



Commercial software versus open-source: Breaking down what you need to know

Adobe Government



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Executive summary

The [federal government reported](#) that it was spending more than \$6 billion annually on software through more than 42,000 transactions in 2016.

That number has since surged to upward of \$9 billion annually, propelled largely by the efforts of the Defense Department (DoD) to replace its legacy health care systems with an off-the-shelf solution, according to [Bloomberg Government data](#).

When it comes to software, the federal government has long grappled with whether to build or buy software-based systems for finance, human resources, or other purposes. Historically, when agencies are unable to identify an existing federal or commercial software solution that satisfies their needs, they look to develop a custom software solution on their own or pay for its development.

To reduce the number of duplicative transactions and increase software reuse across government, many agencies turned to open-source software as an alternative to commercial-off-the-shelf (COTS). They saw COTS versus open-source software as an either-or decision, when in fact that was not always the case.

As more government services and operations are powered by code, agencies must approach their software purchasing and development with eyes wide open — aware of the pros and cons, up-front and total costs, and security risks throughout a project's life cycle.

In this pocket guide, in collaboration with Adobe, we break down the checklist of considerations that agencies should make when deciding to use COTS or open-source.

We also debunk myths to help agencies make informed decisions about COTS versus open-source, while highlighting the importance of open standards that guarantee interoperability of products and solutions.



Software in government: Then and now

The government's outlook and buying habits around software have evolved over the years. The focus has shifted from buying and building in-house to commercial off-the-shelf and open-source software, some of which are hosted off-premises in the cloud. To capture this evolution, we highlight some of the key developments that have shaped government software development and purchasing.

July
2008

Portable Document Format becomes an open standard

Adobe's PDF Reference (a rulebook for developers) was published as an open standard, ISO 32000.

April
2014

NASA publishes software catalog

NASA published the first edition of its software catalog, which became the first comprehensive listing of publicly available software to be compiled by a federal agency.

December
2014

Federal Information Technology Acquisition Reform Act (FITARA)

FITARA was enacted as an amendment to the 2015 National Defense Authorization Act (NDAA). The law makes clear that federal chief information officers (CIOs) are responsible for reviewing and approving department IT contracts. It also called for the creation of a government-wide software purchasing program.

June
2016

Category Management Policy 16-1 memo

The joint memo from the former federal chief information and acquisition officers focused on improving the acquisition and management of common information technology, specifically software licensing. It called on agencies to optimize their use of commercial software licenses and to reduce duplicative efforts by using government-wide software agreements.

July
2016

Making Electronic Government Accountable By Yielding Tangible Efficiencies (MEGABYTE) Act

The law requires CIOs of each executive agency to establish a comprehensive inventory of software licenses, analyze software usage to make cost-effective decisions, provide software license management training, and establish goals and objectives of the agency's software license management program, among other things.

August
2016

Federal Open-source Policy

The policy required that all contracts for custom-developed software allow that code to be shared and reused across the entire federal government. It also established a pilot program that requires agencies to release at least 20% of new custom-developed code as open-source software for three years. There were exceptions for national security and privacy reasons, and to prevent the release of any sensitive information.

May
2019

Air Force appoints chief software officer

The Air Force appointed its first chief software officer (CSO) in May 2019. The chief software officer is responsible for analyzing current software and cloud migration plans to avoid vendor lock-ins and allow for rapid prototyping and a streamlined process for deployment. To keep up with the pace of technology, the CSO evaluates and authorizes new COTS software and cloud-related technologies to help with their adoption across Air Force programs, based on mission needs.

December
2019

President's Management Agenda (PMA) Cross Agency Priority (CAP) Goal

Under the category management CAP goal, the federal government committed to developing a strategic road map for enterprise software that entails working with industry and agency partners to standardize technical requirements, mitigate cyber risk, improve data quality, and leverage the government's buying power.

By the numbers

\$6 billion is what the [federal government spent](#) annually on software through more than 42,000 transactions, according to 2016 data.

\$9.1 billion is how much the federal government spent on [software](#) in 2019.

20% of all new custom code created after August 2016 must be open-sourced by agencies, per the [Federal Source Code policy](#).

6,609 code projects from 26 agencies have been [published](#) on code.gov, the federal government’s platform for sharing open-source software, as of November 2019.

