BSA The Software Alliance

The $1 Trillion Economic Impact of Software

JUNE 2016

www.bsa.org/softwareimpact

WITH DATA FROM

The Economist Intelligence Unit

Contents

This report was written by BSA | The Software Alliance, incorporating the analysis done by The Economist Intelligence Unit (EIU). The EIU compiled these data and economic impact assessments using publicly available government data, maintaining full editorial control of the process and using industry standard approaches. Any views or opinions expressed in this document are not necessarily those of The Economist Intelligence Unit.

The Findings: At a Glance

UNITED STATES[a]

Software is so much more than your desktop at work. Software is apps. Software is data. Software is cloud computing. It creates breakthroughs and drives growth in nearly every industry. Software empowers countless people and American businesses, and improves our lives each day in ways big and small. Along with all this progress comes the dramatic, positive impact software is making on our national economy each year. *The Economic Impact of Software*, a first-of-its-kind study from BSA | The Software Alliance conducted in 2016 by The Economist Intelligence Unit (EIU), captures the breadth of the software industry in the US and the sweeping economic impact it is making at state and national levels.

Total Value-Added GDP:

$1.07 trillion

(includes indirect and induced impacts)[b]

Direct Value-Added GDP:

$475.3 billion

EMPLOYMENT

Direct:

2.5 million jobs

Total:

9.8 million jobs

(includes indirect and induced impacts)

From software developers and web designers to futurists, project coordinators, administrative assistants, and accountants, software creates jobs for a wide variety of professionals in today's workplaces. These numbers capture jobs created directly by the software industry, as well as jobs the software industry supports through indirect and induced impacts.

WAGES

Average Annual Wage for Software Developers:

$108,760[c]

A software developer's wage is more than twice the average annual wage for all US occupations, which was $48,320 in 2015.[d]

RESEARCH & DEVELOPMENT

$52 billion[e]

R&D Investment by Software Companies

17.2% of All Domestic Business R&D in the US[f]

From developing new data analytics to driving breakthrough technologies like cognitive computing, the software industry's commitment to R&D continues to spur innovation at unprecedented rates.

[a] All data is from 2014 unless otherwise indicated.
[b] For definitions of "indirect" and "induced," see Methodology section on page 16.
[c] US Department of Labor, Bureau of Labor Statistics, Occupational Employment Statistics. Data from May 2015.
[d] Ibid.
[e] National Science Foundation/National Center for Science and Engineering Statistics and US Census Bureau, Business R&D and Innovation Survey. 2012 Industry breakdown. Where data is not available for 2012, the most recent year is used.
[f] National Science Foundation/National Center for Science and Engineering Statistics.

LETTER FROM BSA | THE SOFTWARE ALLIANCE

Almost every day, software breakthroughs are unlocking new opportunities to improve our lives in ways both big and small. Following years of substantial investments in software innovation, unprecedented technological advances now are transforming nearly every aspect of our lives, growing our economy, and greatly enhancing our lives. But for too long, software's significant economic impact has gone unseen or undermeasured.

To gain a better understanding of the software industry's role as an engine for economic growth, BSA commissioned The Economist Intelligence Unit to conduct an analysis, the first of its kind, on the economic contributions of software. We set out to help answer two fundamental questions: How broad of a role does the software industry directly play in growing the economy? What kinds of multiplier effects does software innovation play in the sweeping impacts being seen at both state and national levels?

The study's findings are profound. It finds that today in the US alone, the software sector is driving more than a trillion dollars a year in economic impact. Additionally, the software sector drives high-paying jobs, with software developers making more than twice the average annual wage for all US occupations. As software innovation continues to thrive, it is creating a ripple or multiplier effect that stimulates other parts of the IT sector and the economy. This dynamic benefits all 50 states in meaningful ways.

The software industry is poised to build upon today's critical contributions by driving even more widespread growth in the years ahead. The study shows that through investments in R&D, the software industry is investing in America's innovative future — laying the groundwork for a new wave of software-driven technological advances that promise to make businesses more productive, jobs more plentiful, and opportunities more pervasive.

