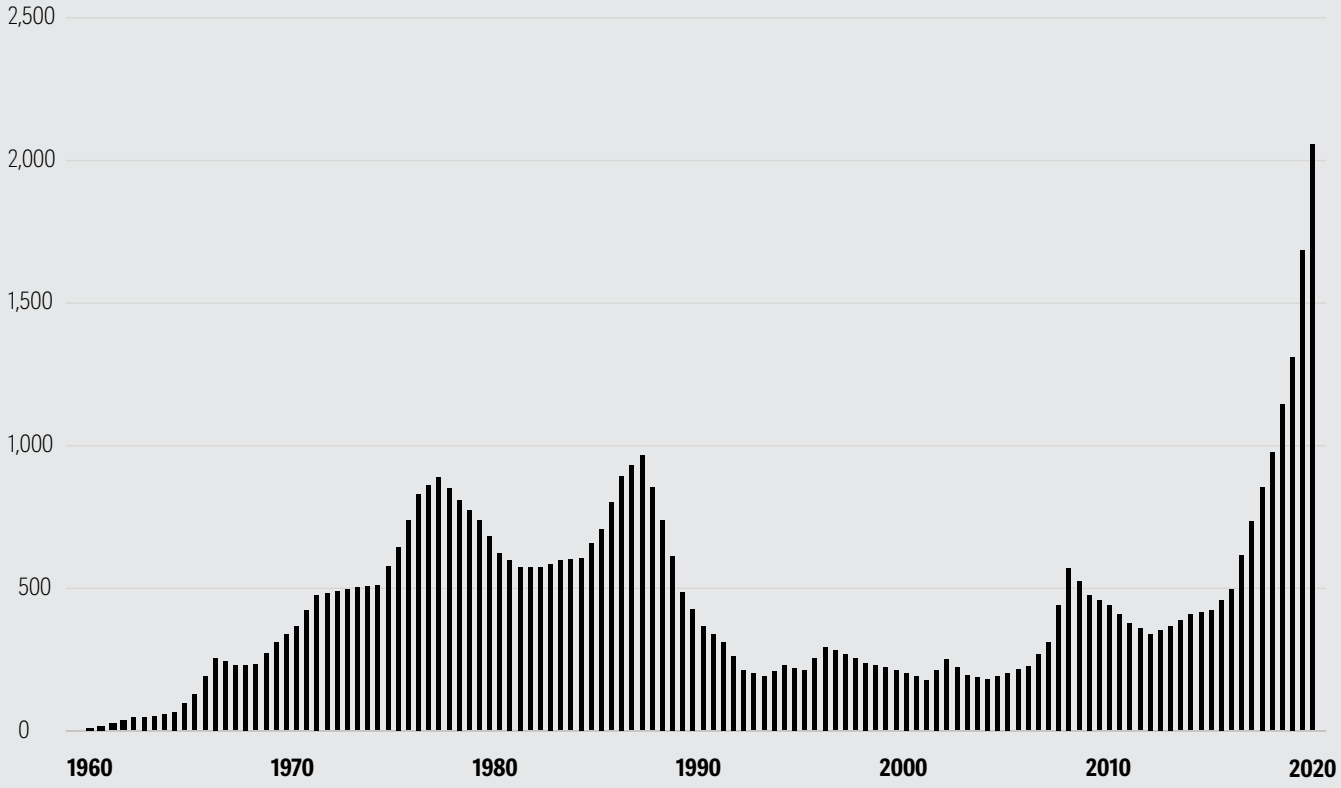
- **Crowded orbits may threaten access.** Space development has come at an environmental cost in the form of space debris.[3] Left unchecked, mounting space debris could close off access to critical earth orbits.

- **Competition intensifies.** More than the expected economic competition for new space industry markets or innovations, geopolitical competition has added a layer of complexity to space industry growth. Some countries are searching for ways to bolster military space technologies without creating additional geopolitical insecurity or threatening access to earth orbits.

Figure 1

Partly because of the entry of private players in the space industry, the number of objects launched into low earth orbit has soared in recent years

The number of objects launched into low earth orbit witnessed a particularly steep spike between 2015 and 2020



Source: Jonathan's Space Pages, "Satellite statistics: Satellite and debris population," planet4589.org, accessed Feb. 14, 2025.

