451 Alliance Spring 2015 *Global Digital Infrastructure Trends* Articles:

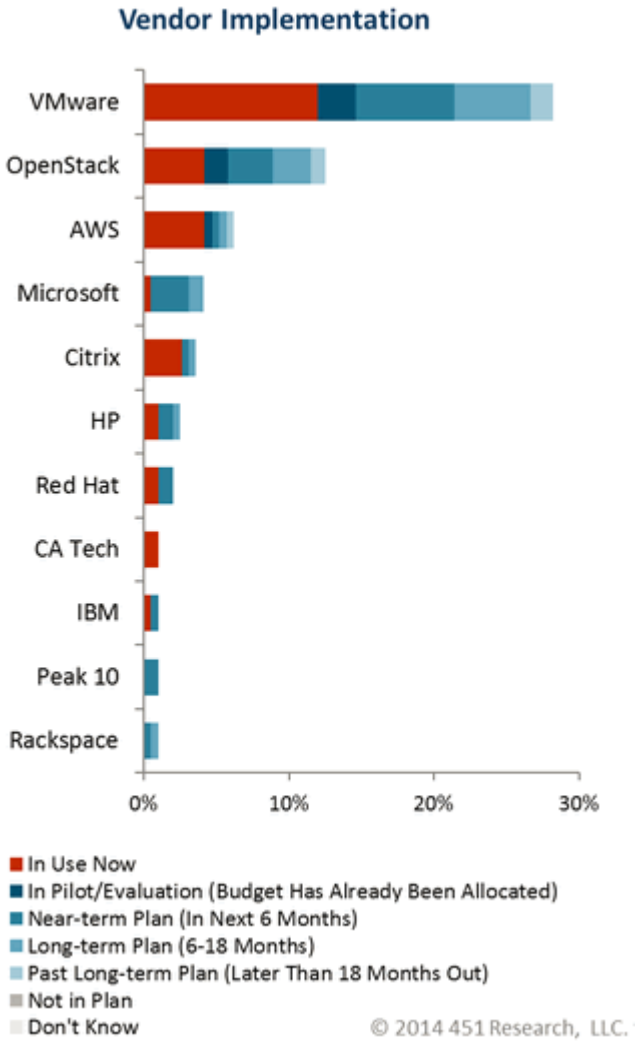
I. Cloud Platform Choice: A Crucial Strategic Decision

As competing factions vie for position in the next round of cloud wars, enterprises are busy choosing the platforms on which to deploy their workloads. Contenders such as VMware, the OpenStack Community, Google, Amazon and Microsoft are all vying for that prize.

Recent 451 Research surveys show that the selection of cloud platforms is one of the most important strategic choices enterprises will make in the next two years.

Less than 12 months ago, VMware was the clear front-runner in the cloud platform space. Just a few months later, much has changed. Other players with deep pockets and established street cred are muscling up to the table and rolling the dice.

While VMware still leads the pack from a total opportunity perspective and CloudStack has lost momentum, the OpenStack community has been bubbling toward the top.