135 recommendations were made by the Government Accountability Office (GAO) to agencies on how they could [improve management](#) of software licenses. All but 19 of those recommendations have been implemented as of November 2019.

\$65 billion is how much the Defense Department (DoD) [plans to spend](#) on its space system acquisitions portfolio over the next five years, including many systems that rely on software for key capabilities.

21 of the 24 Chief Financial Officer Act agencies reported establishing a software inventory and have received an “A” for that component on the [FITARA 9.0 scorecard](#).

Code.gov tracks agency compliance with the Federal Source Code policy



Department of Defense

Non-compliant

- Agency policy has not been reviewed for consistency with the Federal Source Code Policy.
- Agency has open-sourced less than 20% of their custom developed code.
- Agency has inventoried less than 50% of new custom code.



Department of Education

Partially compliant

- Agency policy is consistent with the Federal Source Code Policy.
- Agency has open-sourced greater than 20% of their custom developed code.
- Agency has inventoried less than 50% of new custom code.



Department of Energy

Fully compliant

- Agency policy is consistent with the Federal Source Code Policy.
- Agency has open-sourced greater than 20% of their custom developed code.
- Agency has inventoried 100% of new custom code.

Federal IT Spending (in millions of dollars)

	FY 2019	FY 2020	FY 2021
Civilian Agencies	51,877	52,925	53,358
Dept. of Defense	36,906	39,057	38,815
Total	88,783	91,982	92,174

Note: This analysis excludes Department of Defense classified spending
Source: [whitehouse.gov](#)

The president’s fiscal 2020 budget requires agencies to categorize IT spending by IT Towers. The goal is to improve IT spending data accountability and transparency.

FY 2021

Cost Pools	IT Towers
Internal Labor	Data Center
External Labor	Compute
Hardware	Storage
Software	Network
Outside Services	Output
Facilities & Power	End User
Telecom	Application
Other	Delivery
Internal Services	IT Security & Compliance
	IT Management

Source: performance.gov

Today’s landscape:
When to use COTS vs. open-source

Federal agencies have a checkered past when it comes to investing in software. If you were to review the past decade of OMB memos, you’d see a common message to agencies that the federal government has been echoing for years: Reduce costs and improve the quality of software.

But it’s not that easy. Part of the challenge agencies face is how best to navigate their complex IT environments. The president’s fiscal 2021 budget breaks the issue down further:

When it does come time to modernize or replace federal systems, agencies must make several choices, including whether to buy or build and to use open-source or commercial-off-the-shelf software.

Open-source clearly has a lot of advocates, who say it avoids vendor lock-in, provides better inter-connectivity across teams and agencies, spurs more creative solutions, and can be more secure.

On the other hand, one might argue that agencies can gain many of the same benefits by buying COTS software that is based on open standards. Open standards are approved specifications or guidelines that ensure interoperability among software and products.

Using COTS software that is based on open standards, you get that interconnectivity and avoid vendor lock-in, while also getting all the benefits of buying from commercial vendors, such as more feature-rich, robust solutions.

There are clear benefits for using open-source or COTS. And according to the Federal Acquisition Regulation (FAR) and DoD’s supplement to the FAR, open-source software is almost always classified as commercial software. In fact, several commercial offerings are developed using open-source software, so it isn’t always an either-or choice that agencies are making.

“This is largely due to both legacy and internally developed, non-standards-based systems designed to perform only one function rather than leveraging commercial off-the-shelf technologies that largely enable more efficient use of Federal technical resources. These legacy and high-customized systems are costly for the Federal Government to maintain and secure.”

—President’s fiscal 2021 budget





With the help of pointers from GSA's [digital consultancy group 18F](#), we've highlighted some general considerations that can help your agency decide whether COTS is right for upcoming projects.

Start by articulating what you want the system to do and for whom.

Before making any decision, you should be able to articulate the value of the system you think you need and a general idea of some of the main features that end users need. This is often referred to as a product vision, which is a succinct and shared understanding of what your agency needs. Using an exercise called value mapping, you can determine which of your users' needs are unique and which are a commodity.

When might you want to consider COTS?