- **International cooperation is necessary but can be harder to come by.** Whether developing international rules for space traffic or expanding commercial markets, international cooperation can help deliver space development, but political tensions can make increased and sustained cooperation more difficult to develop.

Trend in action

Driving space innovation through public-private partnerships

Innovation in the commercial space sector is reshaping the understanding of the planet and enhancing everyday life. Large constellations of commercial satellite broadband networks provide globally accessible internet, connecting communities around the world and aiding national

security. In fact, they've proven so important that countries are racing to deploy their own versions of them. The European IRIS² program plans to improve connectivity for governments and the private sector.[4] Other systems, like the "Thousand Sails" satellite constellations, seek to provide similar capabilities in Asia.[5]

Indeed, while commercial companies are often in the spotlight for their innovations, governments, through space agencies and ministries or departments of defense, are working hard to catalyze private sector innovation. In the United States, for instance, NASA is playing a key role in catalyzing low earth orbit destination markets through its Commercial LEO Destinations program.[6] In India, the Indian Space Research Organization is encouraging private space sector growth through technology-transfer agreements and has recently added another 75 such agreements to a quickly growing list.[7]

Closer public-private partnerships between governments and commercial space companies are an important feature in today's space industry because they often benefit governments and the private sector equally. Many pioneering projects, like the International Space Station, laid the groundwork for further commercialization, and today, private companies can build on initial governmental efforts by delivering more affordable and innovative space services that governments require, including crewed spacecraft and national security support.

Industry growth to date has already reshaped perceptions of roles and opportunities in space, and more innovation is on the way.

Moving beyond traditional space activities

Historically, investments have concentrated on traditional industry areas like launch services, satellite communications, and earth observation. While these remain critical, unlocking entirely new markets can require the development of novel technologies and services. Emerging areas such as in-orbit servicing, assembly, and manufacturing (ISAM); space traffic management; space debris remediation; new military capabilities; and ambitious civil space programs (for example, the Artemis program in the United States or the Chandrayaan family of lunar missions in India) can open entirely new opportunities for industry growth and innovation.

Many of these new markets are the product of years of public-private partnerships. For instance, in-orbit facilities, such as the International Space Station have been used to manufacture pharmaceuticals, semiconductors, and even human-grade knee cartilage through partnerships with national space agencies like NASA.[8] And new space companies are leveraging those lessons learned to develop commercial products, like making pharmaceuticals in orbit and returning them to Earth.[9] Other instances of initial government investment spurring commercial products and services touch nearly every space industry sector.

The promise of these new activities is often why governments and the private sector are closely collaborating. Take in-space servicing, for example: The governments of Japan, the United States, the United Kingdom, and other countries are investing alongside private sector investors in commercial space companies that are developing entirely new ways of servicing satellites in orbit and cleaning up space debris.[10]

