

WHITE PAPER

Cloud Computing's Role in Job Creation

Sponsored by: Microsoft

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Introduction

While cloud computing is still just emerging as a computing style — IDC estimates that spending on public cloud IT services in 2011 was \$28 billion, compared with more than \$1.7 trillion in spending on total IT products and services — it already has begun changing how IT delivers economic value to countries, cities, industries, and small businesses.

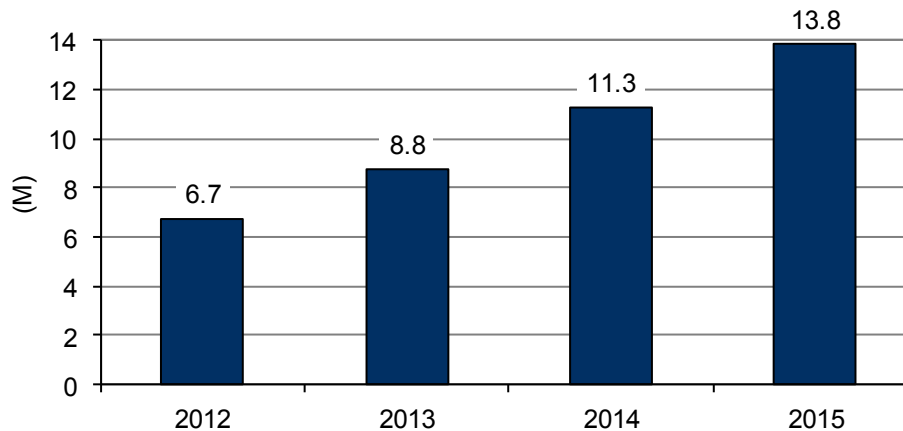
This is because cloud computing comes with unique economic leverage that means a little money spent up front leads to impressive returns down the line.

IDC estimates that last year alone, IT cloud services helped organizations of all sizes and all vertical sectors around the world generate more than \$400 billion in revenue and 1.5 million new jobs. In the next four years, the number of new jobs will surpass 8.8 million.

Figure 1 shows the number of jobs created worldwide as a result of cloud computing.

FIGURE 1

Cloud Computing Impact on Jobs: Total Cumulative Jobs Generated by Cloud Computing Worldwide at Year-End, 2012–2015



Source: IDC, 2012

This White Paper, commissioned by Microsoft, examines the impact cloud computing will have on employment around the world — by region, country, enterprise size class, and industry. It follows on research IDC has conducted on the economic impact of cloud computing since 2009 and the economic impact of IT since 2002.

The Economic Leverage of Cloud Computing

Cloud computing comes in many forms, from the use of third-party resources to store data to delivery of IT services within an enterprise based on virtualized infrastructure, self configuration, and automated provisioning. The former is an example of "public" cloud computing; the latter is an example of "private" cloud computing.¹

For four years now, IDC has been estimating the economic impact of public IT cloud services by taking conservative estimates of the degree to which they could increase IT innovation and then estimating the revenue and potential jobs driven by that innovation.

The following factors play into that equation:

- ☒ IDC estimates that, worldwide, 75% of IT spending is tied up with maintenance of legacy systems and routine upgrades, or "legacy drag." Cloud computing allows IT organizations to shift some of that legacy work to the cloud, freeing up budget to invest in IT innovation that supports business innovation.
- ☒ Lower IT and business process costs driven by the economies of scale in infrastructure and talent of cloud computing also free up funds for new business investment.
- ☒ The ratio of IT spending as a percentage of revenue is small for most organizations — 1% to 4%, generally. Conversely, business revenue, when driven by innovative IT, can be a significant multiple of IT investment.

For this study, IDC expanded on earlier work by extending the analysis to include spending on private cloud services. In general, the payoff may not be as big because internally provided cloud services may be involved with legacy systems, but in some cases not. For example, in emerging geographies where adoption of public IT cloud services is not that far along and where the demands of legacy systems are less, private cloud services may offer greater economic benefit in the short term than public cloud services.