This analysis can help thought leaders and policymakers better gauge the magnitude of the impacts that a thriving software industry can deliver. At the state level, the study's economic rankings can help state leaders better understand the relative success of their technology initiatives, and better focus on the smart policy choices that ignite broader software-driven economic gains.

Now, more clearly than ever, the software revolution isn't just the vital spark that can improve our lives and transform the way we work. It's an economic engine for creating the new jobs, industries, and solutions that are essential for bringing about a brighter future. If we want to rise and meet the challenges of both today and tomorrow, we need to seize upon what may be software's greatest untapped potential — its ability to fundamentally expand tomorrow's economic promise.

Sincerely,

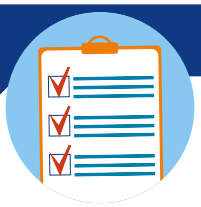
Victoria A. Espinel
President and CEO, BSA | The Software Alliance

Software Is Making a Profound Impact on Our Economy

Software innovation's positive economic impact can be seen throughout our national economy — contributing to our GDP, creating jobs, lifting wages, and securing our future. To measure these impacts, we launched a unique analysis to explore whether these impacts can be seen across the country in all 50 states, whether software's growing economic potential carries through to other sectors of the economy, and whether these benefits extend to local economies, entrepreneurs, workers, consumers, and governments alike.

As part of BSA's *Economic Impact of Software* study, researchers from The Economist Intelligence Unit (EIU) sought to quantify software's economic impact by examining:

- The software industry's breadth as a direct driver of economic benefits; and
- The economic impact software indirectly plays in the sweeping gains being seen at both the state and national levels.



KEY FINDINGS[1]

Taken together, the study's results indicate the software industry's impact is now rippling throughout the economy, benefiting all 50 states, boosting efficiency, creating jobs, and expanding our economic potential across numerous sectors.

- **Software innovation adds more than a trillion dollars a year to the US economy:** The software industry directly added $475.3 billion to the US economy in 2014. When factoring in its full effect (both indirect and induced), software was responsible for a total $1.07 trillion of all US value-added GDP in 2014.[2]
- **Software supports nearly 10 million jobs nationwide:** From app developers to accountants, and from web designers to project managers, software creates jobs for a wide range of professionals across the US economy. While the software industry itself directly employed 2.5 million people in the US in 2014, research shows the software industry supports a total of 9.8 million jobs when including the indirect and induced jobs that software supports.
- **Software lifts wages through jobs that can pay more than twice the national average:** Not only does software support millions of good jobs, but these are great-paying jobs, too. For example, software developers earned $108,760 on average in 2014 — more than twice what the average worker earns — $48,320 a year — for all US occupations.[3]

Among the many results from the study, one thing is abundantly clear: software is a powerful catalyst for economic change with the potential to make businesses more productive and the economy more prosperous.

- **Software is driving economic gains in all 50 states:** Every state's economy and workforce are benefiting from new jobs that fit our modern digital economy and opportunities driven by software advances. The software sector in large states, including California, Texas, and New York, drives about of a third of software's trillion-dollar economic impact on the GDP, while states like North Carolina and Massachusetts are benefiting from large investments into game-changing R&D in their states. Yet every state, no matter how big or small, rural or urban, is seeing tangible economic impacts from software innovation.
- **Software industry investments in the future will help expand America's long-term economic and innovative potential:** Given that well over half the economic growth in this country since the end of World War II has been directly attributable to technological innovation,[4] by investing more than $52 billion into cutting edge R&D in 2012,[5] the software industry is helping to "pay it forward" by supporting breakthrough advances that can spur further innovation and an even more prosperous future. While the software industry makes up 2.7 percent of our economy, it contributes outsized sums to our future (17.2 percent of all domestic R&D.)[6]

Among the many results from the study, one thing is abundantly clear: software is a powerful catalyst for economic change with the potential to make businesses more efficient and the economy more prosperous. Harnessing this potential in pragmatic ways can be the key to lifting our standards of living and accelerating American prosperity.