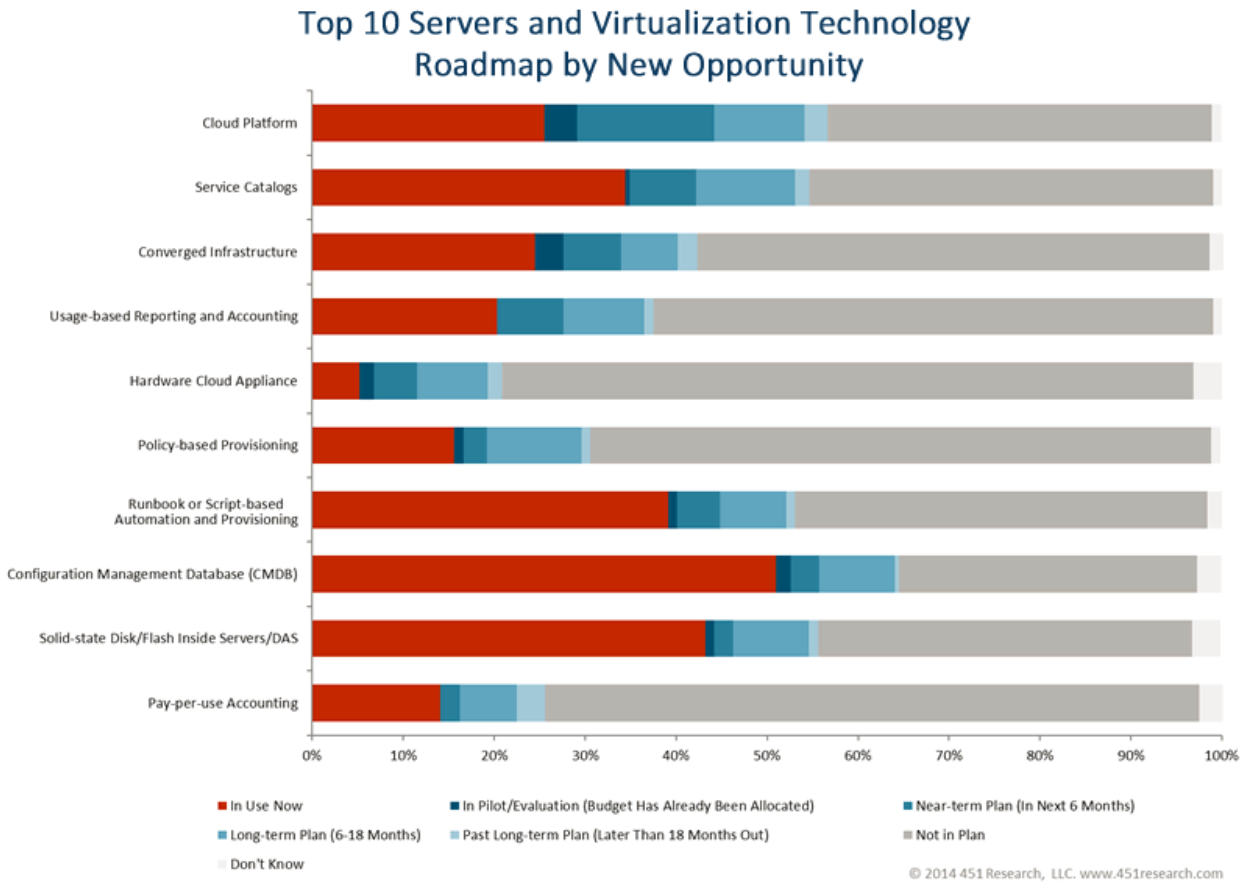


A second 451 Research survey on enterprise cloud platform selection also shows the OpenStack community quickly gathering momentum. And the same study shows cloud platforms are the technology with the greatest overall potential for the next two years.

But above and beyond platform battles between VMware and OpenStack – and taking into account Microsoft and public cloud juggernauts such as Amazon Web Services, Google and others – the entire scenario may change going forward.

One example: Our last few 451 Research surveys have shown the balance of enterprise IT attention shifting away from a hardware-oriented focus to a more abstract, software-defined future.

A look at the top 10 server and virtualization technologies shows that seven are now software focused. Moreover, while three hardware-oriented technologies are in the top 10 (converged infrastructure, hardware cloud appliances and solid-state disks) each is relegated to a supporting role within a software-defined datacenter infrastructure.



The choice of cloud platform – the environment you select and invest in for your future workload development and deployment platform – is a strategic, long-term commitment that will either prove effective if selected wisely or limiting and even disastrous if things go awry.

That said, 2015 spending is showing across-the-board growth for cloud platforms and software-enabling technologies in general – yet one more indicator that platform selection is one of the most important strategic choices enterprises will make in the next two years.