Products under active development, which often indicates that they're continuing to deliver value and respond to market needs, are good candidates. Product development and collaboration tools are a great example of this. At 18F, for example, the team uses many COTS tools to help manage continuous integrations, product backlogs, design exercises, internal communications, and vulnerability disclosure programs.

Following market trends can also be cost-effective because you're sharing the cost with other customers outside of government. If that same COTS solution is authorized through the Federal Risk and Authorization Management Program (FedRAMP) and is successfully in use elsewhere in government, then it is an even more viable option. FedRAMP is a government-wide program that sets baseline security requirements for cloud products and services that federal agencies use.





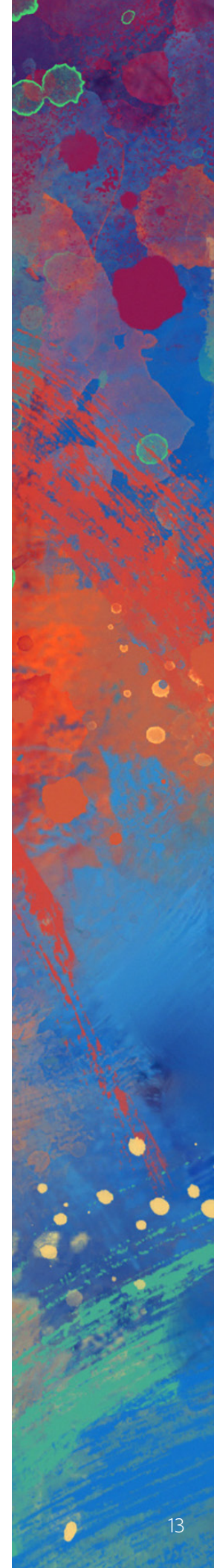
What if COTS isn't the right fit?

You might decide that open-source is a better option, particularly if COTS doesn't meet 70-80% of your needs. For example, COTS could fit business cases for wide-ranging projects that need immediate implementation at no extra cost. Open-source, however, could be better for adaptable programs with less up-front budgets and staff.

Or you may decide that the software itself isn't the issue but that internal processes need to be adapted to align with the way your software manages processes. You might decide to take a hybrid approach and use a mix of open-source software and other software products that can communicate with one another through application programming interfaces, or APIs. An [API](#) is a set of software instructions and standards that allows machines to communicate.

If you do go the route of open-source, be sure that you fully understand what you are signing up for — which should be the case with any software. For one, open-source software is often referred to as free and open-source software, or FOSS. But the word free in FOSS doesn't refer to fiscal cost, but to the autonomy that FOSS grants people to use the software as they see fit in most cases. The cost of trying to maintain and develop open-source can cause sticker shock for agencies, especially if they're trying to go it alone but don't have the in-house expertise.

Costs come later and are sometimes hidden. As with any other software, securing vendor support is an obvious cost. But also consider the increased cost of high customization, testing and maintenance and your appetite for risk. Code contributions made by the open-source community may not always follow standard coding practices and could have security vulnerabilities.



Why open standards should be a priority for your next COTS project

An interview with Helen Corin, AEM Center of Excellence General Manager, Public Sector, Adobe



An enterprise approach to problem-solving in government is vital, whether public servants are defending the homeland or administering benefits to veterans.

But the patchwork of homegrown systems supporting some mission-critical efforts don't always reflect an enterprise mindset. Some agencies have also struggled with interoperability issues and how best to allow their requirements — not technology — to guide their acquisitions.

"We're starting to see issues of not having an enterprise system, and costs are getting high," said Helen Corin, AEM Center of Excellence General Manager for Adobe Public Sector. "Open-source solutions can incur many unexpected costs just to maintain and keep the solution stable."

As employees move in and out of government, it becomes even more challenging to account properly for siloed systems that they maintain. And it isn't always clear where those projects are hosted or located.

But agencies aren't sitting idle. They're evaluating their options for how best to invest in interoperable enterprise systems, whether that involves using open-source software, COTS, or a combination of the two.

"Agencies are innovating, but innovation can be expensive in an open-source environment," Corin said. "There is a belief that you have to use open-source or COTS, one way or the other. That certainly isn't always the case."

In fact, Adobe relies on many open-source software projects to build its own products. Adobe is also a steward of a number of projects that were either born in the open or that released as open-source. This collaboration with the open-source community has enabled the company to work with partners to create interoperable solutions.