SOFTWARE IS...

Pinpointing malaria transmission hotspots to detect outbreaks and improve eradication efforts.

Redistributing water supplies in communities where clean water is scarce.

What Is Software?

Software isn't just the vital code that brings your desktop computer to life, or that puts the "smart" in your smartphone. Software is the foundational language at the very heart of our digital revolution — transforming data into ideas, and ideas into action. It brings technology to life in countless ways, and empowers us to do everyday things in ways that only recently seemed unimaginable. Software is:

- Helping people hear for the very first time.[7]
- Building smarter homes that learn from us to save energy.
- Pinpointing malaria transmission hotspots to detect outbreaks and improve eradication efforts.
- Redistributing water supplies in communities where clean water is scarce.
- Routing travelers and packages more efficiently so they reach their destinations sooner.
- Connecting families and friends worldwide in new and novel ways.
- Helping farmers monitor crops, pests, and soil conditions.
- Empowering doctors with new visualization tools that recognize cancer tumors earlier.

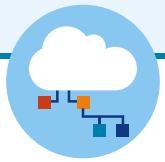
Software advances are improving our lives in thousands of ways every day. We use software almost ubiquitously throughout our daily lives for everything from helping us with simple tasks and conveniences to fundamentally expanding our human potential. For example:

The apps we use every day are software.

When you use apps to connect with friends, check the weather, find the fastest route to work, share the latest viral video, or bank online — you are using software. These software apps have now become vital to our daily lives.

Data is driven by software.

Data's transformative impact is being driven by software innovations that enable everything from smarter cities and better weather predictions, to life-saving health breakthroughs and improved crop yields. Already, 90 percent of business leaders cite data innovation as one of the key resources and a key differentiator for businesses on par with basic resources like land, labor, and capital.[8]



Cloud computing is enabled by software.

Cloud computing — enabled by software — is transforming the way companies work by revolutionizing how computing power and storage is bought, sold, and delivered. It enables companies both big and small to affordably access data, share computing power, and collaborate in new ways — at any time, from any device, from anywhere around the globe.

Industry solutions are powered by software.

Software helps optimize, analyze, and visualize everything from aerodynamics systems to our global financial infrastructure. Throughout our airways, railways, and roadways, software is helping make transportation more efficient to save time, money, fuel, and lives. In classrooms, software is transforming the way teachers teach and students learn. In manufacturing, software is improving the way products are designed, built, and distributed.

These are just a few examples of the pervasive ways we benefit from software. One particularly exciting advance is the way these benefits are being magnified and amplified throughout broad sectors of the economy. New software advances are sparking unprecedented advances that extend benefits more deeply into almost every sector of the economy — to make businesses work better, introduce new jobs, and make opportunities more profound.

The New York City Fire Department is combining 7,500 data points across 17 city-agency data streams with the help of clever software that uses predictive analytics and artificial intelligence to predict which of New York City's 1 million buildings are at high risk for fires.

Software-Driven Data Tools Are Extending Breakthrough Benefits Both Far and Wide

The economic impacts identified in this study are more than just numbers. Software's positive impact can be seen all around us, but perhaps none more significantly than the way software-driven data innovation is leading to benefits throughout broad sectors of the economy. Over the past decade, software innovation has unleashed unprecedented advances, grown our economies, improved our security, and increased our standards of living.

Data analytics is the software tool used to synthesize and make sense of data. It helps us use data to make more informed decisions across a range of disciplines, or to discover unexpected insights from within seemingly unrelated data. These software tools enable startups, governments, small businesses and large enterprises to sift through mountains of data to find nuggets of "information gold." This gives companies a competitive advantage, researchers a breakthrough moment, and governments the ability to better serve their citizens more effectively and efficiently.