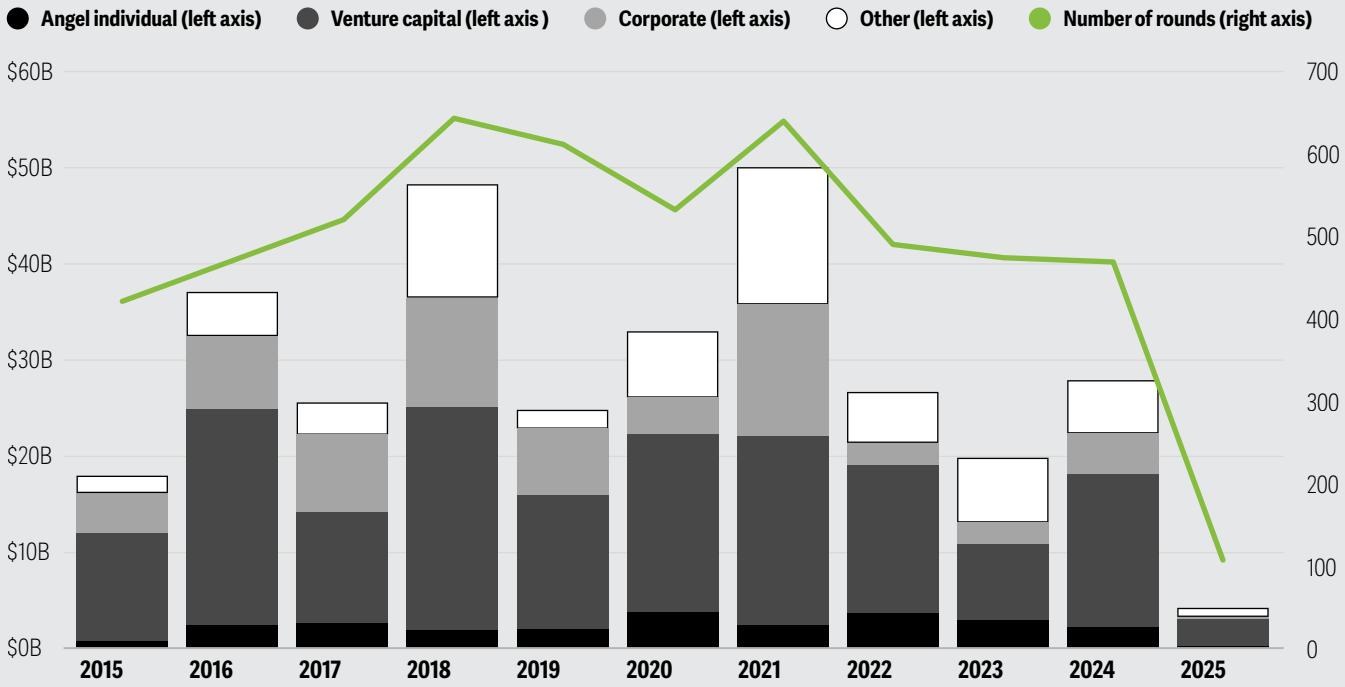
These new activities and associated markets can help the industry move beyond familiar sectors, such as satellite communications or imagery, to sectors that offer new ways of exploring and developing space. For example, as in-space servicing and assembly technologies progress, they could unlock different ways of building more affordable and sophisticated satellites in orbit, like larger scientific telescopes or even manufacturing facilities. However, advancements in these emerging fields are not guaranteed.

Maintaining momentum in the global space sector should include thoughtful collaboration and sustained investment from both governments and the private sector. Recent cycles of private investment—from venture capital to private equity—have sometimes followed overly optimistic forecasts characteristic of a growing industry.[11] Investment levels dipped in 2022, reflecting a more cautious climate after some investments underperformed, but recovered in 2023, with around US$12.5 billion raised—albeit still below previous peaks (figure 2).[12] This evolving investment landscape may suggest that investors are gaining a clearer understanding of how to minimize investor risk while trying to spur industry growth.

Figure 2

Private sector investment into the space industry has been on the rise over the last decade, but not without fluctuations

Space industry investments from the private sector by year



Note: All monetary values are in US dollars.

Source: Space Capital, "Space IQ: Space Investment Quarterly," 2025.

Between 2021 and 2022, reported close approaches between satellites increased by 58%, spotlighting the urgent need for comprehensive space traffic management systems.

At the same time, government spending is up globally (figure 3). The increase in government investment is likely due to a renewed appreciation for the economic, scientific, and national security advantages afforded by space technologies. Disparities in government budgets also reflect an enduring reality: Space exploration and development continue to be a financially expensive endeavor. While new innovations in launch services and electronics have driven down costs in recent years, developing, deploying, and operating large numbers of commercial or government space systems in orbit continues to be an activity for relatively few countries. However, commercial products and services and government partnerships have expanded access to space technologies and services to more countries.

Though the space industry is growing, and signs suggest that it will continue to do so, industry growth is not without prominent challenges. Three major ones are governance, space debris, and geopolitics.

