Industry 4.0 in government

Digital supply networks transform the federal landscape

Deloitte Consulting LLP's Supply Chain and Manufacturing Operations practice helps companies understand and address opportunities to apply advanced manufacturing technologies to impact their businesses' performance, innovation, and growth. Our insights into additive manufacturing allow us to help organizations reassess their people, process, technology, and innovation strategies in light of this emerging set of technologies.

CONTENTS

Dynamically supplying tomorrow's front lines

Charged with managing some of the largest, most complex supply chains in the world, the federal government performs a wide variety of coordination functions, each with different business objectives. This makes the federal government well suited to adopting and implementing digital supply networks, each tailored to meet the diverse objectives of the numerous agencies the federal government operates. Across the four federal archetypes that we identify here—buyer, seller, server, and regulator—the digital supply network is poised to provide a strong value proposition equaling that of commercial businesses.

THE team leader looks at the lower half of his mechanic, whose torso and arms are obscured by the vehicle on which he's working in the makeshift garage. "We need it done by tonight," the team lead grunts. The mechanic slides out from beneath the vehicle and looks at his sergeant: "No promises, but I'll see what I can do."

Getting back up on his feet, the mechanic scans a quick response (QR) code on the side of the vehicle, and a solution begins to unfold. As the schematics for the jeep populate his wrist-mounted display, he logs the issue—"broken front strut brace: needs re-

placement"—setting into motion a digital chain of events that will get the vehicle combat ready.

The mechanic's digital assistant overhears both his conversation with the sergeant and the diagnosis of the problem, which it parses using natural language processing. Coupled with the QR scan and other background information, the system now has all the information it needs to find an optimal solution: the geographic location, capabilities at that base and nearby, the specific vehicle (type and individual serial number) in need of repair, the replacement part required, and the deadline.

The assistant gathers more data from connected sources, querying current inventories and capabilities. The vehicle's manufacturer has dozens of strut braces in stock, thousands of miles away in Ohio—not much help for an immediate need. The assistant locates several more braces sitting on a shelf at the nearest supply depot, a hundred miles away over a mountain range through contested territory—close, but not close enough. More interestingly, it learns that a unit arrived on base last week with a metal additive manufacturing (AM) unit for combat testing. Bingo.

Armed with the power of a digital supply network, the digital assistant proposes a solution: (1) Over the next three hours, 3D-print a temporary replacement part using the recently arrived metal AM machine; (2) Call for a permanent replacement from the depot, which will arrive via quadrotor cargo drone tomorrow; (3) Initiate an order to restock the parts at the depot with fresh inventory from Ohio; those will arrive at the supply depot next week.

The mechanic listens intently and scrolls through the solution before tapping the confirmation into his wearable device, setting in motion the complete chain of events. The 3D-printed replacement should be ready to install in a few hours—enough time for him to get some rest.

Bringing smart technologies to the supply chain: Expanding the notion of connected production

THE example above illustrates the potential power of the connected, responsive digital supply network (DSN). In fact, this same scenario might play out in a number of other different settings in which federal agencies operate, for example, disaster response or management of imports and exports. Deloitte has explored the concept of Industry 4.0 and its impacts on smart manufacturing and the physical world within the context of the commercial sector. Even as we examine and prepare for the rise of connected, responsive production, however, it is crucial to acknowledge that the smart factory is not the entire story. Industry 4.0 does not begin and end with production of a physical object; to focus only on production is to ignore the other parts of the manufacturing value chain. In other words, to tell the complete story of smart manufacturing, we must broaden the focus to consider the supply chain that both feeds and delivers products from factories. Furthermore, these technological evolutions have implications beyond the commercial sector, in the federal space as well.

The technological forces driving the rise of the smart factory impact the supply chain as well, potentially extending beyond the example described above. Deloitte's perspective around the concept of the DSN examines the ways in which digital technologies can collapse traditional supply chain and manufacturing methods, summarized in the following section.

Look closer at the digital supply network and the technologies that drive it:

The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains

Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises

Digital supply networks: A brief primer

Supply chains are traditionally linear in nature, with a discrete progression of develop, plan, source, make, and deliver. Today, however, many supply chains can use advanced digital technologies to transform from a repetitive sequence to a dynamic, interconnected system that can more readily incorporate ecosystem partners and evolve to an optimized state over time. As illustrated in the story above, this shift from linear, sequential supply chain operations to an interconnected, open system of supply networks could lay the foundation for how organizations and agencies—both public and private—achieve operational success in the future.

The DSN is best visualized as rearranging the traditional linear supply chain into an integrated system, characterized by multidirectional, always-on communication between the nodes of the network (figure 1).

