Why Countries Need National Strategies for the Internet of Things

By Joshua New & Daniel Castro | December 16, 2015

The Internet of Things offers many opportunities to grow the economy and improve quality of life. Just as the public sector was instrumental in enabling the development and deployment of the Internet, it must play a similar role to ensure the success of the Internet of Things. Therefore, national governments should create comprehensive national strategies for the Internet of Things to ensure that the technology develops cohesively and rapidly, that consumers and businesses do not face barriers to adoption, and that both the private and public sector take full advantage of the coming wave of smart devices.

A national strategy for the Internet of Things, if designed and implemented correctly, would maximize the opportunity for the Internet of Things to deliver substantial social and economic benefits.

Traditionally, most Internet users have been people: individuals sending email, reading the news, shopping online, and the like. But in the near future, most users will be machines: a vast array of ordinary devices that are equipped with sensors and networking capabilities so they can collect and share data with people and other devices. In fact, we are already well on our way toward building the Internet of Things (IoT). As the cost of deploying smart devices declines, homes, factories, farms, office buildings, and even cities are generating vast quantities of data that can be collected, analyzed, and acted upon. Data from these connected devices is creating tremendous opportunities to generate economic and social benefits, ranging from sensor-equipped bridges that can alert authorities if there is a risk of structural failure to waterways that can warn environmental regulators about spikes of fatally toxic algae.[1]

Smart public policies that proactively support innovation—or carefully avoid doing harm by restraining from the impulse to regulate or if needed, regulating with a light touch—have been integral to the success of major

technological developments such as the Internet, global positioning systems, and supercomputers.[2] Smart policies can foster the growth of the Internet of Things, too. Indeed, there is an even more compelling case for countries to craft comprehensive strategies for the Internet of Things, because, as this report details, there are a number of market failures that if left unaddressed can slow the technology's progress at the national level. Moreover, because many opportunities are strongly tied to areas of public-sector activity (such as health, environment, transportation, defense, and city management), comprehensive national strategies can ensure governments take full advantage of the Internet of Things to improve their own performance.

WHY THE INTERNET OF THINGS MATTERS

The Internet of Things will have a substantial impact on virtually all aspects of business and society. The number of new devices and services built for the Internet of Things has risen sharply in recent years, and connected devices are increasingly used to generate new insights into human health, improve public safety, conserve resources, boost productivity, and support more effective government.[3] Industry forecasters estimate that by 2020 there will be 26 to 50 billion connected devices in use worldwide.[4] While many smart devices provide immediate benefits in isolation, their benefits will multiply as their numbers increase and they generate more shareable data that leads to more actionable insights.

The Internet of Things is expected to contribute up to $11 trillion in value per year globally by 2025.[5] Companies can use the Internet of Things to become more efficient, for example by reducing downtime in factories as they constantly monitor machine performance to address issues before they become problematic, or as they use real-time data about customer demand to better manage supply chains.[6] And consumers can use the Internet of Things to save money, for example by using smart thermostats to reduce their energy bills or by using fitness trackers to earn lower health insurance premiums in exchange for demonstrably healthy behavior.[7]

For the global public sector specifically, the Internet of Things could generate $4.6 trillion by 2022 by increasing employee productivity, making military defense systems more effective, reducing costs, improving citizens' experience with public services, and increasing government revenue.[8] First responders can use the Internet of Things to save lives. For example, firefighters can use smart clothing to monitor environmental conditions and more safely respond to emergencies.[9] Cities can use the Internet of Things to operate more intelligently and better serve residents, such as by monitoring flows in water and sewage treatment plants in real time to reduce power consumption and costs; by installing parking sensors to help

people with disabilities quickly find accessible parking spaces; or by tracking snowplows in real time to better respond to residents' snow removal requests and identify where communities are being underserved.[10]

Ultimately, the Internet of Things is a platform for innovation that has the potential to be as disruptive and beneficial as the Internet itself has been. While industry forecasters and technologists can imagine its potential applications and estimate its impact, there is simply no way to predict all of or even most of the most of the opportunities that the Internet of Things will create. But, from the many connected devices and services that have already begun to reshape factories, hospitals, cities, and homes, there is no doubt that the Internet of Things will be one of the defining technologies of the first half of the twenty-first century.