Software is cultivating agricultural growth

To increase crop yield and boost production, farmers are often turning to software that uses data from seeds, satellites, sensors, and tractors to make better decisions about what to grow, how to grow it, and how to track food freshness from farm to fork. With the amount of farmland shrinking but the number of mouths to feed growing, farmers have quickly found they can use software to harvest data in new ways to increase yields and grow their bottom lines. For example:

- Software processing data coming from a "Lettuce Bot" mounted on a tractor can analyze real-time images of lettuce crops to improve yields by precisely feeding each plant with the nutrients it needs to maximize output. By harnessing data more effectively, farmers are able to target resources to reduce input costs, and reduce pesticide and chemical use, while improving yields by five or 10 bushels an acre.[9]
- In response to President Obama's Innovation Challenge, the US Department of Agriculture, using Microsoft Azure, used key climate data sets to explore solutions for increasing food resiliency and strengthening food systems.[10]

The city of Los Angeles, California, is sharing data with app providers to improve driving, reduce congestion, and promote safety, while the app providers share real-time, crowd-sourced data with the city to help city police, fire, transportation, sanitation, and street services better perform their jobs.

Software is enabling smarter community solutions

Software isn't just the tool that puts the "smart" in our smartphones. It's also helping create smarter solutions for communities to address pressing needs through smart city initiatives. Software is enabling the creation of smart cities where communities are tackling key challenges like improving the delivery of city services, reducing traffic congestion, fighting crime, cutting costs, and boosting local economies. These communities are using software that harnessed data from sensors and systems to improve the city safety, efficiency, and quality of life for their residents. In an era of constrained capital where cities still must compete to grow their economies and improve quality of life, these software-enabled systems are being deployed in a variety of ways to increase energy efficiency, improve city planning, boost transportation efficiency, transform water and wastewater management, and improve service delivery. For example:

- The New York City Fire Department is combining 7,500 data points across 17 city-agency data streams with the help of clever software that uses predictive analytics and artificial intelligence to predict which of New York City's 1 million buildings are at high risk for fires.[11]
- Charlotte, North Carolina, is harnessing smart city software and sensors to achieve a 20 percent reduction in energy usage — saving millions of taxpayer dollars in the process.[12]
- The city of Los Angeles, California, is sharing data with app providers to improve driving, reduce congestion, and promote safety, while the app providers share real-time, crowd-sourced data with the city to help city police, fire, transportation, sanitation, and street services better perform their jobs.[13]
- The city of Chicago, Illinois, has deployed a city-wide network of 500 lamppost-mounted sensors to monitor air quality, and uses software to identify environmental issues like pest infestations that could be connected to the incidence of asthma.[14]

Software is helping people live longer, healthier lives through better diagnoses, lower health costs, and more personalized treatments

As populations age and health care costs rise, software is being used to improve health monitoring to better understand diseases, lower health costs, diagnose faster, revolutionize medical research, improve fitness, and help people live longer, healthier lives. For example, health care professionals are turning to clinical decision support system software to give doctors unprecedented insight into their patients' health, enable better decision making, and inform better treatment options for patients. Software systems that analyze data from disparate sources help make faster and more reliable diagnoses in a complex data environment — proving to be beneficial in more

IBM's Watson helps augment human decision making by crunching data on thousands of previous cancer cases through powerful data analytics software. Watson has helped doctors improve diagnostic accuracy rates to as high as 90 percent for lung cancer compared with a human diagnostic accuracy rate of around 50 percent.

than 70 percent of cases.[15] According to McKinsey, if the health care sector were to use data more effectively to drive efficiency and quality, the sector could save more than $300 billion every year.[16] For example:

- At Memorial Sloan Kettering in New York and at MD Anderson Cancer Center in Texas, oncologists have trained IBM's Watson — a powerful cognitive system that thinks more like a human than a computer — to help doctors make better cancer treatment choices. IBM's Watson helps augment human decision making by crunching data on thousands of previous cancer cases through powerful data analytics software. Through natural language processing — the reading of billions of electronic health records and images — Watson has helped doctors improve diagnoses of various types of cancer, leading to diagnostic accuracy rates as high as 90 percent for lung cancer compared with a human diagnostic accuracy rate of around 50 percent.[17]
- In Africa, the 3D printing of prosthetics is drastically improving the quality of life for amputees, as 3D models can be created quickly and at a fraction of the cost of traditional prosthetics. Autodesk, a 3D entertainment and design software company, recently partnered with the University of Toronto and hospitals in Uganda to give people access to prosthetics and fit them for their daily needs.[18]

Software is driving transportation gains that can save time, money, fuel, and even lives

At a time of ever-increasing congestion on the road, leaders are turning to software innovations to reduce the hours we spend in congestion every year,[19] connect cars in ways that save as many lives as the introduction of seat belts,[20] and enable truck fleets to find quicker routes, perform real-time engine diagnostics, and identify unsafe driving habits before they become a problem.[21] For example:

- New cars today are so packed with software and sensors that they can generate up to 25 GB of data per hour[22] and contain more than 10 million lines of software code just to process the data.[23] This real-time data processing is helping drivers avoid collisions, improve engine performance, save fuel, and save time.
- As more than 25 million packages are routed and delivered every day — about 300 every second[24] — delivery companies are turning to data-driven software to deliver the right product to the right person in the fastest, safest, and most affordable way. Package delivery companies like UPS are using vehicle sensor data combined with software that plans more efficient routes to drive decisions that save millions of gallons of fuel and reduce emissions by the equivalent of taking thousands of cars off the road for a year.[25]

New cars today are so packed with software and sensors that they can generate up to 25 GB of data per hour and contain more than 10 million lines of software code just to process the data. This real-time data processing is helping drivers avoid collisions, improve engine performance, save fuel, and save time.

- New York City's "Vision Zero" system uses an intelligent software-based traffic control and surveillance platform to collect historical traffic incident data to measure changes in patterns that inform improvements in roads, highways, turning lanes, traffic circles, and other infrastructure. As a result, in 2015 New York City experienced the fewest traffic-related deaths in any year since 1910, despite a doubling of the city's population during the past century."[26]

In the manufacturing sector, software is improving the way products are designed, built, and distributed. By one estimate, better use of data in manufacturing can yield up to a 50 percent decrease in product development time, cut assembly costs, and reduce working capital up to 7 percent.[27] In fact, in a Microsoft study, IDC estimates that manufacturing companies that take full advantage of their data are poised to achieve a $371 billion data dividend over four years.[28] Software also is radically improving our ability to design and build things in smarter ways — leading to a revolution that moves us beyond mere mass production to a world of mass customization. Software-enabled digital fabrication technologies like 3D printing can drive down the cost of complexity, enable rapid prototyping, reduce energy costs by 50 percent, and cut material costs by 90 percent.[29]

In the financial sector, software is at the heart of our global financial system — zipping dollars around the globe, boosting efficiency, improving compliance, and cutting fraud. As our financial exchanges generate four to five terabytes of data a day, software is often the crucial tool that enables experts to make sense of it all. In one survey, 71 percent of banking and financial markets firms reported that the use of information and analytics is creating a competitive advantage for their organizations.[30] Similarly, for companies like Visa, software-enabled data analytics has helped the company identify $2 billion in annual credit card fraud, and given it the chance to address those vulnerabilities before that money was lost.[31]

Software's Economic Impact Is Now Rippling Throughout the Economy

It is now becoming increasingly clear that software innovation is transforming the way we do almost everything: from the way we make movies to the way we make medicines; from how we forecast fashion to the way we farm food; from how we educate to the very way we innovate. Software is no longer just the tool that helps bring families closer even when far apart, or that enables us to work even when we are away from our desks. Today's software innovation is an engine that fuels broad sectors of our economy.