This interconnected, open system forms the backbone of the DSN. DSNs integrate information from many different sources and locations to optimize the physical act of production and distribution.[1] By leveraging both the traditional and the new, such as sensor-based data sets, DSNs enable comprehensive, integrated views and management of the supply network as well as the ability to adapt to changing situations. Both of these abilities are crucial to enabling a truly agile ecosystem.

Figure 1. **From the supply chain to the digital supply network**
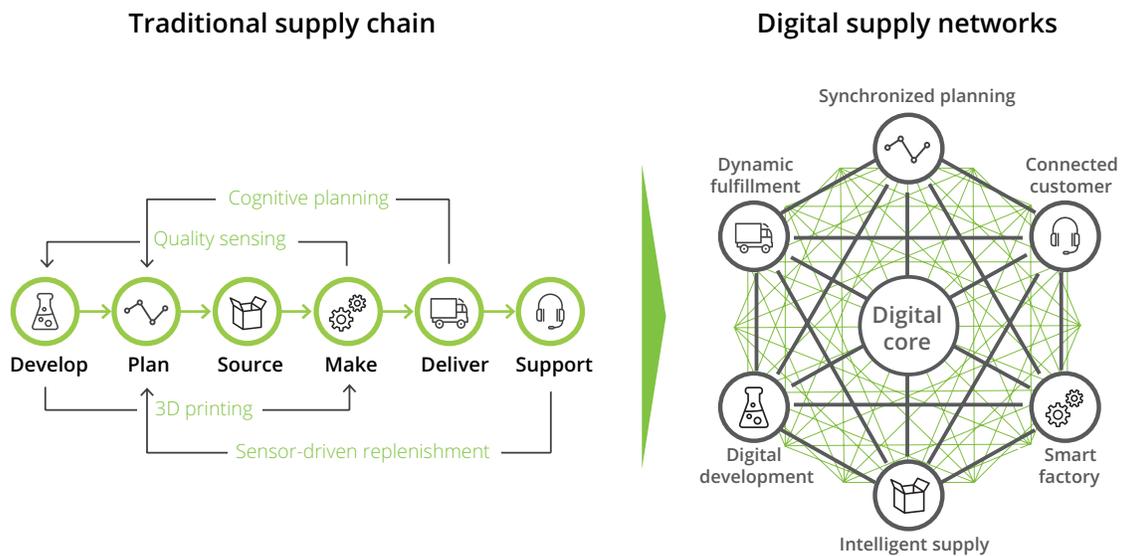
Source: Adam Mussomeli, Doug Gish, and Stephen Laaper, *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016, https://dupress.deloitte.com/dup-us-en/focus/industry-4-0/digital-transformation-in-supply-chain.html.
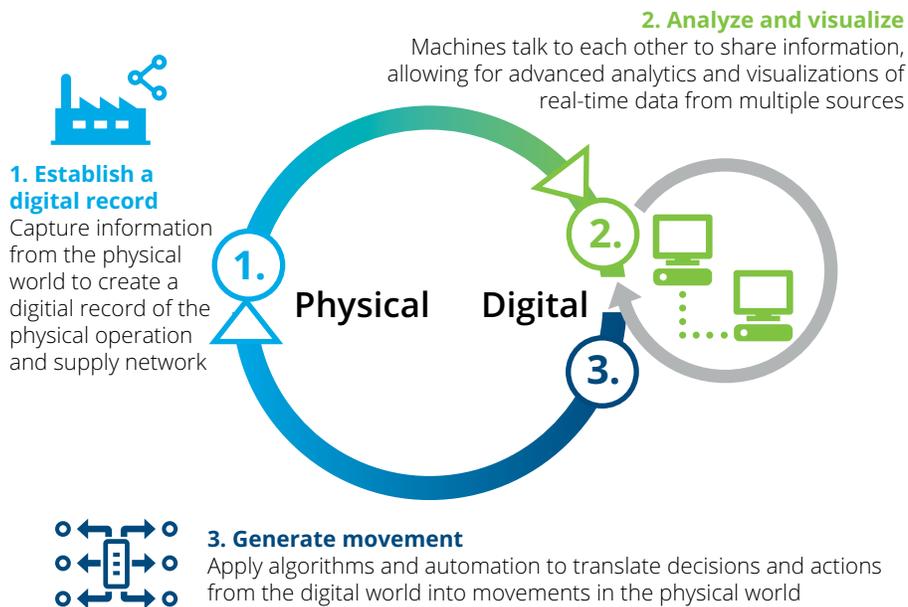
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The digital supply network and the physical-digital-physical loop

For organizations accustomed to traditional linear data and communications, the shift to real-time access to data and intelligence fundamentally transforms the way they achieve objectives and conduct missions. Once organizations make the decision to adopt a DSN, they should consider how to develop, connect, and use the various Industry 4.0–driven technologies that power it to drive decision making. Before developing a DSN, it can be useful to consider the process of information creation, analysis, and action as a loop. The integration of digital information from many different sources and locations drives the physical act of manufacturing and distribution, in an ongoing cycle.