WHY DO NATIONS NEED A NATIONAL INTERNET OF THINGS STRATEGY?

While the private sector can successfully develop many valuable technologies on its own, particularly those technologies with few network effects, the Internet of Things is different. To be sure, the private sector will be the primary driver of the Internet of Things as its potential benefits create enormous incentives to invest and deploy the technology. However, the Internet of Things is subject to an array of market failures that could limit these incentives and thus slow progress toward a fully connected world. Additionally, if poorly designed, government regulations can make deploying IoT technologies more expensive and less valuable. Furthermore, governments can help bridge the divide between those communities and individuals who are able to fully benefit from the Internet of Things and those who cannot based on market forces alone. Because of these three factors—market failures, the need for an innovation-friendly regulatory environment, and the need to promote equity—governments should develop comprehensive national strategies that remove obstacles and support development and widespread adoption of the technology.

MARKET FAILURES

If left solely to market forces, the development of the Internet of Things will fail to reach its full potential. These market failures include:

Externalities, Including Network Externalities

Many of the social and economic benefits from large-scale deployment of the technology accrue not to those buying or selling IoT products and services, but to competitors—through the expansion of network benefits—and to non-users, if the application generates an external benefit. One of these external benefits comes from the use of the data. An application that

can analyze billions of data points is more valuable to society, or to an individual company, than one that can tap only millions of data points. This phenomenon occurs for many networked technologies, since the value of a network rises as the number of users grows.[11]

Another externality is the generation of social benefits in areas such as health and energy. For example, a smart thermostat may save consumers money, but it can also reduce overall energy demand.[12] If certain consumers do not find the cost savings that smart thermostats can generate sufficient to warrant buying them, then the nation as a whole will suffer from increased energy prices and pollution. Likewise, when consumers use IoT applications to improve their health, some of the benefits go to society in the form of lower health-care costs. Because the consumer benefit is smaller than the social benefit, there will be underinvestment in IoT applications.

There are also externalities from increased scale. For many connected technologies, a greater number of users will bring down prices due to economies of scale in production, but individual buyers will receive only a tiny portion of this benefit.

"Chicken-and-Egg" Dynamics

The success of some IoT applications depends on the success of other technologies and vice versa. For example, some successful IoT application rollouts will depend on widespread adoption of smart phones and broadband Internet service. At the same time, more use of the Internet of Things will spur more broadband and smart phone adoption. Similarly, some vehicle applications that rely on the Internet of Things would have more value if all infrastructures were IoT-enabled—from traffic lights to toll booths to railroad crossings. Another example concerns near field communication (NFC) technology.[13] NFC technology allows electronic devices to share data with each other when they are in close proximity and can power applications such as from smartphone "wallets." Though NFC technology has existed for some time, consumers have had little reason to demand it in new smartphones because they have had scant opportunities to use it; and in the absence of demand from a large base of customers, stores have had little reason to invest in NFC payment systems.[14] However, countries like Japan and South Korea have successfully induced a wide variety of market players to adopt the technology, from retailers to banks to public transit authorities.[15] As a result, the Asia Pacific region has captured the overwhelming majority of value of the global NFC payment market, which is expected to reach $21.8 billion by 2020.[16]

While the market may eventually be able to establish effective interdependent systems, it would take longer and happen much more

incrementally than it would with government support to resolve chicken-and-egg dilemmas and encourage mutual adoption of these technologies until market forces can take over and drive full deployment.