In addition to the specific software solutions often at the core of high-growth sectors of the economy,[32] software's pervasiveness also is driving economic change that is boosting the underlying productivity of many key sectors of our economy.

These gains stem from software's ability to make it easier and faster for workers to perform their jobs — in the process enabling companies to be more responsive to customer needs; unleashing greater human creativity and performance; bringing products and services to markets faster; lowering product and service costs; and expanding markets at global scale through the Internet. In fact, a study in the *Harvard Business Review* found that companies in the top third of their industry that use software for data-driven decision making are, on average, 5 percent more productive and 6 percent more profitable than their competitors.[33]

So not only does the software sector help create more good, high-wage, high-skill jobs, it also benefits virtually every other industrial sector by making them more efficient. This potential is so meaningful that a recent report from GE estimates that if companies used data to become just 1 percent more efficient, global GDP would grow by $15 trillion by 2030.[34] It means the next big thing may be the billions of small connected devices made infinitely smarter through software as we connect nearly everything that can be connected to the Internet, to enable even more powerful solutions through what many call the Internet of Things.

Today's software revolution also is about helping us make smarter decisions. Rather than making big decisions based on gut or pure instinct, software innovations now are enabling us to better harness data in ways that help us make better-informed decisions, with greater precision, faster speed, and bigger impact. According to one survey of IT decision makers across a range of industries, 59 percent report that improving the quality of decision making is the primary goal driving investments in data technologies.[35]

Yet despite all of the real-world benefits that software is driving today, we have seen only a fraction of its full potential. We now generate 2.5 quintillion bytes of data each day — so much that at least 90 percent of the world's data today has been created in just the last two years alone, and the amount of data produced is now doubling every two years.[36] And sophisticated software code is helping us make greater sense of this growing data.

The findings are clear: across the country, software innovation is helping drive more than a trillion dollars a year in economic impact, supporting nearly 10 million jobs, and delivering opportunity in all 50 states.

Charting a Path to an Even Brighter Economic Future

This study enables us to better understand the potential that software innovation can deliver as leaders grapple with how to chart a course for an even brighter economic future. The findings are clear: across the country, software innovation is helping drive more than a trillion dollars a year in economic impact, supporting nearly 10 million jobs, and delivering opportunity in all 50 states. And the best may still be ahead as the software industry continues to make large investments in R&D to help unlock future gains.

It is now becoming increasingly apparent that the software industry's greatest untapped potential lies not only in what it enables individuals to do today, but in its ability to fundamentally transform our economic opportunities for tomorrow.

With vast new opportunities on the horizon, how quickly we reap its benefits will be shaped by decisions being made by policymakers today. With pragmatic policies that foster a climate where software innovation can continue to thrive; that tap human talent and tenacity; harness innovation and investment; expand capacity and capabilities; and enable data to flow freely across borders, policymakers can help maximize the benefits that software innovation can deliver.

State Economic Impact

Software makes big economic contributions in all 50 states. Throughout each of the 50 states, software innovation can be seen delivering an enormous positive impact. It is directly contributing to state economies, supporting a wide range of software-related jobs, and driving outsized investments in state R&D to spur continued innovation and advance a more prosperous future.

Every state's economy and workforce are benefiting from new jobs that fit our modern digital economy and opportunities driven by software advances. The software sector in large states, including California, Texas, and New York, drives about of a third of software's trillion-dollar economic impact on GDP, while states like North Carolina and Massachusetts are benefiting from large investments into game-changing R&D in their states. Yet every state, no matter how big or small, rural or urban, is seeing tangible economic impacts from software innovation.