Real-time access to data and intelligence is fundamentally driven by the continuous and cyclical flow of information and actions between the physical and digital worlds. This flow occurs through an iterative series of three steps, collectively known as the physical-to-digital-to-physical loop. First, information is captured from the physical world and digitized *(physical to digital)*. Second, the *digital-to-digital* portion of the loop focuses on sharing data to generate meaningful insights. Finally, the loop is closed with a *digital-to-physical* transformation of those insights into real-world actions. This process is described visually in figure 2.

Figure 2. The physical-to-digital-to-physical loop of Industry 4.0

2. Analyze and visualize
Machines talk to each other to share information, allowing for advanced analytics and visualizations of real-time data from multiple sources

1. Establish a digital record
Capture information from the physical world to create a digitial record of the physical operation and supply network

Physical **Digital**

3. Generate movement
Apply algorithms and automation to translate decisions and actions from the digital world into movements in the physical world

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Taken together, this process enables a more proactive and predictive way of operating, rather than the traditional reactive approach to examining historical data to plan the best path forward. This allows organizations to harness data and take action, rather than simply be informed by it.
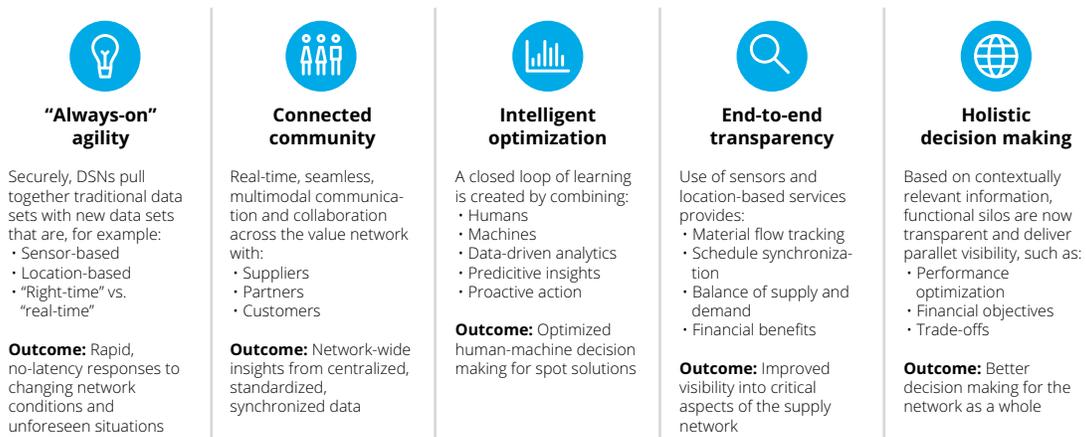
Why now? Historically, supply chain planners have attempted to periodically reoptimize fixed parameters to achieve the most efficient result. The convergence of several technology drivers changes this calculus and enables the dynamic optimization and constant reconfiguration of supply chains. Some of the specific technological factors that enable the DSN are the continuing commoditization of computing power, storage, and bandwidth; the Internet of things; advanced analytics; cognitive computing; robotics; additive manufacturing; and autonomous systems.

The benefits of this interconnected, open system can be leveraged by both federal and commercial organizations, which share some crucial similarities. One of the DSN's greatest strengths is that it can address highly customized needs—whether of the consumer, supplier, or organization—in ways that traditional, linear mass production cannot. This customization capability has clear benefits for the mission-focused environments in which both federal and commercial organizations operate, as individual DSNs can address very specific, discrete goals. Additionally, the real-time feedback, analytics, and predictive decision making that are the hallmarks of a DSN are critical in both the federal and commercial arenas, where conditions change quickly. Furthermore, both public and private DSNs require the development of a fuller technology architecture to drive connectivity, the building blocks of which are already in place through connected systems.

So what makes a DSN more effective and responsive than a traditional linear chain, and why would an organization want to make the shift? A DSN is distinguished by five key characteristics: "always-on" agility, connected community, intelligent optimization, end-to-end transparency, and holistic decision making (figure 3).

