Enterprise Spending on Cloud Services will Expand US GDP, Jobs and Tech Spending. A New Forecast Predicts the US Economy will gain nearly 3 Trillion Dollars in GDP and 8 Million new Jobs from 2015 to 2025.  

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**Major Findings**

This forecast contends that the US economy will obtain dramatic benefits from enterprise spending on cloud services (cloud computing, data analysis and the Internet of Things). It will contribute $1.7 trillion in new spending, add 3 trillion to GDP and create 8 million jobs for the US economy by 2025. This would add about 1.5% per year to GDP and about 0.5% per year to employment growth. This would boost US economic growth to a much faster-paced expansion than some forecasters are predicting.

As a consequence of this spending, there would be a significant shift to a cloud-services driven, New-IP based economy, a software-defined, highly interoperable economy. In this economy, software becomes the central focus of economic activity, initially because of dramatic changes in infrastructure.

Complementing this shift are: 1) a rapid rise in the demand for high-speed connectivity; and 2) greater automation of complex jobs, opening opportunities for those with basic knowledge to master positions that once required advanced degrees.

The forecast offers a framework to consider the economic impacts of the rapid shift from traditional enterprise infrastructure to cloud services. It estimates industry-level spending to forecast how spending on cloud services is likely to change GDP and employment.

This forecast is based on estimates of enterprise spending in 13 US industries that are early adopters of cloud services, data analysis and the Internet of Things (we consider this to correspond to the “New IP.”) It employs enterprise level estimates that have been checked against industry-level cloud spending forecasts. We adjusted these estimates to account for a significant shift in enterprise spending over the

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1 This is Report 2: The Potential Economic Impact of Spending on Cloud Services – the New IP -- as well as Data Analysis and the Internet of Things on the US Economy over the next Ten Years, 2015-2025
2 This is based on a forecast model that identifies the potential for $572 billion in new cloud services spending that would, without multipliers, add $966 billion to GDP and create 2.54 million to 2.9 million new jobs. This would mean adding about 0.5% per year to GDP and 0.16% per year to employment, using current GDP and employment figures as a base.
3 This position is very similar to the one that Steve Case develops in his new book, The Third Wave. Simon & Schuster, 2016.
next 8 years when spending on traditional IT infrastructure\textsuperscript{5} will fall from 60\% of the total in 2015, to 20\% in 2020 and to 0\% in 2023 (See Appendix 1 for a discussion of this change).

The forecast identifies specific sectors that are likely to be at the forefront of the change and estimates how their spending will vary over the next eleven years. The forecast makes explicit assumptions about important trends, such as assuming a substantial growth of the Internet of Things after 2020 and a proportional shift of more spending on outsourced cloud services to telcos from cloud service providers after 2020. These assumptions are based on interviews with and presentations by firms that are early adopters of cloud services including the Internet of Things. The forecast is flexible. This makes it possible to adjust the forecast and use different assumptions to clarify how they might affect the trends described here.

Spending on cloud services will also have the following effects:

1. Significant new funds ($217 billion) will be spent for internal software development to support fast product and service development, data analysis, reliability centered maintenance, virtual product-based simulations, and developing and operating sensor networks for the Internet of Things.
2. Funds will increase for outsourced software and services ($355 billion) with $269 billion going to cloud service providers (CSPs), such as Amazon, Google and $86 billion going to telcos.
3. Six sectors, financial services, information technology, social media, retailing, the insurance and agriculture industries are forecast to account for almost three-fourths of total spending on cloud services.
4. Spending on the Internet of Things will expand from 17\% of enterprise cloud services spending in the 2015 to 2019 period to 40\% in the 2020-2025 period.
5. Telcos will be a major beneficiary of enterprise spending on cloud services from 2020 to 2025, providing much support for the Internet of Things. Cloud service providers, such as Amazon, Microsoft, Google, Rackspace and IBM will benefit from $94 billion in new spending during 2015 to 2019 and a surge to $176 billion during 2020 to 2025.

The forecast divides enterprise spending on cloud services along two dimensions. One, how spending on cloud services will be divided between internal spending not only on staff to support software development and management of for cloud services, data analytics and the internet of Things, but also on spending for outsourced cloud services. By structuring the forecast in this way, we can estimate how spending on outsourced cloud services can be divided into new spending on cloud service providers as well as on telcos, reflecting the new demand for outsourced services. The second dimension is how spending on cloud services may be divided between spending on software development including continuous service delivery versus on the Internet of Things. This provides a way to capture increased spending on the Internet of Things that many industries see as a significant change in spending during the 2020 to 2025 time period.