STATE ECONOMIC IMPACT					
	GDP	EMPLOYMENT		SOFTWARE R&D	
State	Direct Contribution ($million)	Direct (Jobs)	Total (Jobs)*	Investments ($million)	As % of all R&D**
United States	**$475,301**	**2,536,908**	**9,820,443**	**$52,006**	**17.21%**
Alabama	$3,289	25,241	52,108	$142	11.06%
Alaska	$248	1,325	2,839	$4	10.26%
Arizona	$5,190	40,834	87,244	$235	4.74%
Arkansas	$1,466	11,238	14,503	$68	22.30%
California	$90,526	408,143	949,916	$20,522	25.12%
Colorado	$11,633	73,371	128,931	$694	16.91%
Connecticut	$5,401	31,600	95,390	$285	3.88%
Delaware	$839	5,899	13,397	$39	1.61%
District of Columbia	$4,424	23,104	41,612	$44	16.92%
Florida	$15,812	107,522	197,220	$976	18.73%
Georgia	$12,596	85,773	148,748	$858	22.14%
Hawaii	$791	5,485	15,724	$22	11.70%
Idaho	$680	4,972	12,392	$26	2.41%
Illinois	$16,126	97,568	262,447	$545	4.19%
Indiana	$4,138	27,293	54,122	$232	3.84%
Iowa	$2,496	17,186	28,665	$86	4.88%
Kansas	$2,267	16,355	31,836	$88	4.25%

*includes indirect and induced effects

**all R&D refers to all domestic business R&D in the US

STATE ECONOMIC IMPACT					
	GDP	EMPLOYMENT		SOFTWARE R&D	
State	Direct Contribution ($million)	Direct (Jobs)	Total (Jobs)*	Investments ($million)	As % of all R&D**
Kentucky	$2,154	20,493	24,676	$43	4.00%
Louisiana	$1,234	9,606	18,042	$26	7.16%
Maine	$701	4,907	10,776	$29	10.55%
Maryland	$11,938	77,561	149,768	$490	12.16%
Massachusetts	$22,572	114,114	341,406	$3,153	18.03%
Michigan	$8,481	57,556	124,254	$331	2.22%
Minnesota	$8,182	48,191	73,316	$567	9.12%
Mississippi	$691	5,730	7,023	$14	5.13%
Missouri	$7,132	46,757	107,656	$442	6.33%
Montana	$476	4,279	7,067	$11	10.48%
Nebraska	$2,291	17,074	21,185	$243	42.04%
Nevada	$1,415	9,195	21,523	$53	8.36%
New Hampshire	$2,162	13,706	28,697	$141	7.59%
New Jersey	$16,420	86,256	232,836	$639	4.04%
New Mexico	$706	5,306	9,102	$29	6.52%
New York	$37,160	147,361	476,335	$2,331	19.87%
North Carolina	$9,325	70,134	127,278	$1,433	22.91%
North Dakota	$606	4,638	5,019	$11	4.95%
Ohio	$10,961	72,249	177,543	$292	3.77%
Oklahoma	$1,499	10,457	23,149	$33	7.13%
Oregon	$4,220	28,460	66,942	$559	10.84%
Pennsylvania	$13,301	81,603	229,603	$992	10.65%
Rhode Island	$1,300	9,658	19,418	$21	4.67%
South Carolina	$2,356	17,443	29,543	$55	3.41%
South Dakota	$286	2,246	2,819	$10	8.93%
Tennessee	$3,724	24,651	48,745	$54	3.76%
Texas	$29,977	199,999	339,723	$2,214	14.60%
Utah	$4,451	37,066	84,935	$456	21.37%
Vermont	$633	4,693	9,539	$199	42.70%
Virginia	$25,833	162,987	439,948	$660	13.88%
Washington	$27,564	115,133	297,699	$9,061	62.52%
West Virginia	$676	4,289	8,379	$7	2.30%
Wisconsin	$5,710	39,269	58,446	$531	12.84%
Wyoming	$168	945	2,159	$3	10.00%

*includes indirect and induced effects

**all R&D refers to all domestic business R&D in the US

LETTER FROM THIRD-PARTY ECONOMISTS

The future competitiveness of the US will demand extraordinary competence in software capabilities — not just in the IT sector, but across the economy.