Figure 3. The characteristics of a digital supply network

"Always-on" agility	Connected community	Intelligent optimization	End-to-end transparency	Holistic decision making
Securely, DSNs pull together traditional data sets with new data sets that are, for example: • Sensor-based • Location-based • "Right-time" vs. "real-time"	Real-time, seamless, multimodal communication and collaboration across the value network with: • Suppliers • Partners • Customers	A closed loop of learning is created by combining: • Humans • Machines • Data-driven analytics • Predictive insights • Proactive action	Use of sensors and location-based services provides: • Material flow tracking • Schedule synchronization • Balance of supply and demand • Financial benefits	Based on contextually relevant information, functional silos are now transparent and deliver parallel visibility, such as: • Performance optimization • Financial objectives • Trade-offs
Outcome: Rapid, no-latency responses to changing network conditions and unforeseen situations	**Outcome:** Network-wide insights from centralized, standardized, synchronized data	**Outcome:** Optimized human-machine decision making for spot solutions	**Outcome:** Improved visibility into critical aspects of the supply network	**Outcome:** Better decision making for the network as a whole

Implications

Government entities can achieve new levels of performance, improve operational efficiency and effectiveness, **creating a new level of mission readiness.**

As agencies leverage their full supply networks, the **traditional barriers of time and space shrink**

Source: Adam Mussomeli, Doug Gish, and Stephen Laaper, *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016, https://dupress.deloitte.com/dup-us-en/focus/industry-4-0/digital-transformation-in-supply-chain.html.

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Government agencies are charged with managing some of the largest, most complex supply chains in the world. Indeed, the federal government serves a wide variety of functions, each with different business objectives.

While Deloitte has previously explored the applications of the DSN among commercial businesses, its impacts on federal organizations are no less profound, though the drivers differ slightly. Indeed, despite their similarities in terms of DSN benefits, federal and commercial goals are not always the same. For commercial industry, the value proposition of the DSN typically manifests in increased profitability. For federal agencies, however, the DSN poses a different, but no less significant, value proposition.

Put simply, government agencies are charged with managing some of the largest, most complex supply chains in the world. Indeed, the federal government serves a wide variety of functions, each with different business objectives: Cash flow may take a backseat to speed in one agency, depending on its needs, while service and quality supersede cost in another. This makes the federal government particularly well suited to adopting DSNs, as multiple DSNs can be used simultaneously, each tailored to meet a different set of objectives, some of which may even be on opposite ends of a spectrum.

In this way, DSNs have the potential to improve many aspects of government. The challenge, then, becomes identifying the specific agency's objective (in other words, where it wants to play) to best determine which aspects of the DSN are most crucial to focus on (in other words, how it can determine success). To do so, federal agencies should work independently and collaboratively to examine what purpose a DSN can serve.

Doing so requires an understanding of the breadth of roles a federal agency can play. In the next section, we introduce a framework that identifies and explores various archetypes the government can embody as well as how the DSN characteristics described in figure 2 relate to each archetype.

A framework for considering the federal DSN

WE have identified four broad archetypes of government activity to facilitate the discussion of government supply chains and DSNs: buying, selling, serving, and regulating. These archetypes serve as a useful starting point for thinking about the roles DSNs can play within an agency. It is important to note, however, that agencies will likely find that their missions align with more than one category. As with their commercial counterparts, government agencies will likely operate multiple DSNs, touching these multiple archetypes and serving multiple objectives, at times even seemingly at odds with each other.[2] It is likely, however, that one dominant archetype may emerge, enabling agencies to prioritize the development of their DSNs.

As such, it is important to understand which roles the agency fills and, by extension, how to construct a DSN to best address the objectives of each. This archetype framework is described in figure 4.

Exploring the DSN in the federal context: A deeper dive

Depending on its mission, each government agency can exploit DSNs in a different way. Below, we explore some specific examples of government agencies that fit each archetype, and examine the ways in which a DSN could impact and streamline their processes.
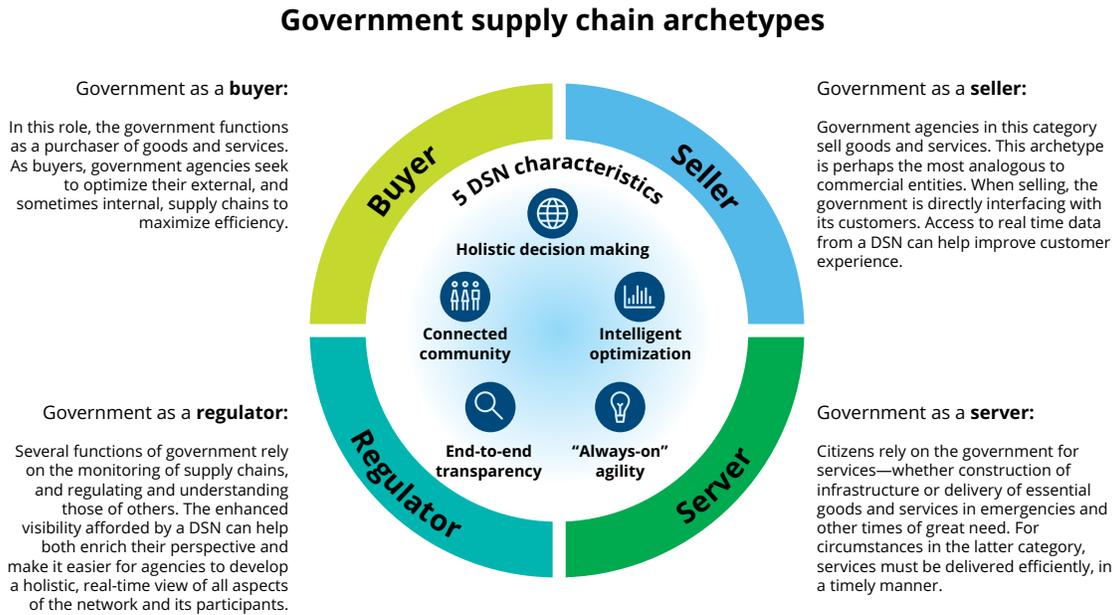
Furthermore, we conclude each section with a table of archetype-specific strategic transformations and impact statements that leaders can consider as they think about future-state operating models for their organizations. The full list of strategic transformations can be found in figure 5 of *The rise of the digital supply network*.[3]