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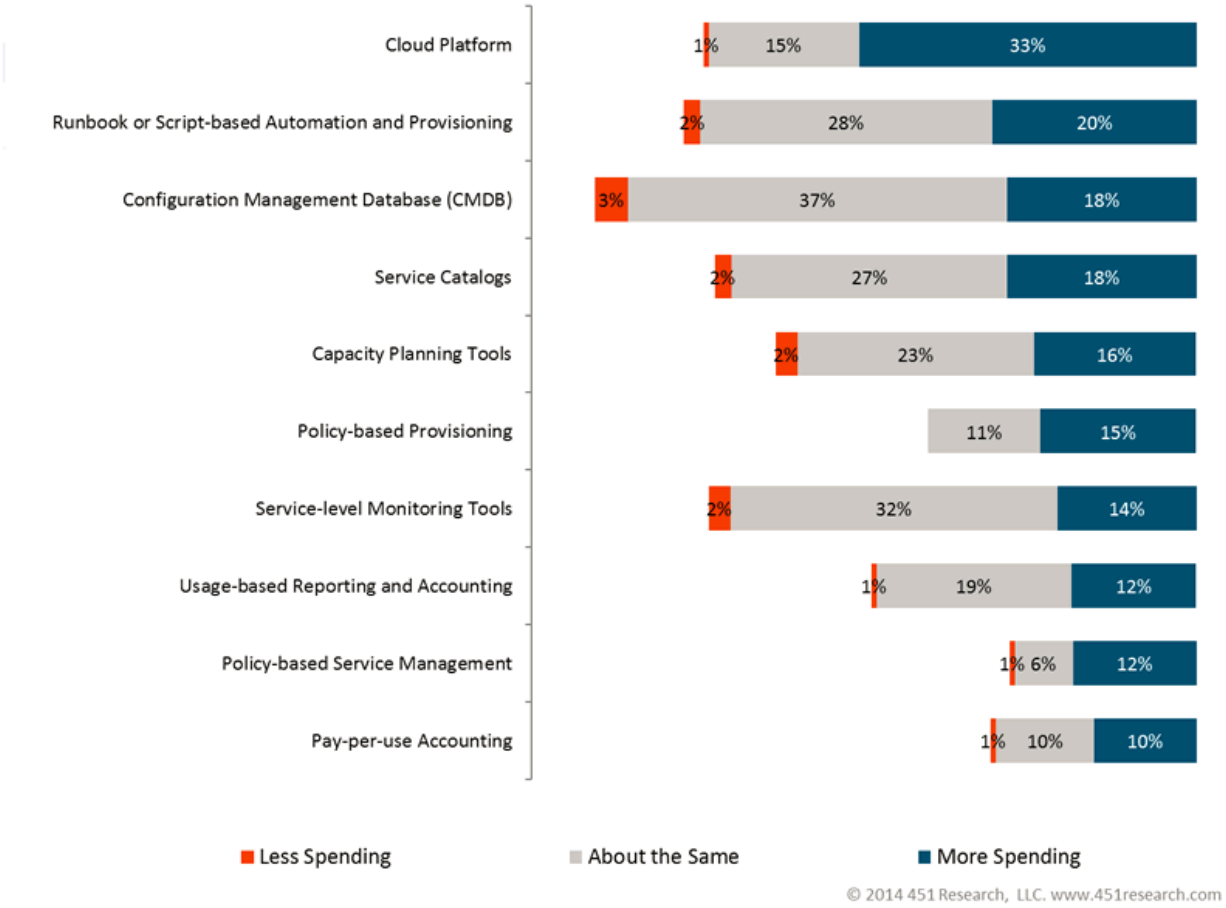
2015 vs. 2014 Spending Change for Top 10 Software Technologies



II. A Small Watch – But A Big Game Changer?

Apple is accustomed to being in the spotlight, but March has provided an over-the-top opportunity for the tech leader to dominate the news headlines.

In recent weeks, Apple became the newest member of the Dow 30 Index, hosted a media event to introduce its line of luxury smartwatches, and took a big step toward reinventing the way people watch television by linking with HBO.

When Apple officially joined the Dow 30 on March 18, it replaced AT&T and is now the fifth-largest component with a weight of 4.7%. Apple increased the technology portion of the Dow 30 by 11.2 percentage points to 30.9%, and caused the telecom sector weight to dwindle to just 1.8%.