Risk and Uncertainty

Because the Internet of Things represents an emerging set of technologies, many potential users, including companies and local governments, will disregard the benefits it promises and delay adoption until the technology is proven. Economists refer to this challenge as excess inertia or, more commonly, "the penguin effect"—in a group of hungry penguins, no individual penguin is willing to be the first to enter the water to search for food due to the risk of encountering a predator. Yet if no penguin is willing to test the waters, then the whole group risks starvation.[17]

Governments have much to gain from adopting connected technologies, but when they do so, they are not the only ones that benefit; they help the entire IoT ecosystem. As early and lead adopters, governments can help spur development and growth of the entire ecosystem by helping to reduce risk and by encouraging others to invest in the technology. However, without a national strategy to drive this adoption, government agencies will be less likely to consider the external benefits when weighing whether to integrate the Internet of Things into their operations.

Competitiveness Externalities

The Internet of Things offers a valuable opportunity for countries to gain a competitive advantage in the global marketplace. Those that are home to companies well-positioned to produce billions of new connected devices, develop software to run them, and apply analytics to generate value from the data they generate will have a competitive advantage over other countries. Similarly, given the efficiency and productivity gains the technology can offer the private sector, countries that readily adopt and implement the Internet of Things will gain a competitive edge over those that do not.

While business actions can improve an individual firm's competitiveness, everyone, not just the individual firm, shares in the benefits of a national economy that is more competitive overall.[18] But the drawbacks of an uncompetitive economy work the same way: if a country is not well-positioned to develop or adopt the Internet of Things, its national economy will be less competitive overall and individual businesses can be at a relative disadvantage in the global marketplace. For example, an importer that implements connected technologies to improve the efficiency of its international supply chains and reduce overhead costs will increase the overall competitiveness of domestic companies that can purchase

imported goods at resulting lower prices.[19] Conversely, companies in a country slower to adopt this technology, through no fault of their own, will find themselves at a competitive disadvantage as a result of comparatively sluggish supply chains.

Interoperability

The private sector can and should lead the development and adoption of standards for the Internet of Things. However, standards coordination is important in public-sector applications. In the past, the lack of national coordination has led to incompatible systems and lagging adoption. During the last two decades, for example, some U.S. states have implemented radio-frequency identification systems to allow drivers to easily pay highway and bridge tolls, but they have deployed these systems independently of one another, leading to a patchwork of incompatible systems from state to state.[20] Earlier federal efforts to support interoperability and widespread deployment would have made these toll payment systems more useful to drivers.

While local governments should be encouraged to experiment with the Internet of Things, national governments have an important coordinating role to play in developing large-scale deployments of sensor networks and smart infrastructure that spans multiple jurisdictions. For example, in June 2014, the UK government's Technology Strategy Board provided $12.1 million to convene an industry working group to develop an open standard for the Internet of Things called HyperCat, designed to reduce the need for additional software to facilitate data sharing between new connected devices.[21] In January 2015, the group, with support from the Technology Strategy Board, launched an initiative called HyperCatCity to encourage the adoption of the HyperCat standard by technology firms working with public-sector agencies to support the interoperability of different smart city technologies as they are developed for multiple cities.[22]

Additionally, certain countries may mandate the use of particular standards within their borders in an effort to support domestic business interests. However, nation-specific standards limit the ability of international companies to enter domestic markets and actually reduce domestic firms' ability to compete internationally.[23]

Public Goods

Certain aspects of the Internet of Things require public goods that the private sector cannot or will not adequately provide. National strategies should ensure the public sector provides these necessary public goods, which include:

Human Capital

The value of the Internet of Things, and thus the willingness of the public and private sector to develop and implement the technology, hinges upon the data it generates. But no country will be able to fully capture this value without a workforce equipped with the necessary skills. By 2018, the United States will face a shortage of up to 190,000 workers well-educated in data science and 1.5 million managers and analysts able to use data to make better decisions.[24] Similarly, a survey of 497 businesses in the China, France, Germany, India, the United Kingdom, and the United States revealed that this shortage of skilled data workers is a universal concern, with only one-third of companies reporting they have the human capital necessary to effectively use new data.[25] The public sector will likely feel the impact of this skills shortage more severely than the private sector, because businesses will be able to offer more competitive salaries as data skills become even more in demand, while governments will struggle to attract comparable talent.