As a result of extending this earlier work:

- ☒ Increased business revenue from the IT innovation enabled by cloud could reach \$1.1 trillion a year by 2015 across the countries studied.
- ☒ IDC estimates that spending on public and private IT cloud services will generate nearly 14 million jobs worldwide by 2015.

¹ IDC's definition of cloud computing can be found at <http://blogs.idc.com/ie/?p=422>.

- ☒ More than 50% of those jobs will accrue to small and medium-sized businesses, and more than 1 million jobs each will accrue to the banking, communications, and discrete manufacturing industries.
- ☒ A majority of these jobs will be found in emerging markets because of their immense workforces — 1.2 billion workers in China and India alone.

The Jobs Created

The basic rationale for job growth is that IT innovation allows for business innovation, which leads to business revenue, which leads to job creation — a premise that is not unique to this study.² To create a model that analyzes the role of cloud in job creation, IDC calculated the number of cloud-generated jobs by weighing several factors, including available country workforce, unemployment rates, GDP, IT spend by industry and company size, industry mix by country and city, technology infrastructure by country and city, regulatory environment, and other factors. Much of this methodology is explained in the ensuing pages of this White Paper.

In the IDC analysis, since the jobs created are the result of increased business revenue, we assume they match the industry mix by job function — marketing, sales, finance and administration, production, service, and so on. We also consider them net of jobs lost to cloud computing (e.g., in the IT organization itself).

In discussions we have had with CIOs testing and experimenting with cloud computing, we find that most look at migration to cloud computing as a way to free up existing resources to work on more innovative projects, not to do away with the positions entirely. In that way, cloud computing differs from traditional outsourcing. On the other hand, cloud computing could certainly change the skills requirements in an IT organization.

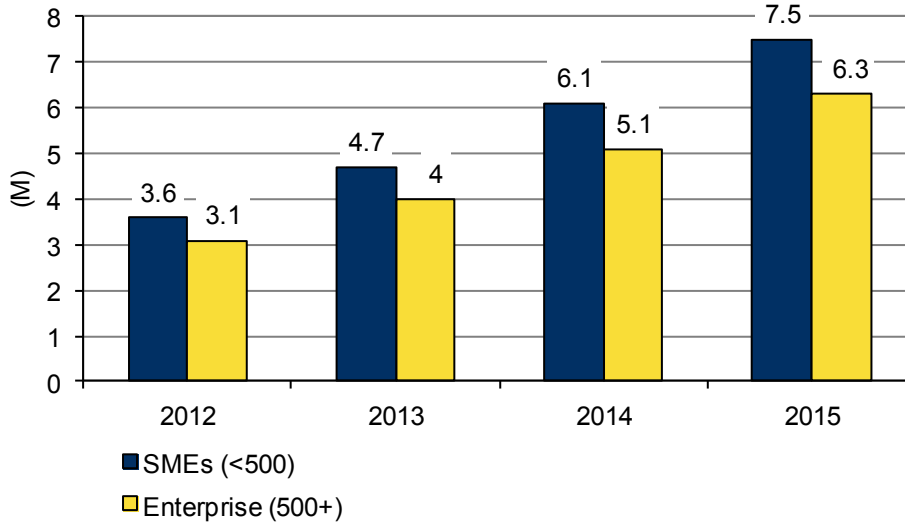
Jobs by Segment

By enterprise size class, the jobs will be split fairly evenly between companies with fewer than 500 employees and companies with 500+ employees, as shown in Figure 2.

² See, for example, the work of Professor Federico Etro of the University of Milan (<http://www.intertic.org/Policy%20Papers/CC.pdf>).