It would not have been practical to add Apple to the Dow index before it executed a 7:1 stock split last summer. Were it not for that split, Apple's shares would currently be trading at nearly $900, which would gobble up too much of the weighting.

The fabled Dow benchmark is nearly 120 years old and has lost much of its significance in recent decades. Two big problems are its methodology (driven by price weightings of constituents rather than market values) and its record of being a lagging indicator and failing to keep pace with changes in the economy as a whole.

Regardless of its entry into the Dow 30, Apple's ascent shows no sign of withering as its smartwatch prepares to enter the marketplace.

A Category Maker?

Apple CEO Tim Cook calls the Apple Watch "the most personal device we have ever created." It's the key to this product, which is the company's first foray into the luxury brand area. Until now, Apple has been a technology company, but with the smartwatch, it enters new territory, posing challenges for itself and for a range of new competitors.

The Apple Watch straddles the line between jewelry and consumer electronics, and is creating different types of expectations from consumers about quality, obsolescence and the buying experience.

The watch, which ranges from $349 to $17,000, enters a field where numerous other companies have already traveled, but none have managed to gain widespread adoption as consumers struggle to find compelling apps for the devices.

One question is why would anyone buy a $17,000 watch that will be effectively obsolete in a couple of years and serve little purpose as an heirloom? As a new symbol of luxury, the highest-priced watches will gain some fans, but Apple will generate most of its sales from its lower- and mid-priced models.

451 Research's latest ChangeWave survey does indicate the Apple Watch is set to roil the market. Data shows that Apple (76%) is the overwhelming number one choice among buyers who plan to buy a smartwatch. Samsung (3%) is a distant second.

These are mind-boggling numbers even for Apple, whose iPod, iPhone and iPad established major product categories and captured the imagination of consumers. The survey evidence to date suggests the Apple Watch has the potential to follow a similar trajectory.

The watch will go on sale on April 24 in nine countries, although the company will start accepting preorders on April 10. Apple states the watch will have 18 hours of battery life and will be able to conduct phone calls.

On Wall Street, one of the most optimistic projections comes from analysts at Cantor Fitzgerald, who predict Apple Watch will be the best-selling new product category (in its first 12 months of availability) in Apple's history. The firm expects 20.6 million units sold in the first year versus 19.5 million for the iPad.

But in reality, there is no fully accurate basis for predicting how many watches Apple will sell this year or beyond. What definitive benchmark could one use for measuring? The Apple Watch cannot be compared to traditional watches or even to any of the smartwatches currently sold.

Rather, Apple is in the process of creating a new product category, and as with Apple's previous mobile devices, it will take time to fully understand how people will use the Apple Watch.

Here at 451 Research, we will continue to track the evolution of the Apple Watch and its competitors in the wearables space.

III. Software-Defined Storage: A Proxy for Storage Transformation

Enterprise storage – so long an afterthought of the IT department – is changing. A combination of relentless data growth, capital expense, complexity, fragmentation and huge overhead, is prompting many enterprises to rethink their storage infrastructure strategies.

Although the challenges aren't new, changing software infrastructure higher up the stack has become a catalyst for changes in storage. Because enterprises increasingly want their IT stacks to look and behave like clouds, storage infrastructure is working to catch up.

The transformational term for this rethinking of storage strategies – now used by storage suppliers old and new – is software-defined storage (SDS).

While the term itself is an offshoot of the broader 'software-defined datacenter' and is overused, it speaks to the fundamental changes that have been taking place in enterprise storage systems in recent years.

Broadly, the term software-defined storage speaks to a number of related and simultaneous storage technology trends that have been occurring in recent years, including:

- The shift in storage system design away from ASIC-based designs to using x86 industry-standard processors.
- The emerging presence of storage software functions that are divorced from the underlying hardware, essentially 'virtualizing' the underlying storage – sometimes described as the separation of the data plane from the control plane.
- The emergence of storage stacks that utilize open source software, often in conjunction with broader open source platforms such as OpenStack.