The results of this forecast net out how much of enterprises’ spending is being shifted from existing investments that support traditional infrastructure to investments in cloud services.

For both dimensions included in this forecast, new spending on cloud services increases investments in software defined infrastructure and services (including software defined networking (SDN) and network function virtualization (IoT)). Spending also expands for data analysis and the Internet of Things (both of these elements encompass the dimensions of the New IP).

The sections that follow summarize the forecast’s main findings.

**Dimension 1: Examining Total Spending on Cloud Services**

The first dimension of the forecast begins with overall cloud services spending. It then divides this forecast to examine how the estimates can forecast spending that is part of cloud services for internal employees that perform software development functions as well as outsourced services provided by cloud service providers and telcos. The former include well-known cloud service providers such as Amazon, Microsoft Azure, Google, IBM and Rackspace.
The first part of this forecast explores enterprise purchases of cloud services. We estimated total spending over the 11 year period at $572 billion net of spending – netting out inputs from a shift in spending from traditional infrastructure investment to cloud services. We forecast that new, net “adjusted” spending on cloud services would reach a total of $170 billion over the 2015-19 period and grow to $402 billion over the 2020-25 period. In the latter period, the netting out “offset” is smaller, since we assume that a large part of the transition from traditional infrastructure to the cloud will be completed by 2023 (see Appendix 1 for the description of the transition and how we used it to develop the estimate of the “offset.”).

We used these net figures to estimate that this spending would create $966 billion in GDP and 2.5 million to 2.9 million new jobs over the 2015 to 2025 period.

This shift also indicates that the economy will experience a rapid and very dramatic shift in the use of computing and communications infrastructure as well as applications, Amazon and other firms that have developed very sophisticated software defined ecosystems are likely to continue to provide the lion’s share of enterprises cloud services. Telcos are being challenged by these players for enterprise business. Moving rapidly should enhance telcos’ abilities to provide cloud services, especially initiatives such as AT&T’s Domain 2.0. Nevertheless, the fleet-footed competition from Amazon and others may make real inroads into telcos’ traditional dominance of enterprises’ spending on services.

The forecast also suggests that there will be a more rapid adoption of Software Defined Networking and Network Function Virtualization because enterprises are demanding a new, highly flexible and adaptive infrastructure to create and deploy new services, support data analytics and underpin expanded use of the Internet of Things.

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6 When enterprises shift spending from IT vendors to cloud service providers and telcos, spending changes from IT vendors to internal software development and cloud service providers. Thus, the reduction in spending on IT equipment and services helps finance new spending on the internal software development and cloud service providers. We estimate the change in spending and deduct it from the industry spending that we estimate. We used estimates from Gartner to develop an estimate of the “shift in spending” offset for the forecast. Using Gartner forecasts for global IT services, we assumed that enterprise spending on traditional IT spending as Gartner forecasts for data center systems and software would decline by about 7 percent per year while new spending on total IT would follow the forecast that Gartner expects for the rest of this decade. We defined the difference between Gartner’s IT spending forecast for data center systems and software and the 7 percent annual decrease we computed is defined as the “spending shift.” We estimated this amount and adjusted it to the US market and for the size of the industries we analyzed in the entire US economy. We found that the “spending shift” would account for about half of the spending on cloud services that goes to telcos and cloud services providers from the early adopter industries we studied. We used data center systems and software because we found that a number of enterprise users including Ford, GM, and Tribune Media, saved a great deal on traditional IT spending by consolidating data centers and that many banks saved on software and data center services by shifting data to the public cloud, as is also the case with JPMorganChase, Barclays, and Bank of America.

7 To do this we used a Keynesian multiplier based on an estimate of the marginal propensity to consume (mpc) in the US economy of 0.4. The multiplier is 1 / (1-mpc). We multiplied the new spending estimate by the multiplier to obtain the impact on GDP.

A Few Large Industries are Likely to Dominate Enterprise Spending on Cloud Services.9

Spending on cloud services will be driven by several large industries. During 2015-19, six sectors, financial services, information technology, social media, retailing, insurance and agriculture will account for almost three-fourths of spending on cloud services.10 These sectors will spend $150 billion of the total of $192 billion11 we expect enterprises to spend. In the 2020-25 period, these industries are expected to spend $235 billion of the $419 billion forecast to be spent on cloud services, or just over 50 percent.