FIGURE 2

Cloud Jobs by Size Class: Total Cumulative Jobs Generated by Cloud Computing Worldwide, 2012–2015



Source: IDC, 2012

In most geographies, organizations with fewer than 500 employees account for a majority of total employment — more than 70% in some cases — but at the same time, they account for only a third of IT spending. This lower level of automation means that jobs created as a result of deploying IT cloud services won't mirror workforce size class segmentation. At the same time, IDC believes that small and medium-sized companies — at least those with computers — will adopt cloud IT services faster than larger companies. A number of factors play into this:

- ☒ The degree of "legacy drag" is less for smaller firms than larger firms.
- ☒ Capital constraints make public IT cloud services more attractive to smaller firms than larger firms but also limit investments in private IT cloud services.
- ☒ The concentration of small firms varies by industry, which will affect IT cloud service adoption.

The final distribution of cloud-generated jobs, therefore, is the result of an equation with offsetting elements — high percentage of employment, low percentage of IT spending, higher-than-average public IT cloud service adoption by computerized firms.

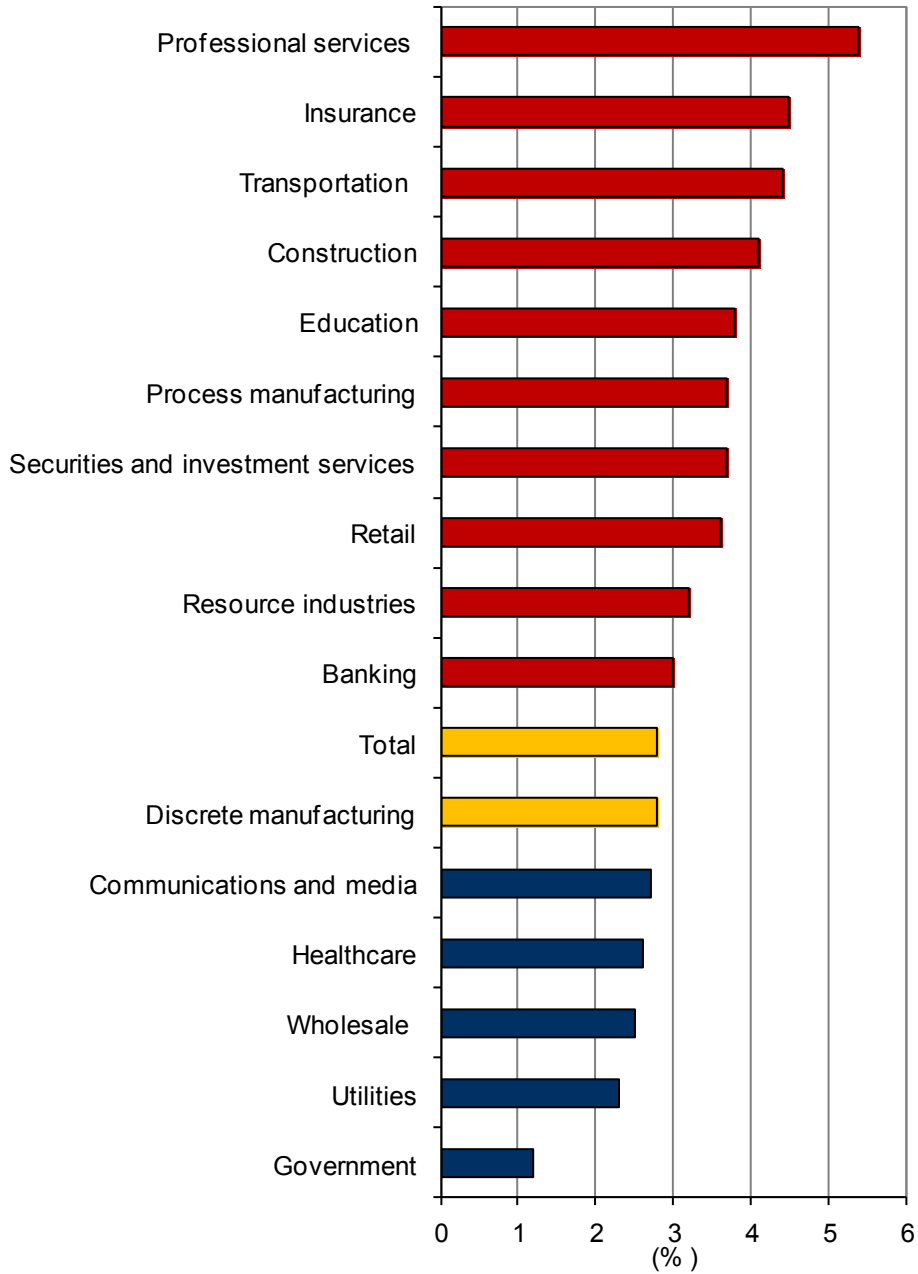
Jobs by Industry

By industry, the jobs to some extent mirror the industries by size, but not entirely. In research conducted in 2010, IDC found that adoption of IT cloud services varied greatly by industry. For instance, professional services firms spent nearly five times

as much on public IT cloud services as a percentage of IT spending as the government and nearly two-and-a-half times as much as utility companies.

FIGURE 3

Cloud Computing "Intensity": U.S. Spending on Public IT Cloud Services as a Percentage of IT Spending, 2011



Source: U.S. Public IT Cloud Services by Industry, IDC #226222, December 2010

The reasons for this difference in adoption of public IT cloud services by industry are complex. In some cases, the preponderance of small and medium-sized companies in a sector — for example, professional services and retail — will drive up adoption. In other cases, security issues will slow adoption in sectors, such as banking, that may typically be high users of IT. At the same time, they might increase adoption of private IT cloud services.

Some specific insights from the document cited above are as follows:

- ☒ Securities and investment services, typically early adopters of new technologies, are expected to be ahead of the average in the adoption of public IT cloud services as well. This should hold true across all geographies because of the global nature of the market.
- ☒ Banking, on the other hand, because of regulation, privacy concerns, and security issues will be closer to the average, despite being a traditional early adopter of technology. On the other hand, banking will be an investor in private IT cloud services. There may be more variation across geographies depending on the concentration of small lenders and banks.