While businesses can provide some supplementary training for employees, only government efforts to encourage the cultivation of data science skills in high school and higher education can meaningfully reduce the human capital shortages that stand to limit the benefits of the Internet of Things.

Radio Spectrum

The Internet of Things will consist of billions of connected devices communicating with one another, and this influx of new connected devices will create demands for spectrum frequency space that many national spectrum licensing regimes will likely be unable to support. If too many transmitting devices compete for spectrum, they will be unable to share data with each other or operate effectively.

Many applications in the Internet of Things, such as smart home devices and networked assembly lines, can operate on local Wi-Fi networks and thus not take up much radio frequency space—a practice known as Wi-Fi offloading.[26] However, many applications of the Internet of Things will have unique technical requirements that Wi-Fi is not well-suited to support. For example, a sensor network dispersed through miles of farmland will need to utilize spectrum bands that can transmit data over long distances, but it will likely not need to transmit a high volume of data. As more specialized applications of the Internet of Things emerge and more devices rely on spectrum, governments will likely need to make available greater amounts of licensed and unlicensed spectrum. Some countries have already begun to explore how they can anticipate the spectrum needs of the Internet of Things. For example, in July 2014, the French telecommunication regulator solicited public comments about how it could be forward-looking in its

provision of unlicensed spectrum for connected devices.[27] And in September 2015, the Ministry of Economic Affairs in the Netherlands published a report examining the impact of the Internet of Things on radio spectrum, which recommended that the government closely monitor how new connected devices could contribute to bottlenecks in both licensed and unlicensed spectrum and investigate how it could provide additional spectrum to support critical IoT applications.[28]

Research and Development Funding

Substantial government investment in research and development (R&D) played a critical role in developing many vital technologies, including smartphones, search engines, genomic sequencing, and, of course, the Internet.[29] Thus, the Internet of Things, which offers equal or potentially greater value than these examples, should be a high priority for government R&D spending. Countries with robust technology sectors already leading the development of the Internet of Things may not feel the need to invest in R&D as urgently.[30] However, countries in this position should recognize that public and private R&D investments are complementary, rather than interchangeable, as public-sector R&D can advance research in areas that benefit all market players, such as scientific measurement.[31] In fact, government R&D spurs an increase in private-sector R&D spending, which can help accelerate the growth of the Internet of Things and give countries with already robust private sectors a competitive edge.[32]

INNOVATION-FRIENDLY REGULATION

Excessive or poorly-designed regulations can significantly slow the growth of the Internet of Things. Yet some policymakers have suggested that they want to develop new rules and regulations specifically for the Internet of Things, particularly as it relates to privacy.[33] For example, the U.S. Federal Trade Commission has expressed support for requiring the practice of data minimization for data generated by the Internet of Things—limiting the collection and retention of data so it can only fulfill specific, predefined purposes.[34] Applying such rules to the Internet of Things would be damaging as there may be one primary reason to collect data, but innumerable other ways to use the same data beneficially beyond its initial purpose. And, with so many new opportunities to collect data from billions of new connected devices, the value of the data at stake is proportionately large. Furthermore, mandating data minimization practices can preclude opportunities for de-identification, which can protect sensitive information without unnecessarily sacrificing its value.[35]

Similarly, it would be damaging to apply existing notification and consent rules to devices that gather consumer data on the Internet to the Internet

of Things, because many connected devices will have limited, if any, user interfaces.[36] Outdated notification requirements will prove particularly frustrating given that the vast majority of applications on the Internet of Things pose no real threat to consumer welfare and most data collection would likely be routine and insignificant. Any costs incurred by adhering to these regulations would be passed on to consumers and ultimately serve to make consumers less likely to adopt connected devices.

Companies also face the prospect of multiple regulators creating a confusing and disjointed patchwork of regulations. Whereas a company making a device for a car previously may have worked with a single government agency, a company developing connected devices for cars today could very well be subject overlapping or inconsistent rules from a consumer protection regulator, a transportation safety regulator, and a spectrum regulator, among others. Not only should countries strive to reduce counterproductive regulations, they should also curtail enactment of multiple regulatory frameworks that serve as barriers to new products and services, and instead simplify the regulatory process for innovators.