International governance of space

Earth's orbits are a shared space, the providence of mankind.[13] While some international agreements formed in the 1960s and 1970s provide some guidance for activities and behaviors in orbit, more clarity is needed on the international rules for space exploration and development.[14]

Figure 3

Governments have been increasing space budgets to account for the growing space industry and its many innovations

Government space budgets in recent years have grown 8%

Government space budgets, 2022

Nation/agency	Spending	2021 to 2022 change	2021 to 2022 change (national currency)	Source
United States	$69.5B	13.6%	13.6%	US government public filings
China	$16.1B	0.7%	4.5%	Space Foundation estimate
ESA	$5.4B	11.6%	0.1%	ESA, Eurospace
Russia	$3.7B	19.7%	10.5%	Ministry of Finance of the Russian Federation
Japan	$3.1B	11.8%	7.8%	Japan's Cabinet Office
European Union	$2.3B	21.4%	11.0%	The European Commission, Eurospace
India	$1.3B	20.6%	15.6%	India's Ministry of Finance
Germany	$1.2B	6.6%	5.8%	Germany's Federal Ministry of Finance
France	$1.1B	9.5%	2.5%	Centre National d'Études Spatiales
EUMETSAT	$1.0B	77.0%	100.5%	EUMETSAT, Eurospace
Italy	$0.6B	30.3%	47.6%	Agenzia Spaziale Italiana
South Korea	$0.6B	3.7%	18.5%	All Public Information In-One
Canada	$0.3B	1.6%	5.5%	Canadian Space Agency
United Kingdom	$0.2B	21.7%	38.2%	UK Space Agency
Additional countries	$1.4B	6.5%	6.5%	Respective government agencies
Non-US military	$10.8B	14.9%	14.9%	Space Foundation estimate
Total	**$118.6B**	**8.1%**		

Notes: Data for ESA excludes income from the European Union; data for Germany, France, EUMETSAT, Italy, Canada, and the United Kingdom excludes ESA and EUMETSAT contributions; all monetary values are in US dollars.

Source: Space Foundation, "The Space Report 2023 Q2: E-edition," accessed May 21, 2024.

Take managing space traffic, for example. The surge in satellite deployments—with more than 11,000 active satellites currently[15]—has led to unprecedented congestion in Earth's orbits. With active satellites now accounting for over half of all payloads ever launched and predictions estimating up to 20,000 satellites in orbit by 2030, the risk of collision and interference continues to grow.[16] Importantly, many of these satellites are part of constellations and are intended to be replaced with upgraded versions every few years, which increases space traffic as satellites are deorbited and substituted.

Between 2021 and 2022, reported close approaches between satellites increased by 58%, spotlighting the urgent need for comprehensive space traffic management systems.[17] Yet, with the growth in orbital use occurring internationally, space traffic cannot be managed solely at the national level.

There will need to be an international agreement about how satellite operators manage traffic, just as there are international rules for managing civil aviation or shipping traffic.[18]

Data about where spacecraft are in orbit is a critical piece of managing space traffic, and some countries are working together to acquire and share space situational awareness data. Through the Traffic Coordination System for Space program, the US government aims to provide a better way of collecting and sharing space situational awareness data for commercial and government operators.[19] The European Space Agency and other countries also have programs designed to track and catalog space objects to help manage space traffic.[20] Although data-sharing is increasing, cooperation between countries is required to use that data to manage traffic most effectively.

Beyond managing space traffic, new international agreements covering a host of emerging space activities can help pave the path of space development and safeguard commercial and national security interests in space. Addressing these challenges requires robust international cooperation and the establishment of global norms and other international agreements. Initiatives like the Artemis Accords—led by the United States but embraced by a growing number of international partners—illustrate how collaborative efforts can set standards for responsible space exploration and use.[21] Developing these rules becomes more pressing when considering the challenging state of space debris.

Addressing the proliferation of space debris

The rapid growth of the space industry has created junk in orbit, which exacerbates orbital congestion challenges and increases risks to satellites. Space debris—ranging from defunct satellites and spent rocket stages to fragments from satellite collisions—poses risks for operational spacecraft and vital services. There are tens of thousands of pieces of debris in orbit currently, and more than half of this debris is concentrated in low earth orbit, the region where most commercial activities occur (figure 4).[22] In early 2024, a near-miss between space debris and a non-maneuverable satellite underscored the potential for catastrophic collisions that could generate thousands of additional debris fragments, further cluttering Earth's orbits and endangering active satellites.[23]

These issues are recognized globally. The United Nations Committee on the Peaceful Uses of Outer Space has produced guidelines intended to limit the creation of debris, and many countries have national regulations intended to do the same.[24] Yet, solutions to date only address part of the problem.