- ☒ Insurance, generally less constrained by regulation than banking and yet a heavy user of IT, is already toward the top of the list in spending on public cloud services as a percentage of IT spending. On the other hand, it's one of the slower growth sectors in both IT and IT cloud services spending, with larger organizations slower to adopt cloud solutions than smaller organizations.
- ☒ Professional services, a large sector in itself, is a sweet spot of public IT cloud services spending because it contains a multitude of information-dependent midsize companies that will adopt software-as-a-service components of cloud computing, not to mention large services companies adopting infrastructure as a service. This holds true across geographies — to the extent that the firms in this sector spend on IT at all.
- ☒ Communications and media will run below the overall average in terms of spending on cloud services as a percentage of IT spending but will be a large — and fast-growing — sector when it comes to jobs. IDC expects the media segment to be one of the main users of storage on demand as a service to enable continuous service for content-heavy customer offerings. This sector already accounts for 20% of spending on public cloud storage in the United States. IDC expects this to hold true across geographies.
- ☒ Healthcare is expected to be a little slow in adoption of public IT cloud services as a result of regulation, security issues, and "legacy drag," but healthcare reform and the rise of connected healthcare will lead providers toward the public cloud for specific functions such as email and portal development. Many of the countries studied have initiatives under way similar to those in the United States for electronic medical records, which are tailor-made for public IT cloud services. Healthcare will also adopt private IT services, but much of this may still be aimed at making legacy systems more efficient, not at new business initiatives.

- ☒ The education sector, a small vertical but with better-than-average cloud-related job growth, will see IT cloud services as an attractive way to deal with budget constraints. Many are worried about being locked into a single cloud vendor, but in many developed countries, they may find cloud computing is still a good way to face budget cuts. In less financially constrained geographies, IT cloud services will offer standardization and lower capital costs of expansion.

- ☒ The manufacturing sector, even in developed countries, has a high percentage of small businesses, and adoption of cloud-based technologies is a viable way to simplify software management, improve service levels, and reduce capital costs. Thus far, customer relationship management (CRM) and collaboration have been the most popular cloud-based services in this sector. Over time, application development services and storage services will grow as manufacturers deal with infrastructure costs related to the growing use of digital models and virtual product testing. Process manufacturing has a higher percentage of IT spending devoted to IT cloud services today than discrete manufacturing, but that difference will narrow by 2015.