Some nations also want to restrict how data can flow across borders. India requires gateways and application servers that support the Internet of Things to be located inside the country if they service Indian customers. The rationale is to protect national security, even though such localization requirements have no impact on security whatsoever.[37] Such requirements limit the ability of international device manufacturers and service providers to analyze data collected from the Internet of Things around the world, thereby reducing the technology's potential value.[38]

Creating restrictive rules for an emerging technology at such an early stage in its development without clear evidence of concrete consumer harms can have the unintended consequence of limiting innovation by unnecessarily hampering certain business models or raising costs. Moreover, the privacy fears associated with new technologies are often substantially inflated.[39]

A national strategy for the Internet of Things can forestall such problems by sending a clear message to legislators and regulators that this technology is important and that over-regulation or poorly-designed regulation would limit its growth. Moreover, a national strategy can encourage legislators and regulators to focus on regulations that would expand, rather than limit use of the Internet of Things. For example, regulations designed to free up energy consumption data from smart meters, which are traditionally locked down by utility companies, can empower consumers to reduce their energy use and spur the development of new analytics services.[40] And in the United States, the E-LABEL Act of 2014 allowed manufacturers of certain connected devices to provide regulatory labeling information in an

electronic format through device displays, rather than on physical labels.[41] This simple change reduces overhead costs for device manufacturers and provides consumers with a greater amount of useful information.[42]

EQUITY

The Internet of Things can be a valuable tool to help meet the needs of underserved populations, but without appropriate public policies such as ensuring that smart city technologies serve all cities and neighborhoods rather than just affluent ones, adoption will be uneven. Failure to do so will limit the value of such systems as a whole because of the network effects that widespread deployments generate. For example, smart city technology that police departments use to reduce crime would be substantially less effective if they could only analyze data from certain neighborhoods.

A more pressing concern for governments is that many people and communities live in "data poverty"—the result of a routine lack of inclusion in public and private data collection efforts.[43] As the world increasingly relies on data to improve services such as health care, education, and finance, the potential harm of being underrepresented or excluded in the data that drives this decision-making also increases.[44] The Internet of Things offers a valuable opportunity to close this divide. Low-cost sensor technologies and networked services empower underserved populations to more easily provide data that is useful for improving their quality of life. However, this can only happen if governments invest in and deploy these technologies equitably. If the public sector does not take this into account, the Internet of Things could exacerbate existing inequalities by providing the benefits of data-driven decision-making only to some, and placing already underserved communities at an even greater disadvantage.[45]

NATIONAL EFFORTS TO SUPPORT THE INTERNET OF THINGS

Many nations have already recognized that the Internet of Things should be a high priority for the government, and some have even gone as far as to develop strategies to support the technology. However, none have developed and implemented a sufficiently comprehensive Internet of Things strategy.

CHINA

In March 2010, the Chinese central government committed $117.2 million to boost national competitiveness by opening a national center devoted to Internet of Things R&D.[46] Since then, the government has launched several IoT initiatives. In 2011, China's Ministry of Industry and Information Technology issued a Five-Year Plan for the Development of the Internet of Things, outlining how the government intends to support the technology,

such as by setting standards and demonstrating real-world applications. This plan called for creating an Internet of Things "Special Fund" to support R&D with investments totaling $774 million for the period of 2011 to 2015.[47] In August 2013, China's State Council issued guidance to support smart city pilot programs, with a particular focus on smart utilities and transportation, and the Chinese Development Bank agreed to establish financing programs for smart city pilots.[48] Also in 2013, China established an inter-agency council to guide national policy on the Internet of Things and issued guidance to support the technology, including fostering industry development, workforce training, and R&D targets.[49]

GERMANY

The Internet of Things is a main focus of Germany's "Industry 4.0" plan to modernize its manufacturing sector.[50] Germany has devoted $221 million to support industry, academic, and government research and development efforts to advance "smart factory" technologies ranging from sensor-embedded systems to artificial intelligence platforms that can help operate Internet-connected machinery.[51]