GOVERNMENT AS A BUYER

The US federal government is the single-largest purchaser of goods and services in the world.[4] Managing a system of this magnitude requires that it fuse its own internal supply chains with those of the marketplace, while still maintaining the additional compliance and transparency rules demanded by the public sector.[5] This can, in turn, result in systems that are a hybrid of the government's own traditional processes and rapidly evolving commercial DSNs—making it all the more crucial that agencies within the buyer archetype consider developing some approach for interacting with DSNs, even if they do not adopt them entirely. Their objectives can be diverse and run across a broad spectrum.

Consider the Department of Defense (DoD), which buys warfighting equipment and supplies from

Figure 4. Four main federal agency archetypes

Government supply chain archetypes

Government as a **buyer:**

In this role, the government functions as a purchaser of goods and services. As buyers, government agencies seek to optimize their external, and sometimes internal, supply chains to maximize efficiency.

Government as a **seller:**

Government agencies in this category sell goods and services. This archetype is perhaps the most analogous to commercial entities. When selling, the government is directly interfacing with its customers. Access to real time data from a DSN can help improve customer experience.

Buyer **Seller**

5 DSN characteristics

Holistic decision making

Connected community

Intelligent optimization

Government as a **regulator:**

Several functions of government rely on the monitoring of supply chains, and regulating and understanding those of others. The enhanced visibility afforded by a DSN can help both enrich their perspective and make it easier for agencies to develop a holistic, real-time view of all aspects of the network and its participants.

Regulator **Server**

End-to-end transparency

"Always-on" agility

Government as a **server:**

Citizens rely on the government for services—whether construction of infrastructure or delivery of essential goods and services in emergencies and other times of great need. For circumstances in the latter category, services must be delivered efficiently, in a timely manner.

Source: Deloitte analysis, 2017.

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commercial organizations and then often moves those products through its own highly specialized supply chain, supplemented by its own organic manufacturing capability. All told, the DoD manages and moves 4.9 million inventory items worth an estimated $91.7 billion annually.[6] As with commercial organizations, the DoD's supply chains and emerging DSNs should get the right part to the right place at the right time, but the organization has the added challenges of changing locations, obstacles, and, at times, hostile environments. According to the Government Accountability Office's *2017 High Risk Report*, asset visibility, distribution of materials, and inventory management remain challenges, as it can be difficult to accurately predict demand, meet delivery deadlines, and track movement of cargo.[7]

The DoD is supported in its mission of deterring war and protecting the security of the United States by numerous commercial organizations.[8] It's im-

portant that DSNs on both the industry and the government sides operate seamlessly with one another, enabling on-demand parts, reduced inventory, operational agility, and maximal readiness. This need to support both public and private organizations makes the DSN uniquely complex. DSN characteristics such as always-on agility and holistic decision making, among others, respond to this need for dynamic and unpredictable supply requirements at a huge scale across a complex system. Notably, each of these DSN capabilities can address some of the challenges the DoD faces.

As discussed in the opening vignette, government buyers of the future, empowered by the visibility afforded by their DSNs, may source parts dynamically—combining traditional manufacturing, repurposing and redirecting existing inventory, and deploying emerging technologies such as AM. In this way, the DoD can leverage DSNs across a wide swath of transformations (table 1).

It's important that DSNs on both the industry and the government sides operate seamlessly with one another, enabling on-demand parts, reduced inventory, operational agility, and maximal readiness.