- ☒ Like manufacturing, resource industries have a high concentration of small businesses and fewer security and regulatory constraints than many industries but just an average level of spending on IT cloud services as a percentage of IT spending. What's more, worldwide, the sector is not particularly fast growing in either IT spending or cloud-related jobs.

- ☒ The retail sector, with lots of small businesses, relatively free of regulatory concerns, and with records and documents easily stored in the cloud and despite generally being slow to adopt new technologies, has been an early adopter of cloud computing. This may be abetted by a smaller sunk investment in legacy infrastructure compared with many other sectors.

- ☒ Utility companies, low on the vertical "intensity" scale, have traditionally been late adopters of IT, and IDC expects the same in adoption of IT cloud services. Regulated in many areas of operation, they have less competitive pressure to drive new revenue through IT than many other vertical industries. What investments they make may be heavier on the private IT cloud services side since these investments can be folded into capital budgets. This will change over time with the development of smart grids, optimized consumption models, and retail energy marketing, but not fast enough for the segment to rise faster than other industries.

- ☒ Government adoption of IT cloud services will be quite heterogeneous. We would expect to see more private IT cloud services at the federal level as large agencies offer services for their smaller entities, although services such as email, portal development, and collaboration will migrate to public IT cloud services. State, provincial, and local governments will be more likely candidates for public IT cloud services.

Combine this varying intensity based on industry dynamics with varying sizes of the industries studied for this White Paper and you get some big differences by industry in cloud-related jobs, as seen in Table 1.

TABLE 1

Worldwide Cloud-Generated Jobs, 2012–2015

Selected Vertical	2012	2013	2014	2015	2012 Through 2015 CAGR (%)
Banking	735,126	945,381	1,192,592	1,425,402	27.4
Communications and media	1,048,965	1,385,577	1,859,267	2,416,457	31.6
Discrete manufacturing	631,497	818,679	1,054,258	1,308,262	28.8
Education	347,598	452,584	580,606	723,671	29.0
Government	271,039	343,236	427,316	513,202	26.3
Healthcare	183,056	234,325	295,887	356,453	26.3
Insurance	344,057	442,562	559,401	673,440	27.7
Process manufacturing	446,681	564,700	706,593	854,342	25.9
Resource industries	127,719	171,886	229,344	296,547	32.7
Retail	351,486	440,404	540,495	639,281	24.2
Subtotal	4,487,223	5,799,334	7,445,760	9,207,056	28.5
All other industries	2,244,982	2,954,636	3,804,666	4,632,974	29.6
Total	6,732,204	8,753,969	11,250,426	13,840,030	28.8

Note: Public and private/hybrid cloud jobs are included.

Source: IDC, 2012

For instance, note that banking and communications are not particularly early adopters of cloud computing, but they each will have more than 1 million cloud-related jobs by 2015. This is because they are big segments and spend a lot on IT.

The government, on the other hand, which is the largest of the enumerated sectors when it comes to IT spending, is just middle of the pack in cloud-related jobs because of its slow pace adopting the new computing style.

Jobs by Geography: Overview

The data tables that accompany this document show cloud-generated jobs by region, country, and select metropolitan areas in the United States and Canada.

The factors determining the number of jobs that might be created in a particular geography are numerous and include:

- ☒ The current and projected level of spending on IT
- ☒ Current and projected spending on IT cloud services
- ☒ IT as a percentage of GDP or output (i.e., the degree of current automation)
- ☒ Percentage of IT work done on legacy systems and routine upgrades
- ☒ Workforce levels by industry and/or size class
- ☒ Economic base by industry and/or size class
- ☒ The ratio of private IT cloud services spending to public IT cloud services spending

For instance, in the U.S. metropolitan area splits, New York accounted for just over 9% of the U.S. cloud-generated jobs in 2011, yet only 6% of the U.S. workforce. But the workforce in New York is more concentrated in banking, communications, securities, and professional services than the workforces in most other cities, which increases New York's share of U.S. cloud-related jobs. Washington, D.C., on the other hand, has a higher concentration of government workers than many other cities, so while it commands more than 2% of the U.S. workforce, it accounts for less than 2% of the U.S. cloud-generated jobs.