INDIA

India's National Telecom M2M (Machine-to-Machine) Roadmap, published in May 2015, established a policy framework to support digitization efforts and grow the Internet of Things.[52] The roadmap outlines opportunities the Internet of Things can offer for a wide variety of public- and private-sector applications, and details ongoing and planned government efforts to facilitate growth and adoption.[53] These efforts include providing government-backed venture capital funding, creating incubators and test bed facilities to support the growth of the Internet of Things, carrying out smart grid pilot programs, and working with educational institutions to provide the workforce with data skills.[54] The roadmap also outlines the government's ambitious plan to develop 100 smart cities, which it will finance with a $7.4 billion investment over the next five years.[55] India's smart city plan also calls on state and municipal governments to match national funding for smart cities.[56]

However, several of the provisions in India's roadmap designed to grow the Internet of Things would do the exact opposite.[57] For example, the roadmap details plans to require import licenses for certain types of connected devices, which could allow the government to charge foreign device manufacturers high fees to access Indian markets or block them from Indian markets outright. This policy necessarily reduces the ability of Indian consumers and businesses to take advantage of the best and most cost-effective connected devices and services, limiting their willingness to invest in the Internet of Things.

JAPAN

In June 2013, Japan declared it would strive to make the country the "world's most advanced IT nation," and announced a series of measures to harness the Internet of Things to develop solutions in the areas of healthcare, disaster resilience, public safety, and infrastructure planning, as well as encourage sensor technology R&D.[58] And in July 2015, the Japanese government announced plans to establish a council of public- and private-sector organizations to support the development and implementation of specific Internet of Things technologies by the end of 2018, including information processing technologies that can analyze the large amounts of data from connected devices, and systems for safely disabling Internet-connected autonomous devices such as self-driving cars in the event of a safety or security risk.[59]

SINGAPORE

In May 2005, Singapore unveiled its Intelligent Nation 2015 10-year plan to support the growth of the information and communications technology industry. This plan focuses in part on supporting the development and deployment of sensor networks and developing the communication infrastructure necessary to support ubiquitous connectivity.[60] In November 2014, Singapore also launched its Smart Nation initiative to secure economic and social benefits through greater adoption and cohesive use of technology, particularly the Internet of Things.[61] Singapore has allocated $1.6 billion in for the Smart Nation initiative for 2015, and while not all of aspects of the initiative are related to the Internet of Things, the funding will focus prominently on large-scale deployments of smart city applications.[62] And in August 2015, a group of government agencies began work on guidance to define standards for the Internet of Things, such as sensor network standards and domain-specific standards, to support the Smart Nation initiative and private-sector deployment of the technology.[63]

SOUTH KOREA

South Korea has $5 billion in planned investments in the Internet of Things through 2020 to support industries ranging from wearables to smart cars.[64] In October 2014, the South Korean Ministry of Science, Information Communications Technology, and Future Planning released a roadmap for the Internet of Things to guide government actions to develop cybersecurity standards and best practices.[65] South Korea has also built the Songdo International Business District, the world's first purpose-built smart city, with the help of government funding.[66]

UNITED STATES

The White House in September 2015 launched its Smart Cities Initiative, which encapsulates the majority of the U.S. government's efforts to support the Internet of Things and outlines $160 million in new and ongoing R&D funding that covers more applications than just smart cities.[67] The Smart Cities Initiative includes support for a range of programs including the National Institute of Standards and Technology's Global City Teams Challenge, which encourages the development of smart city applications, Internet-connected vehicle pilots, and the establishment of Internet of Things research test beds.[68] The federal government's Networking and Information Technology Research and Development Program also released its Smart Cities and Connected Communities Framework—a short guide to coordinate federal agency investment and collaboration for smart city technology.[69] In October 2015, the White House released its Strategy for American Innovation, which highlights the value of the Internet of Things for applications ranging from environmental monitoring to supply chain management.[70] And in December 2015, the Department of Transportation launched the Smart City Challenge, which will award $40 million in March 2016 to a mid-sized city to implement connected technologies to reduce congestion, improve transportation safety, protect the environment, and support economic growth.[71]

Country	Funding
China	$774 million over five years
India	$7.4 billion for smart cities
Germany	$221 million for smart factories
South Korea	$5 billion over five years
United States	$200 million

Table 1: Ongoing and recently launched government funding for the Internet of Things for select countries.