At the heart of any COTS project must be a commitment to open standards and a focus on requirements, Corin said.

Make open standards your default

Adobe publishes and contributes to a number of open standards. These standards guarantee the interoperability of Adobe's products and solutions. For example, Adobe's Portable Document Format (PDF) was approved and published by the International Organization for Standardization in July 2008.

So why should open standards be top of mind for your next software project?

For one, if you adopt plugins and applications that aren't compatible with your existing systems, there could be major issues. When you're selecting modules or plugins to use, specifically in the case of open-source software, it can be a gamble if you aren't sure what's current or if the next version of that module will be compatible with your existing systems, Corin said.

"It's a little like building a tower from Legos," she said. It can be overwhelming when you have all the pieces to build a tower, but some pieces may become unavailable because they are no longer supported or maintained by the open-source community. That, in turn, can leave you open to security vulnerabilities and the added testing and maintenance to fill the gap when these building blocks are no longer available. Those added burdens also come with added costs.

With COTS, vendors such as Adobe are constantly thinking about what the market needs today and in the future. Investments are made in research and development to anticipate those needs, Corin said.

For open-source communities, R&D is not their bread and butter. Adobe offers the best of both worlds, with core components that are open yet have the necessary vendor governance and controls to ensure backward compatibility, security, and performance.

Corin also dispelled some myths about customers having to wait on vendors to tell them when new releases, enhancements or updates, will be available. "There are always ways to address that, and COTS vendors will work with you to understand your needs," she said. "As vendors and customers move to an always-on mindset, with cloud solutions these updates and upgrades are continuous, meaning you always have access to the latest and greatest product innovations."

"Don't try to reinvent the wheel. There are companies out there spending billions to do what you are looking for. Just because you are the government, that doesn't mean commercial solutions can't help you."

—Helen Corin, Adobe

Let your requirements guide you

In addition to open standards, agencies must always keep their end users' needs at the forefront. When looking for a COTS solution, agencies should be searching for the option that best supports their mission requirements, rather than forcing their requirements to fit a specific solution.

That could include taking advantage of user research to evaluate user needs, identify existing tools and map out the components of the system, such as infrastructure or an authentication service, according to [best practices from GSA's 18F](#).

"Don't try to reinvent the wheel," Corin said. "There are companies out there spending billions to do what you are looking for. Just because you are the government, that doesn't mean commercial solutions can't help you. In fact, there are many commercial companies that have faced the same challenges, and government can learn from their experience."

Embracing digital: Case studies

Denver empowers employees to be digital content creators

The city and county of Denver want to make life better for residents, current and future, as it continues to grow.

This means making every interaction with the government quick and easy, whether people want to look up event schedules, request a permit, sign up for the composting program, or adopt a pet from a city shelter. Employees are taking advantage of digital channels to inform constituents and help them access services online.

The city of Denver recently switched to Adobe Experience Manager, an Adobe Marketing Cloud solution within Adobe Experience Cloud, to improve creating and delivering website content. With Adobe Experience Manager Sites as the content management system, web authors can quickly create modern webpages optimized for any size screen.

Not only are employees equipped to quickly create professional content for the public, but the city has also reduced the burden on IT. That's because technical staff and content authors are now empowered to take action and leverage tools that made updating all aspects of the web experience easier without sacrificing security.

The number of content authors was reduced as operations were streamlined, and the technical benefits allowed fewer people to publish across multiple sites with ease.

City agencies, such as the Office of the Clerk and Recorder, have used Adobe Spark to create compelling, visually attractive communications quickly. The office was able to prepare its annual report in about half the time normally required.

"Visual communication is an important part of any job these days, but it can be intimidating for people who don't normally work with design," said digital marketing strategist Kersten Arnold. "We want to empower people from every department to be creative communicators. By making design tools more accessible, we can help people create content that will catch audiences' attention and get them engaged."

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—Kersten Arnold, Adobe



Embracing digital: Case studies

Digital solutions support mission to keep children safe

In its earliest days, the National Center for Missing & Exploited Children (NCMEC) served primarily as a call center that collected information about missing children.