In a world underpinned by ever-more powerful, affordable, and public digital technology platforms, software is fast becoming the key source of economic value and competitive advantage in business. As a result, software is redefining nearly every industry.

Although no study of this nature can ever be perfect, it is vital to measure the industry as best we can and interpret findings carefully. This study from BSA | The Software Alliance, conducted by The Economist Intelligence Unit, is well designed, uses the best data available and draws reasonable, thought-provoking conclusions.

The findings of the study are important and merit attention. The software sector has a large economic impact in terms of value addition, employment, and wages. Its impact is extensive; every industry uses software. Beyond the direct contribution to GDP, software also is an enabler of productivity growth across the economy. Moreover, it offers a growing number of high-paying and professionally satisfying jobs across many sectors. And it continues to invest substantively in R&D, which increases the likelihood of its ongoing success.

The future competitiveness of the US will demand extraordinary competence in software capabilities — not just in the IT sector, but across the economy. The US already is the world leader in software. Maintaining this leadership position will require ongoing investment in R&D at the national and corporate levels, a commitment to funding related education including computer science, and a comprehensive understanding of the dynamics of the software industry and its economic impact. This study represents a welcome step in that direction.

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METHODOLOGY

In 2016, BSA | The Software Alliance commissioned The Economist Intelligence Unit (EIU) to assess the economic impact of the software industry. The EIU collected and analyzed the most recent data available from several recognized and reputable sources. These sources included the EIU itself, IMPLAN, the National Science Foundation, the US Bureau of Economic Analysis, the US Bureau of Labor Statistics, and the US Census Bureau.

To estimate the total contributions of the software industry to the US economy, the EIU analyzed the direct contributions and estimated indirect and induced impacts using various economic multipliers. The economic contribution analysis presented in this paper uses input-output models, which describe the full inter-industry transactions between producers and intermediate and final consumers, to compute multipliers. Multipliers allow for the estimation and isolation of the direct, indirect, and induced contributions of an industry to economic outcomes (e.g., value-added GDP, employment, and wages). Direct and indirect contributions are estimated using different multipliers:

1. **Direct contributions:** The levels of output or employment from the software industry directly.

2. **Indirect impacts:** The indirect impacts estimate the inter-industry economic activity resulting from the direct contributions (e.g., purchases of inputs). These indirect effects look backward at the linkages of the software industry in the economy, and the demands inputs from other sectors, like real estate and other professional services. This demand generates additional output (and jobs) from those sectors, that wouldn't exist if it weren't for that software industry demand. As a result, the indirect multipliers estimate this additional output from other industries that is attributable to the software industry.

3. **Induced impacts:** Induced impacts take the next step — identifying the additional economic activity supported by spending on goods and services by households whose income was affected by the direct contributions and indirect impacts. The software industry pays its employees but also supports incomes in other sectors, like real estate. These jobs come with additional wage payments, which increase total earnings to people working in these upstream sectors. These people then buy more goods and services, which generates additional demand (and output) across the broader economy. Induced multipliers estimate this additional output from increased general demand due to higher total wages paid to people in the software industry and people in industries that supply to the software industry.

The modern definition of the software industry used in the study reflects recent technological advancements in the software industry — from one that focused on tangible and packaged software products to one that includes software related services like the cloud based software as a service (SaaS), cloud storage and computing, mobile app development and hosting. As a result, the EIU analysis has defined the US software industry to include the following software sub-industries:

NAICS 5112:	Software Publishers
NAICS 5415:	Computer Systems Design and Related Services
NAICS 518:	Data Processing, Hosting and Related Services
NAICS 519130:	Internet Publishing and Broadcasting and Web Services

The EIU compiled these data and economic impact assessments using publicly available government data, maintaining full editorial control of the process and using industry standard approaches. Any views or opinions expressed in this document are not necessarily those of The Economist Intelligence Unit.

NOTES

1 All data is from 2014 unless otherwise indicated.

2 Value includes indirect and induced impacts. For definitions of "indirect" and "induced," see Methodology section on page 16.

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