Because of the relatively high level of computerization in the United States and Canada, variations in share of total U.S. or Canada jobs of a designated market area (DMA) compared with overall employment are driven mostly by industry differentiation; there is some differentiation by IT spending level.

By region, however, the differences are more subtle. Between emerging and developed countries, the numbers are driven more by the degree of IT spending and adoption levels of cloud, public and private, than industry makeup.

By Major Region

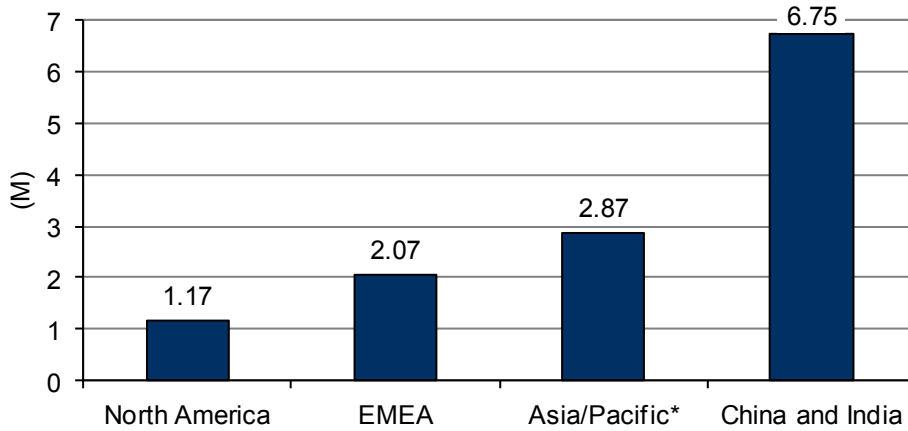
The distribution of cloud-related jobs by region is a mix of employment by region crossed by investment in IT cloud services by region. The dynamics by major region are as follows:

- ☒ North America (defined by IDC as the United States and Canada) is driven by the high adoption rate of IT cloud services in the United States. According to IDC's regional forecast, the United States accounted for 62% of worldwide spending for public IT cloud services last year, compared with 35% of worldwide IT spending. Canada, on the other hand will be a much slower adopter of public IT cloud services and therefore a more aggressive adopter of private IT cloud services. Coming from a smaller base, though, cloud-generated jobs will grow 50% faster in Canada than in the United States. Despite the region's high aggregate share of spending on IT cloud services, it will have the lowest total number of cloud-generated jobs in 2015. This is because it has the smallest workforce and a high "legacy drag" for both public and private cloud services.
- ☒ EMEA, a complex mix of developed and emerging countries, has more cloud-created jobs than North America primarily because of its workforce, which is nearly four times as large. Last year, EMEA's spending in public IT cloud services was 40% of North America's, but its investment in private cloud was equal to or more than that of North America. This, coupled with the larger workforce, drove cloud-created jobs higher than North America.
- ☒ Asia/Pacific, except for a few small countries that account for only about 5% of the total workforce, is dominated by two countries in terms of job creation — China and India. The region is a more aggressive adopter of public IT cloud services than one might think, accounting for 12% of such services worldwide (compared with 25% of IT spending). In addition, the region has two other factors in favor of cloud-based job creation: (1) infrastructure challenges will help spur investment in private IT cloud services, and (2) in such an emerging market, spending on IT cloud services will be subject to less "legacy drag" than in developing regions. But, of course, the primary reason for such high job numbers is the immense workforce in the region.

Figure 4 compares the regions in total cloud-created jobs in 2015. For context, we have broken out China and India from the rest of Asia/Pacific.