Over the years, those efforts expanded to distributing information to as many people and places as possible, including publishing photos and details of missing children on milk cartons, posters, and in mail fliers. Today, NCMEC reaches a global audience by disseminating critical information through a broad range of digital touchpoints across web, mobile, and social media channels.

“We review more than 2 million images and videos of child sexual exploitation every month.”

*—Michelle DeLaune,
SVP and CEO at NCMEC*

Adobe supports continued digital transformation at NCMEC by sharing expert advice and advanced digital technologies that touch everything NCMEC does, from age-progressing photos of missing children and forensic image analysis to training, education, and prevention programs.

“We review more than 2 million images and videos of child sexual exploitation every month,” said Michelle DeLaune, Senior Vice President and Chief Operating Officer at NCMEC. “Adobe Creative Cloud apps play an essential role in helping us identify victims, determine their possible locations and ultimately provide law enforcement with information that can help them rescue a child from harm.”

Finding missing children or children at risk of exploitation means that NCMEC needs to treat almost all outbound messages as crisis communications. Reaching people quickly with accurate information across multiple channels is essential to achieving NCMEC’s mission.

Adobe Analytics, part of Adobe Analytics Cloud within Adobe Experience Cloud, delivers data that helps NCMEC understand how changes to the layout, visuals, and content encourage engagement. Using this data, NCMEC made changes to the website that lowered bounce rates by 88% compared to the previous year. The organization also increased total website page views by 47% and traffic to the donation and fundraising pages during this period increased 218% in just three months. Ultimately, website engagement increases public awareness.

“We’ve helped to reunite hundreds of families because someone recognized age-progressed images we created using Adobe Photoshop,” DeLaune said. “Seeing those children reunited with their families years later reminds us why we will never give up on finding our missing children.”



Cheat sheet

To fully take advantage of what COTS can offer governments, agencies must ensure due diligence when evaluating which software solution is best for them. Here are some best practices from [code.gov](#), [18F](#), and Adobe that can help guide your next software acquisition.

- Perform research and analysis prior to initiating any technology acquisition or code development project.
- Ensure your strategic analysis considers not only agency mission and operational needs, but also external public initiatives and interagency initiatives.
- Conduct an alternatives analysis, evaluating whether to use an existing federal software solution or to acquire or develop a new software solution.
- Understand the feasibility and total cost (time and financial) to transition from legacy systems. Identify ongoing operations and maintenance costs.
- Clearly define the costs related to doing business with a single vendor, including data migration, understanding of your business process, and uncovering technical debt.
- Determine the costs associated with maintaining custom features, who owns those modifications, and the data associated with them.

Helen Corin of Adobe advises taking into account not just the initial license cost but also the following when considering whether an OSS or COTS solution is right for your long-term needs:

- Hosting: Not all hosting or managed services solutions are created equal. Be sure you understand what's included, such as service-level agreements, or SLAs, for the application rather than just the infrastructure.
- Customization: Understand how much custom development is required. Heavily customized solutions will always be more costly to maintain in the long run.
- Integration: How easily does the solution integrate into existing solutions?
- Security: Understand who is responsible for each layer of security, from application to underlying infrastructure.

Conclusion

Software plays an integral role in the way government operates and connects with the public. That's why agencies must take an eyes-wide-open approach when evaluating their software options.

Driving those decisions should be the needs of end users, including those who may be outside the walls of government agencies. Once those requirements are known, agencies can then evaluate which capabilities support those needs and how best they can take advantage of market innovation to ease costs.

Regardless of whether agencies choose COTS or take another route, open standards should be a priority. When software programs can communicate with one another, agencies reduce complexities and empower end users to focus on what matters most: the mission.



Whether you're using COTS or open source software, the key is adopting solutions that best fit your agency's requirements.

About Adobe

Adobe's trusted and proven enterprise solutions enable next-generation digital government. Government agencies can leverage Adobe's industry leading enterprise end-to-end data management and customer experience platform that supports modern websites, digital forms and electronic signatures. From the first stages of creative design to the full customer journey, Adobe can help agencies fully modernize so they can better reach the public and their employees and provide greater access to programs and resources.

To learn more visit us at:
adobe.com/government

To view our resources in response to the COVID-19 pandemic go to:
adobe.com/covid-19-response/government-resources.html



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