Some governments and companies are taking action to reduce the creation of new debris, but there is currently no means of actively removing existing debris. Efforts are underway by several governments and companies to develop the technologies to do so. For example, the Japanese Aerospace Exploration Agency's Commercial Removal of Debris Demonstration mission leverages a partnership with private space companies to develop debris removal technologies.[25] Similar public-private partnerships to address space debris are ongoing in Europe and the United States. Of note, many of the technologies needed to remove debris from orbit are the same technologies found in ISAM activities, which means investments in ISAM can both expand access to new markets and help preserve the markets that already exist.

Geopolitical competition in space is heating up

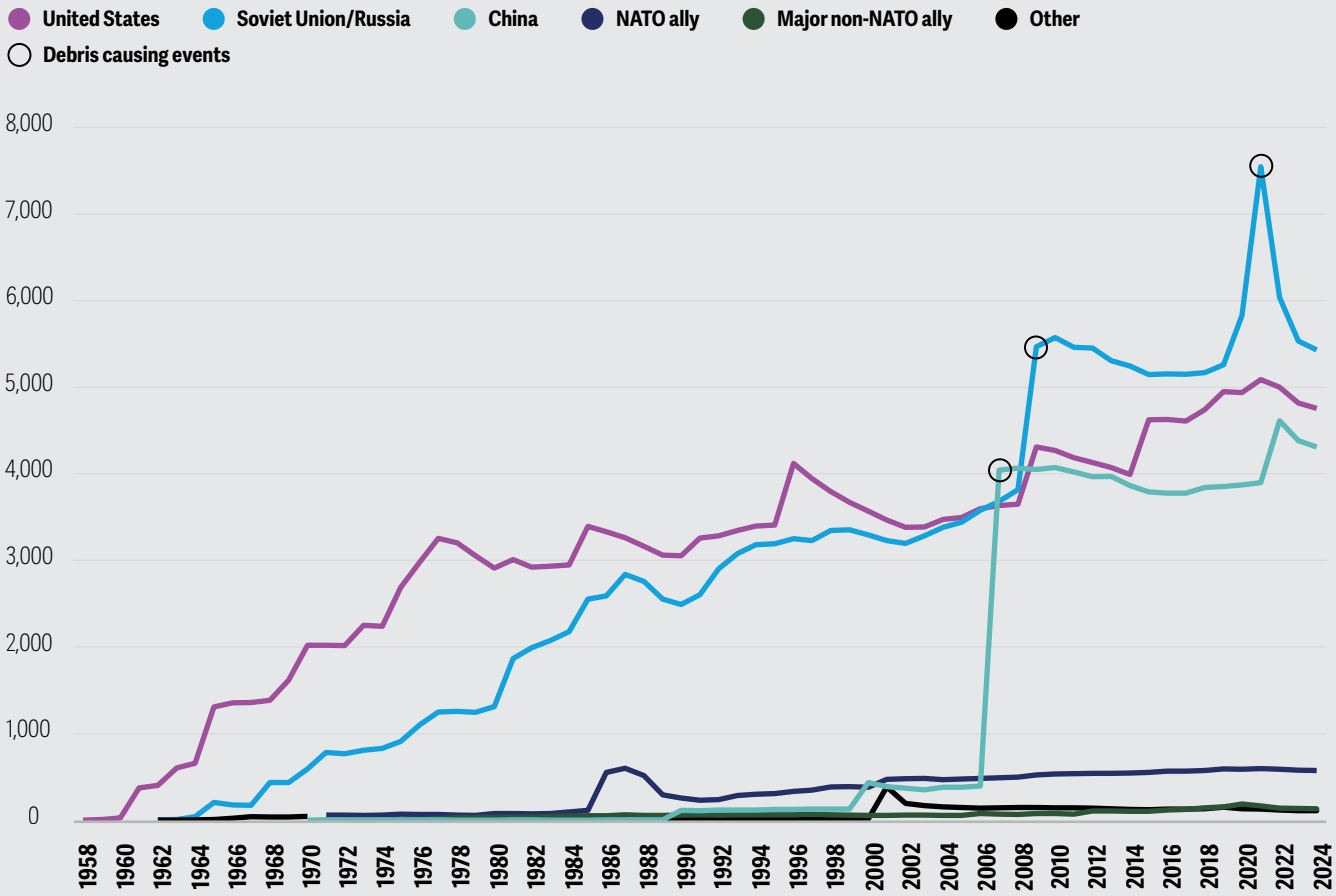
Historical precedents, such as the Cold War space race beginning in the 1950s, show that competition can stimulate rapid progress. Today, geopolitical competition is helping to stimulate growth in the commercial space sector as governments seek new innovations and ways of addressing national security needs through private sector companies. However, racing to capture markets and to develop new military technologies can also create tensions in the space industry.