Table 1. Strategic buyer transformations via the DSN

DSN transformation	Digital enablers	Example of buyer impact
Planning and inventory efficiency	• Analytics-driven demand sensing • Dynamic inventory fulfillment • POS-driven auto-replenishment • Real-time inventory optimization • Sensor-driven forecasting	DSN predicts and optimizes inventory levels, lightening inventory requirements while maximizing readiness
Risk prevention and mitigation	• Proactive quality sensing • Track-and-trace solutions • Proactive risk sensing	Supply chain is illuminated with data; risks are mitigated in advance
Supplier collaboration	• Analytics-driven sourcing • Asset sharing • Blockchain-enabled transparency • Cloud/control tower optimization • Supplier ecosystem	Direct data sharing between suppliers and customers streamlines the procurement process and allows for new business models
Logistics optimization	• Augmented reality–enhanced logistics • Automated logistics • Direct-to-user delivery • Driverless trucks • Dynamic/predictive routing	Supports inventory optimization by ensuring the right part in the right place at the right time
"Aftermarket" services	• Augmented reality–enabled support • End-to-end transparency • Make-to-use with 3D printing • Predictive aftermarket maintenance	Advanced sensing and display technology collapse geographic barriers, provide complete supply chain visibility, and help experts track and interact with assets thousands of miles away

GOVERNMENT AS A SELLER

In some ways, and at a significant scale, the government acts as a seller of goods and services. Some government agencies even operate in direct competition with commercial organizations.[9] Thus, for the seller archetype, delivering goods and services to its customers involves a strategy and supply network that are very similar to those of commercial organizations.[10] In this way, the government can use many of the same approaches to optimize its supply chains as private sector organizations do.

Consider Amtrak, our national passenger rail service. It is important to note that although Amtrak is ultimately accountable to the federal government, it is structured and behaves much more like a private company than many federal agencies. Amtrak operates a reconfigurable set of mobile assets—engines and passenger cars—to move customers between fixed stations via tracks to which it leases access. Customers depend on rail travel to get from place to place for either business or pleasure. In 2016 alone, Amtrak conducted more than 31.3 million passenger journeys, a record high.[11]

Exploring the seller DSN through the lens of Amtrak illuminates a dual opportunity for transforming the customer experience and improving business processes. From the customer experience perspective, DSN can provide end-to-end transparency before, during, and after customers' travel. With a DSN in place, customers can see real-time train status alerts, gather information about their surroundings based on geographical location, and connect to related third-party vendors, such as ride sharing and parking applications.[12]

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On the operations side, a DSN can help track and optimize customer movements through a station using location data, integrate sales and traveler data to manage real-time pricing for distressed inventory, and target customers with specialized marketing based on travel patterns and history.[13] A seller-based DSN could drive transformations in multiple areas (table 2).

Leveraging the power of the DSN, rail travel of the future could be powered not only by locomotive but also by data. While the anachronistic sound of letters flipping on the arrivals board evokes a certain nostalgia, it can just as easily be a source of anxiety due to train delays and cancellations. End-to-end transparency could connect waiting customers with their rail cars in real time. Geolocation sensors could streamline and digitize bag tracking. Taking a page from commercial shipping and logistics companies that have leveraged data from a wide variety of internal and external sources to inform their pricing and shipping activities, tying digitized sales data and operations planning more tightly together could result in right-sized trains and better-optimized inventory based on the number of tickets actually sold.[14] Such intelligent optimization could yield efficiencies in fuel economy, maintenance, and manpower.

GOVERNMENT AS A SERVER

Government as a server refers to the services that the government provides to the public without any remuneration, such as public safety and disaster relief. The role of emergency management agencies such as the Federal Emergency Management Agency (FEMA) provides a particularly illustrative use

Table 2. Strategic seller transformations via the DSN

DSN transformation	Digital enablers	Example of buyer impact
Planning and inventory efficiency	• Analytics-driven demand sensing • Dynamic inventory fulfillment • POS-driven auto-replenishment • Real-time inventory optimization • Sensor-driven forecasting	Data-driven demand planning enables pre-positioning of physical assets for optimal utilization
Operations efficiency	• Augmented reality–enhanced operations • Automated production • Predictive maintenance • Sensor-enabled labor monitoring	Data visibility across the entire enterprise enables good decision making and positive interactions with customers
Sales optimization	• Inventory-driven dynamic pricing • Sensor-driven replenishment pushes • Targeted marketing	Advanced pricing strategies are possible using actual data rather than estimates

case, highlighting the resilience of a properly configured DSN. In the event of a disaster, FEMA operates a supply chain in an environment characterized by constant change, degraded communication, rapidly changing needs, and imperfect information. With lives in the balance, a DSN can provide greater situational awareness and agility for planners seeking to optimize allocation of limited resources in times of crisis.