FIGURE 4

Cloud Computing Jobs by Region: Total Cumulative Jobs Generated by Cloud Computing Worldwide at Year-End 2015



* Except China and India

Source: IDC, 2012

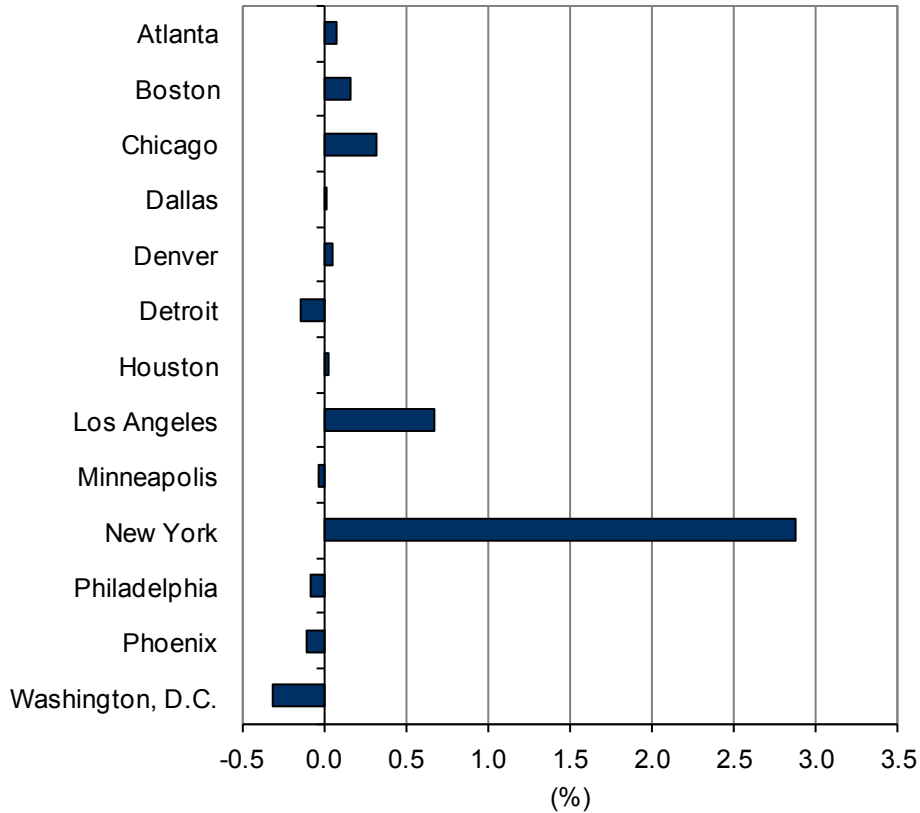
U.S. Metropolitan Areas

Part of this study was to develop a picture of cloud-generated job creation in 13 major metropolitan areas, also called designated market areas (DMAs). As with countries and regions, this was primarily an exercise in understanding IT spending by vertical in each DMA, the potential for spending on both public and private cloud computing, and the dynamics of the local economy.

For the most part, the cloud jobs created in each DMA are proportional to the DMA's share of the U.S. total workforce, but not exactly. Figure 5 shows how each DMA varies from its share of the U.S. workforce.

FIGURE 5

Cloud Jobs Versus Total Jobs: Percent of U.S. Cloud-Generated Jobs – Percent of Total U.S. Workforce



Source: IDC, 2012

These differences are the result of three factors: (1) IT spending less than or more than the DMA's share of the U.S. workforce, (2) its mix of spending on public and private cloud, and (3) its industry mix (refer back to Figure 3).

For example, by DMA:

- ☒ **Atlanta:** While this DMA's vertical industry set is less public cloud intense than the United States as a whole (e.g., higher on utilities and lower on professional services), its IT spending and investment in private IT cloud services are above the U.S. average, making its share of U.S. cloud-related jobs higher than its share of the U.S. workforce.
- ☒ **Boston:** The vertical industry mix is such that this DMA has the same public cloud intensity as the United States — its educational and financial sectors are offset by the healthcare and government sectors — but its general level of computerization is high, driving its share of cloud-created jobs higher than its share of the U.S. workforce.