Space holds strategic military value, providing critical national security capabilities such as communications, intelligence, early warning, and navigation. For decades, military space systems—once developed in relatively low-risk environments—have contributed to national defense. In recent years, however, as more countries improve their space technologies, existing assets have become more vulnerable to threats ranging from electronic warfare and cyber interference to direct kinetic attacks.[26]

Figure 4

Earth's orbits—especially low earth orbit—are increasingly congested with space debris, a trend that poses a risk to space sustainability

Growth of debris over time



Source: American Enterprise Institute, "Space debris trends," accessed May 2024.

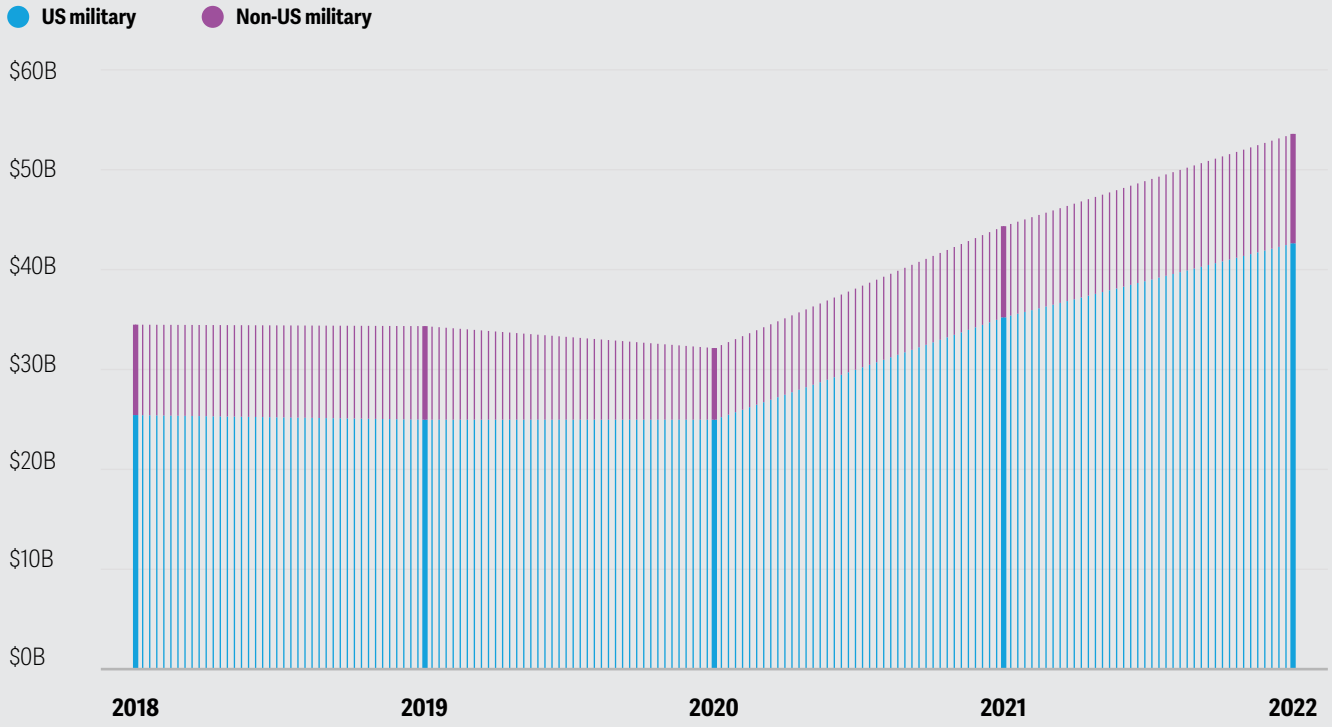
Similarly, as novel space activities increase, it can lead to uncertainty regarding their intentions. Unfamiliar space activities can also create additional risks of military escalation.[27] Indeed, there have even been reports of military "dogfighting" satellites in orbit (similar to aircraft dogfighting in combat).[28] Evidence of countries placing greater importance on space assets for national security is reflected in recent global budget increases for military space programs (figure 5).