Ecosystem-wide DSNs, spanning both commercial and government networks, could dramatically improve disaster preparedness and response. In the case of a large-scale natural disaster such as 2012's Hurricane Sandy, first responders often make do with incomplete, at times conflicting information.[15] Coordination among the various federal, state, lo-

cal, tribal, and commercial stakeholders can be difficult and time consuming, or information may come too late to be useful.[16] Aid workers may not know conditions on the ground or the full scale of need until they arrive on site, and needs can vary widely from location to location.[17] Furthermore, lack of communication between private and public sector stakeholders can also lead to critical supplies, such as dialysis machines and power generators, being turned away.

Individual agencies are improving their planning and response capabilities, but a lack of integrated coordination exists across the public health emergency ecosystem.[18] Coordination through DSNs is particularly important considering that FEMA's Initial Response Resources inventory alone exceeds

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Table 3. Strategic server transformations via the DSN

DSN transformation	Digital enablers	Example of buyer impact
Planning and inventory efficiency	• Analytics-driven demand sensing • Dynamic inventory fulfillment • POS-driven auto-replenishment • Real-time inventory optimization • Sensor-driven forecasting	Analyze data from a variety of sources to compute the optimal distribution of limited resources
Logistics optimization	• Augmented reality–enhanced logistics • Automated logistics • Direct-to-user delivery • Driverless trucks • Dynamic/predictive routing	Support inventory optimization to autonomously route and redirect goods/services to points of greatest need
Supplier collaboration	• Analytics-driven sourcing • Asset sharing • Blockchain-enabled transparency • Cloud/control tower optimization • Supplier ecosystem	Engage the supplier network and pass data directly between systems to ensure optimal distribution of goods/services

13 million parts.[19] By connecting different systems through DSNs, it becomes possible to create an emergency health community that is able to track the movement and consumption of products and services (such as vaccines) in order react quickly to overages, shortages, or disruptions, leading to more effective delivery. The next link in this system is moving from digitized observation to physical action, completing the digital-back-to-physical loop. A complete DSN could ramp up just-in-time production, direct movement of supplies to the right geographies, and provide real-time guidance to the public regarding how to stay safe during an event. When data clear the fog after the storm, server DSNs can enable transformations across multiple areas (table 3).

GOVERNMENT AS A REGULATOR

The role of regulator is another important governmental function to consider. Of particular note, the government shoulders the imperative to regulate commerce across our borders. The US Customs and Border Patrol (CBP), for example, is tasked with

Each year, nearly 25 million containers enter the United States by boat, truck, or rail. In order to do their job properly, officers need access to real-time threat information to help them identify risks without hindering legitimate trade.

(among other things) regulating, facilitating, and enforcing the legal flow of goods across borders and through ports of entry. Each year, nearly 25 million containers enter the United States by boat, truck, or rail.[20] In order to do their job properly, officers need access to real-time threat information to help them identify risks without hindering legitimate trade. Objectives for regulators focus predominantly on information.

The CBP has taken the first steps in developing a DSN through its single-window system called Automated Commercial Environment.[21] Imagine enhancing this system with a connected community of shipping manifests, cargo contents, payment data for duties/tariffs, and sensors to geo-locate and detect any tampering of container seals. In tying these multiple DSNs together, such a system would po-

tentially allow the CBP to make data-driven, holistic decisions in tasking officers to investigate specific containers that represented greater risk of smuggling, contraband, or tariff dodging.

Furthermore, subsequent analysis of data could identify patterns that suggest potential nefarious behavior. Sensor data could reveal the fact that a ship stopped and sat idle for 30 minutes a few miles offshore, while analytics could reveal whether a particular handler experienced an unusual amount of "broken" cargo seals. Each of the five DSN characteristics contributes to improved information and analysis, leading regulator agencies to place higher confidence in their activities, whether in the financial, medical, environmental, or other spheres (table 4).

Table 4. Strategic regulator transformations via the DSN

DSN transformation	Digital enablers	Example of buyer impact
Risk prevention and mitigation	• Proactive quality sensing • Track-and-trace solutions • Proactive risk sensing	Provide complete visibility and accountability of the supply network; offer opportunity to identify and respond to nefarious activity
Operations efficiency	• Augmented reality–enhanced operations • Automated production • Predictive maintenance • Sensor-enabled labor monitoring	Enable the end effector (agent, officer, etc.) to make better decisions with complete data in real time
Logistics optimization	• Augmented reality–enhanced logistics • Automated logistics • Direct-to-user delivery • Driverless trucks • Dynamic/predictive routing	Provide visibility into how, why, and where materials are being directed

The path forward: Setting priorities for a DSN

P ERHAPS one of the greatest challenges of developing a DSN is the need to approach the process in a wholly different way than building a traditional supply chain. In designing and implementing a DSN, government agencies can begin by examining their mission and objectives. Given the diverse roles federal agencies play, their missions may touch more than one archetype, requiring a mix of capabilities to construct the most effective ecosystem required to accomplish their missions. This can make it difficult to hone in on where to play, and thus how to determine success. This is also where the power and agility of the DSN become particularly salient, as agencies can construct more than one DSN to address each of their goals.