The shift in the share of cloud services spending accounted for by the top six sectors from two-thirds to one-half is a result of rapid increases in enterprise spending during the 2020-2025 period. This increase is focused in industries that one might consider to be “second-tier” during the 2015 to 2019 time period. This includes industries such as pharmaceuticals, healthcare, aircraft, autos, oil and gas and logistics. We are assuming that these industries will disproportionately increase in their spending and close the gap with higher spending sectors during the 2020-2025 period.

Industry Spending on Cloud Services

The forecast identifies two industries, financial services and information technology, as the largest spenders on cloud services. Other industries forecast to have substantial spending include insurance, retailing and social media. Spending by these industries is forecast to grow more rapidly in the second time period, largely because of the increased spending on the Internet of Things in these sectors.

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9 The industry spending impacts presented here are not adjusted for a reduction in spending on traditional IT services. We will include that adjustment in later reports.
11 These figures do not include the offset for the spending shift described in the footnote above, footnote 4.
Two Waves of Spending Growth. This indicates that there is likely to be two waves of spending to move to a greater demand for cloud services over the ten years from 2015 to 2025. During the first wave, from 2015 to 2019, industries that are early adopters of cloud services and have made such services central to their business strategy will dominate total spending. During the second wave, from 2020 to 2025, there will be more industries where firms have recognized the significance of cloud services to their businesses. For many of these industries, the main firms will require a longer period of time to shift from more traditional infrastructures to ones that are software-defined.

Discussion of Findings:

This forecast asserts that the US economy will benefit significantly from enterprise spending on cloud services (cloud computing, data analysis and the Internet of Things).

The forecast does this by using an Input/Output Model framework with estimates of industry spending that are created from analyses of firm-level spending. We have compiled these industry estimates in a way that tracks the impact of cloud services spending on internal software development and outsourced services and software. In a similar way, we employ a second dimension of the analysis to explore how cloud services spending is divided into cloud-related software and services vs. Internet of Things.

Employing this framework provides insights into the scale and timing of new spending across the main early adopter industries benefitting from cloud services and the shift to software-defined enterprise architecture.

Taking an Input/Output model approach to this analysis provides a way to evaluate several different data streams and to determine whether the impact of cloud services is likely to be substantial or insignificant.
It offers a way to estimate spending for several downstream providers of services, such as Cloud Service Providers and telcos acting as Cloud Service Providers. In addition, this approach offers a way to incorporate different assumptions into a growth model such as the growing importance of the Internet of Things after 2020.

The results provide a way to estimate the impact on spending in the economy, on GDP and on jobs.

**Conclusions**

This forecast predicts that cloud services (and the New IP in general) will have a substantial impact on the US economy over the next eleven years. It reaches this conclusion based upon an analysis of industry spending on cloud services over this time.

We expect that the economic gains estimated here will also result in increases in productivity and investment. These may be more difficult to measure because traditional parameters to estimate US economic growth do not measure cloud services and changes in infrastructure spending very well.

**Appendix 1. The Shift of Enterprise Spending from Traditional IT Infrastructure to Cloud Services.**

In preparing this forecast, we have wanted to take into account the shifting of enterprise spending away from traditional infrastructure and to cloud services. From interviews with a number of firms that have shifted to cloud computing, we know that much of the funding for new cloud service deployments comes from shifting funds spent on traditional infrastructure to paying for new cloud services. This means that spending on cloud services is not completely new, but rather offset by funds that are shifting away from paying for traditional infrastructure.

The chart below from Nomura Research forecasts the shift that is occurring in IT consumption. We have estimated the size of this shift and corrected some of the overall estimates of spending on cloud services to reflect the shift as an offset to new spending. The chart illustrates how rapidly this shift is taking place.
This chart suggests that much of enterprises’ spending on cloud services is financed by cost savings due to the reduction of costs for traditional internal infrastructure, such as labor and equipment costs, and *shifting spending* that was dedicated to traditional IT infrastructure into spending on cloud services.

**Appendix 2. Industries that are often classified as “Digitized” could easily be in the Early Stages of Adopting Cloud Services**

Where industries are considered “digitized” or in the midst of a “the transformation in the use of infrastructure,” they are often the same industries we identified as early adopters of cloud services.
We want to argue that, based upon recent studies, many of which connect digitization to income inequality, that industries leading the adoption of cloud services are often those that are major investors in cloud service, data analysis and the Internet of Things.

If this is true, industries that are leading the move to cloud services are the primary ones identified as digitized industries. As noted above these digitized industries perform better than others, so we would expect that industries focusing on cloud services perform in a similar manner and that this is one of the benefits they achieve.