Economic competition for space industry markets and even space-based resources can also create tension within the industry. For example, some developing countries worry about their ability to compete in an important industry compared to more developed nations.[29] For these countries, capturing value from the space industry can involve deciding between purchasing space services from foreign providers—an often easier and more affordable option but one that

Figure 5

Across the space industry, military space spending is on the rise due partly to increasing international competition

US and non-US military space spending, 2018 to 2022



Note: All monetary values are in US dollars.

Source: Space Foundation, "The Space Report 2023 Q2: E-edition," accessed May 21, 2024.

makes them a customer—and devoting more of their resources to developing and operating their own satellites and systems to capture their own customers. The choice can require what may be difficult trade-offs, but it can also be a source of industry innovation or advantage. For example, some developing countries have presented more affordable options for developing space systems than more developed countries. Take, for instance, how the Indian Space Research Organization has managed several accomplishments with lunar and Mars exploration programs at a fraction of the costs spent on similar missions by more developed countries.[30] The number of industry stakeholders is increasing dramatically. Today, numerous countries, companies, universities, and other entities have spacecraft in orbit.[31]

This means that a military conflict that extends into space would likely affect not just a select few government satellites, but also possibly thousands of satellites from around the world. For instance, as competition for markets and military advantages encourages the development of large constellations of thousands of

communications and other types of satellites, it could add to the congestion and debris challenges that affect other space actors as well.[32]

Expanding the commercial space sector could help reduce the likelihood that military actions in orbit leave lasting effects that foreclose access to important Earth orbits, though it's no guarantee. Emphasizing the economic benefits of space could raise the threshold for engaging in certain types of military actions, like those that cause space debris, because doing so could create an indiscriminate risk to space assets, meaning the country that created the debris would also likely be affected by it. Additionally, establishing certain norms of behavior for military space activities and clear lines of communication could help to avoid confusion that could lead to unintentional escalation. One example of a positive norm of behavior that is gaining international support is the United Nations' proposed ban on debris-generating anti-satellite weapon tests.[33]

Tools and strategies to deliver on space development growth

Looking forward, governments can consider several actions to foster industry growth, including:

- **Synergistic investment:** Combine private sector funding targeted at traditional space activities with government investment in promising emerging areas like space traffic management, debris remediation, and in-space infrastructure. Public funds can bridge the gap until these technologies become commercially viable.

- **International market collaboration:** Strengthen global partnerships by developing stronger commercial relationships for existing industry markets and emerging ones. This cooperation can spur innovation and also provide a platform for creating robust international norms and standards.

  - Specifically, these collaborations should include developing tools and resources to provide foreign companies with information about national processes, regulations, funding opportunities, and other relevant aspects to help them bring their technology to countries with investment opportunities and markets.

  - Governments should also consider how to establish consistent, long-term investment demand to facilitate the flow of more private capital into the system.

- **International governance to preserve access:** Additional international agreements focused on space debris and space traffic management are necessary. These efforts should be inclusive of like-minded countries, but developed to evolve quickly with changes in technologies and governance needs.[34]

- **Balancing military and commercial objectives:** Champion the economic benefits of space—and the promise of an ever-more-beneficial industry—to help balance the development of commercial space capabilities with military objectives.

- **Establishing norms of behavior and open lines of communication:** Norms of behavior for avoiding military miscalculation and escalation could focus on distinguishing between commercial and military behaviors to ensure commercial activities aren't confused with military actions. Similarly, clear lines of communication between private sector operators and governments and between governments could expedite the sharing of important information and offer a chance to clarify where confusion may be present.

The space industry is on a growth path. Whether that path remains straight and smooth or indirect and bumpy depends on how governments nurture emerging space markets and balance commercial development with potential challenges stemming from geopolitical competition. Of course, the private sector has a role to play as well. Bringing these factors together will require focused government time and attention, but the payoff—delivering on space development growth—will be worth it.

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