To do so successfully, however, they should be willing to embrace and prioritize the changes that go along with fully interconnected supply networks. With these changes comes opportunity in the form of more strategic decision-making capabilities, fewer trade-offs, and increased customization to individual mission needs.[22] To start building a functional DSN, federal agencies can take several steps:

Think big

Don't be afraid to innovate. A DSN opens up new opportunities: using real-time data visualiza-

tion in decision meetings, for example, or analyzing patterns to predict where the next need may pop up. Taking advantage of these new capabilities will likely require federal agencies to shift their mindset toward rapid adoption, agile testing, and a flatter, more collaborative environment.[23]

Look to commercial successes. As commercial companies successfully implement DSNs, federal agencies can note their successes and challenges to guide their own DSN development. Finding a company whose mission dovetails with one's own archetype can help agencies learn from their commercial counterparts; for example, a buyer such as the DoD can look to similar organizations in the automotive or aerospace sectors.

Set new standards. Given its interconnected nature, a DSN will likely require sharing data across multiple players, platforms, and privacy regulations. Agencies may therefore find it necessary to develop new governance and decision rules around the changes DSNs will bring to operations. This presents a real opportunity for innovative approaches to decision-making processes.

Consider the impact on talent. The interconnected nature of the DSN often requires adjusting the way talent is organized, trained, and evaluated. It ordinarily demands new skills and new processes,

and the demands will likely vary across archetypes. Recruiting and retaining new talent who understand how to operate in DSNs will be a crucial step to successful implementation.

Start small

Focus on one archetype to start with, and pilot DSN trials around one or two transformations. Given the complexity of federal agencies, a mix of the DSN archetypes, and thus DSNs, is required to be successful. At the same time, each agency may possess a dominant DSN archetype. Identifying that dominant archetype can help an agency prioritize the development of its DSNs. Furthermore, focusing on just one or two transformations to start with—several tactics for driving operations efficiency in the case of a seller archetype, for example—can help the agency start with a manageable load it can test and refine. Agencies can remain cognizant of the other, less dominant archetypes they embody as they become ready to scale their efforts.

Take inventory of your stakeholders—and where and when you interact with them. Identify the stakeholders with whom the agency interacts and under what kinds of conditions, keeping in mind that the agency's mission may require it to interact with multiple stakeholders. The types of interactions required for working with individual citizens, contractors, and foreign governments (among others) are very different and require distinct organizational tactics, as well as diverse approaches to maintaining data privacy and securing information. They may require different modes of communication and may need to take place via discrete platforms. Indeed, each may even need its own DSN.

Understanding each stakeholder, and how and when it comes into play, can help the agency prioritize where to focus first.

Act fast

Recognize the need for an approach to interacting with DSNs, even if your agency does not plan to adopt them. Many government agencies, particularly buyers, interact with commercial entities as part of their mission. Thus understanding DSNs and developing an approach to either interact or interoperate with them will likely be crucial to successfully working with private sector suppliers or partners.

Use small successes as proof points. Successes in one transformation for one archetype can lead to greater willingness to invest in further development. By showcasing success stories, agencies can demonstrate the value of the DSN, and move quickly to scale it to other transformations and archetypes.

> Given the diverse roles federal agencies play, their missions may touch more than one archetype, requiring a mix of capabilities to construct the most effective ecosystem required to accomplish their missions.

Conclusion

The mechanic checks back with the tech expert who was printing the replacement strut brace. Right on schedule, he sees the tech expert remove the part from the build chamber and brush away the excess metal powder. The brace itself is pretty simple, just a bracket with a few strategically placed holes, but it will put his team back in the fight that very night. Thanks to the power of the DSN, the tip of the spear is ready.

Digital supply networks represent the evolution of linear supply chains, a result of the changing technology landscape and increasing connectivity between the digital and the physical worlds. Now real-time information and insights can be shared across the entire supply network to drive actionable decisions. Beyond the private sector, the rise of DSNs presents a unique opportunity for federal agencies to address the breadth of needs across their various functions: buyer, seller, regulator, and server. Indeed, the power of a DSN rests in its ability to adapt to meet multiple diverse objectives, and to

run alongside other DSNs to better serve the needs of the organization. By understanding the role they play, the stakeholders they serve, the transactions they often facilitate, the variability of demands they may address, and the archetypes that are most relevant to them, federal agencies can build the DSN that best serves their needs.

As federal agencies seek to improve their capabilities and empower more informed decision making, they can look to the DSN as a tool to not only support their mission but also to drive it forward.

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