POLICIES FOR NATIONAL STRATEGIES

Every nation is different, so there is no "one-size-fits-all" approach to developing a national strategy. Yet, while specific policy considerations will vary from country to country, all national strategies will have to include a broad array of policies that focus in particular on funding, convening and planning, agency action, regulatory action, and trade. These include:

Funding

- Funding local government efforts to implement connected technologies and services;
- Funding large-scale national pilot projects for smart cities that focus on integrating multiple smart city applications with scalable and replicable solutions;[72]
- Establishing national challenges with prizes to spur the development of IoT applications with high social or economic impact;
- Subsidizing key connected devices for low-income populations;[73]
- Funding R&D for key underlying technological challenges relevant to the Internet of Things, such as improving cyber security and reducing power consumption; and
- Establishing government-backed venture capital funding for promising connected technologies that could benefit public sector operations.

Convening and Planning

- Encouraging robust public-private partnerships for ambitious civic technology projects;
- Facilitating local government smart city deployments, such as by providing best practices and financing guides and freely accessible software tools;
- Coordinating public sector deployments of sensor networks, particularly for applications spanning multiple jurisdictions; and
- Encouraging the development of industry-led voluntary standards and best practices around issues like privacy and security.

Agency Action

- Requiring relevant government agencies to develop and follow Internet of Things action plans focused on improving agency mission delivery with connected technologies;
- Revising procurement and grant policies to encourage deployment of connected devices;
- Making “smart” the default for government operations, such as by requiring the use of connected technologies for customs inspections, integrating smart technologies into government-subsidized housing and agency buildings; and embedding sensor networks into infrastructure as part of modernization efforts;[74] and
- Supporting data science skills in high school and higher education.

Regulatory Action

- Allocating additional licensed and unlicensed spectrum for connected devices;
- Ensuring that any consumer protection rules are narrow and targeted;[75]
- Minimizing the regulatory cost of data collection;[76]
- Fast-tracking regulatory review and approval for smart devices in regulated industries, such as connected medical devices;[77]
- Enacting regulations to increase the potential for data-driven innovation from connected devices, such as by giving public utility consumers access to their smart meter data; and
- Revising accessibility requirements for people with disabilities based on the opportunities created by connected technologies, such as dynamically adjusting the amount of accessible parking spaces based on sensor data indicating demand.

Trade Policy

- Ensuring that companies can freely exchange data across local and national borders;
- Promoting access to the best and most cost effective connected devices and services, such as by eliminating policies that restrict the ability of international device manufacturers to enter domestic markets; and
- Supporting voluntary, industry-led standards and fighting against nation-specific standards.

CONCLUSION

A national strategy for the Internet of Things, if designed and implemented correctly, would maximize the opportunity for the Internet of Things to deliver substantial social and economic benefits. No country will successfully capture these benefits by leaving development of the Internet of Things solely up to the market, just as no government actions could capture all of the potential benefits without a robust private sector that can innovate unencumbered by overly restrictive regulations. As countries increasingly recognize the potential of the Internet of Things, they should develop comprehensive national strategies that proactively promote development and adoption of the technology while limiting regulatory barriers that restrict its growth.

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The Center for Data Innovation is the leading global think tank studying the intersection of data, technology, and public policy. With staff in Washington, DC and Brussels, the Center formulates and promotes pragmatic public policies designed to maximize the benefits of data-driven innovation in the public and private sectors. It educates policymakers and the public about the opportunities and challenges associated with data, as well as technology trends such as predictive analytics, open data, cloud computing, and the Internet of Things. The Center is a non-profit, non-partisan research institute proudly affiliated with the Information Technology and Innovation Foundation.

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