- ☒ **Chicago:** IT spending and spending on cloud services are higher as a percentage of the U.S. total than its share of workforce, and the vertical mix is more cloud intense than the U.S. as a whole (higher in banking, professional services, process manufacturing, etc.).
- ☒ **Dallas:** While this DMA's vertical makeup is a little less cloud intense than the U.S. average (lower professional services) and its investment in private cloud services will lag some of the other DMAs, its level of computerization compared to its workforce is enough to drive its share of cloud-created jobs up to its share of the U.S. workforce.
- ☒ **Denver:** The same dynamic is at work for Denver as for Dallas, except Denver's investment in private cloud IT services will be higher and its vertical "intensity" lower, primarily because of an unusually large communications and media sector.
- ☒ **Detroit:** Jobs created by cloud computing are a smaller share of the U.S. total than this DMA's workforce is of the U.S. workforce. This is the result of lower-than-average vertical intensity (more retail and utilities, fewer professional and financial services) and lower investment in private IT cloud services.
- ☒ **Houston:** Although the vertical mix in this DMA is a little different, the general dynamics are the same as those of Dallas.
- ☒ **Los Angeles:** This DMA has a share of U.S. cloud-generated jobs a little ahead of its share of the total workforce despite a mix of vertical industries that will adopt cloud computing more slowly than the U.S. average (particularly communications and media). This is because of a better-than-average expected investment in private cloud computing and an IT spending per employee that is higher than the U.S. average.
- ☒ **Minneapolis:** In this DMA, cloud-created jobs are a lower percentage of total U.S. cloud jobs than the Minneapolis workforce is of the total U.S. workforce, mostly because of lower-than-average investment in private IT cloud services. In its vertical mix, cloud-intense verticals and verticals that aren't cloud-intense balance each other to make the total mix about the same as the United States in vertical intensity.
- ☒ **New York:** Almost all factors that would increase this DMA's share of cloud-created jobs beyond its share of the total U.S. workforce are at play: verticals heavy in financial and professional services and lower in utilities and discrete manufacturing, higher-than-average investment in private IT cloud services, and a general level of IT spending much higher than share of the total U.S. workforce.
- ☒ **Philadelphia:** Although this DMA has a good mix of verticals, especially professional services, education, and process manufacturing, its level of IT spending as a percentage of total U.S. spending is lower than its share of the total U.S. workforce, dragging its cloud jobs below its share of the U.S. workforce.

- ☒ **Phoenix:** This DMA's vertical mix is a story of cloud-intense industries (e.g., professional services, banking) being cancelled out by non-cloud-intense industries (e.g., discrete manufacturing) and lower-than-average investment in private IT cloud services. Combined, these factors drop the DMA's share of cloud-created jobs below its share of all U.S. jobs.
- ☒ **Washington, D.C.:** Although this DMA has a higher-than-average investment in private IT cloud services than many of the other DMAs, its vertical mix (high government, high communications and media) helps drive its share of U.S. cloud-created jobs below its share of all U.S. jobs.

CONCLUSIONS

The study results seem to indicate one of the beauties of cloud computing — it frees enterprises from the constraints of the client/server model, where up-front investments in infrastructure are required to pursue technological solutions to business problems. Emerging markets, small cities, and small businesses have as much access to the benefits of cloud computing as large enterprises or developed nations. The availability of private IT cloud services as an option where public cloud IT services are not fully available or where there are infrastructure challenges is a nice hedge for emerging markets.

Beyond this, and not measured in this study, is the use that cloud computing can be put to beyond mere capital cost avoidance. Organizations large and small can host their own cloud services for their own customers. IT cloud services can support other industry services offered in the cloud, from e-government and online health records to product development and design, logistics, and billing. And here may be an even bigger payoff for local economies than the adoption of IT cloud services alone.

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