Spending Priorities in Digital Industries.

Nomura Research’s survey of CIOs taken in October 2015 and in March 2016 indicates that priorities for spending in enterprise IT center on cloud computing and big data analytics. These drivers are closely linked to cloud services spending.

![Fig. 4: What are the top drivers of IT spending for your company?](source:steven-norton-cios-reduce-budget-forecasts-for-2016-nomura-wall-street-journal-cio-journal-march-22-2016)

A second analysis by Deloitte and the Material Handling Industry (MHI) indicates that a wide range of software covered in the spending this study is forecasting for software development. This includes modifying and managing inventory and network optimization tools, operating sensor networks and automatic ID systems, operating cloud computing and storage, operating predictive analytics, managing software for wearable and mobile technologies, and operating and managing robotics and automation.

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12 Several studies that have examined whether there are differences in rents in the US economy, how firm performance impacts income inequality, offer interesting evidence concerning how the performance of digital firms has begun to help certain industries outpace others.
Digitized Firms and the Return on Capital.

McKinsey Global Institute has mapped the extent of digitization in US industries. Most of the classification of more digitized industries parallels the early adopter industries studied here. McKinsey identifies the most digitized industries as ICT (information and communications technology), media, professional services and finance and insurance. We agree with that characterization. The main difference between this study and the McKinsey analysis is its description of agriculture as a sector with low digitization. This disagrees with the focus on agriculture that we discuss above.
In searching for an explanation of inequality, Jason Furman and Peter Orszag estimated whether the return on capital for the highest 10 percent of publicly traded non-financial U.S. firms, i.e., the 90th percentile of firms that reported returns on invested capital (ROIC) during the 1965 through 2014 period, grew considerably more than the median. The figure excludes goodwill, an intangible asset.

Their analysis finds that “the 90th percentile of the return on invested capital across firms has grown markedly since around the early 1990s. The 90/50 ratio—that is, the ratio of the 90th percentile of the distribution of capital returns to the median—has risen from under 3 to approximately 10. In addition, the

dramatic returns on invested capital of roughly 100 percent apparent at the 90th percentile, and even 30 percent apparent at the 75th percentile, at the very least raise the question of whether they reflect economic rents......... The McKinsey data show that two-thirds of the non-financial firms enjoying an average return on invested capital of 45 percent or higher between 2010 and 2014 were in either the health care or information technology sectors.”

We would infer, with some caution, that the great returns of the 90th percentile firms might be a result of the transformation in the use of infrastructure, which has reduced capital costs and operating costs.


Digital Industries, Profitability, Wage Growth and Cost Savings. A similar study by McKinsey\textsuperscript{15} examines digitization, profitability, wage growth and cost savings. It identifies industries that are the beneficiaries of digitization. While the inference of the McKinsey analysis is that the source of the benefits derives from digitization, there is a remarkable similarity between the industries that are already significant users of cloud services and the sectors that McKinsey considers to be the more digitized in the US economy.

In a way that parallels the findings of Furman and Orszag, McKinsey finds that “firms that operate at the digital frontier can capture disproportionate gains.” It asserts that “the most digitized sectors in the US economy—especially software-intensive sectors such as media, professional services, and finance—tend to be highly profitable as well. Over the past 20 years, their average profit margins have grown two to three times as much as those less digitized sectors.”\textsuperscript{16}

Among the industries that have seen the greatest changes in profit margins are IT, media, and autos. Firms in these industries have moved rapidly to adopt cloud services and the Internet of Things.

Wage Growth and Digitization. McKinsey’s “Digital America” report also presents data to show that “Some highly educated or specialized workers, especially those in knowledge-intensive industries with strong profit growth such as finance and ICT, have enjoyed rapid wage increases [see the chart below]. But these sectors also display sharp wage dispersion; in other words, even within the most digital sectors, wage gains are going to a select group of workers.”\textsuperscript{17} “Additionally, [although] these industries make up only about 19 percent of total US employment, as digitized companies [they] are able to generate more output and capture more profit with fewer workers.”\textsuperscript{18}

The main industries cited as those with higher than average post-tax profit margin growth are information technology (IT), autos, and media, i.e., industries cited above as being early adopters of cloud services.

\textsuperscript{16} Manyika and others, pp. 20-21.
\textsuperscript{17} Manyika and others, p. 57.
\textsuperscript{18} Manyika and others, p. 57.
US profit margins have risen 60 percent in two decades, with industries on the digital frontier at the forefront.