SDS is not a single type of product or technology; rather, it's a pervasive approach that can be applied to a wide number of use cases and technologies. Indeed, one of the promises of SDS is that it can help simplify and consolidate highly fragmented storage infrastructures.

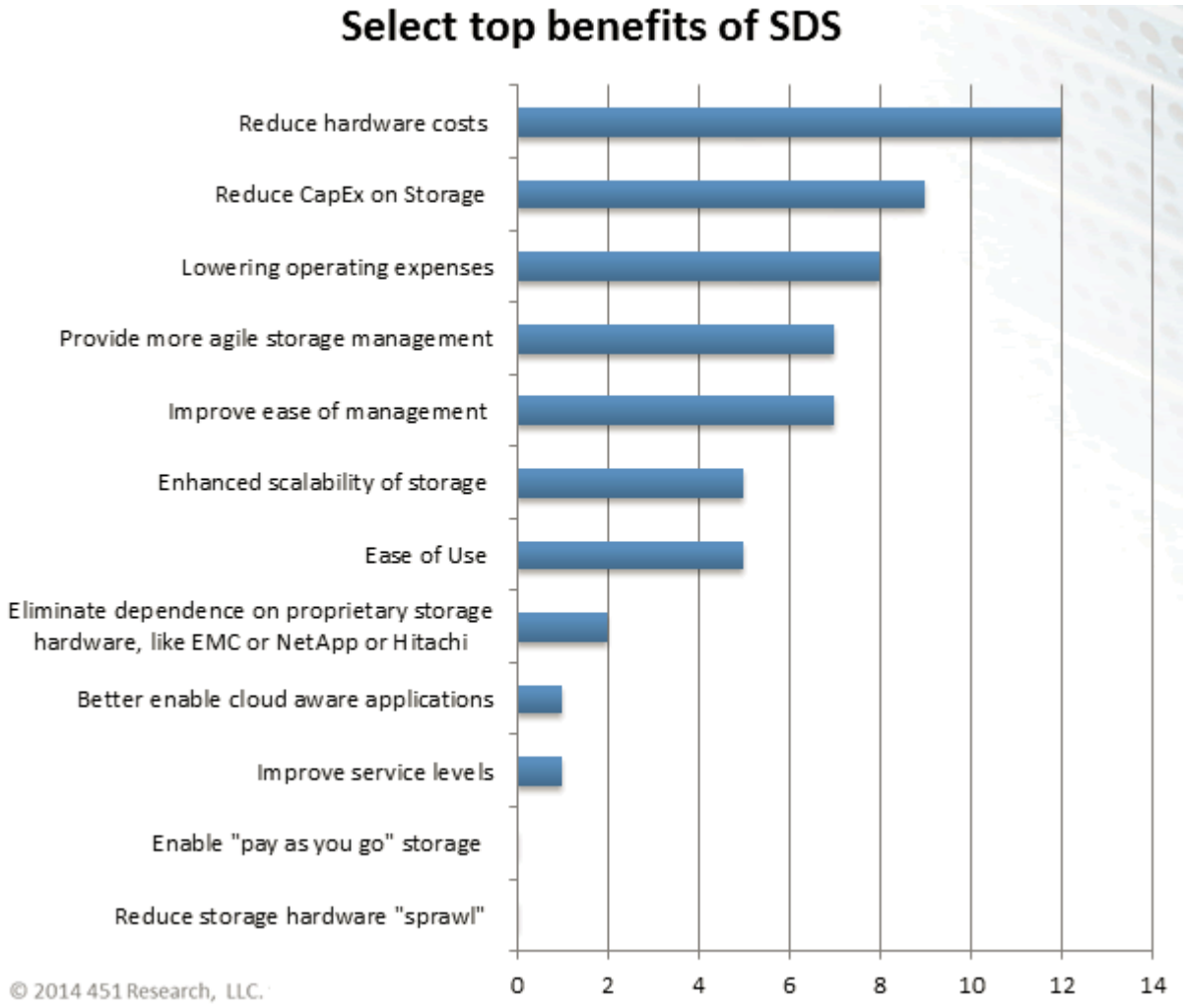
In sum, the term SDS is a synonym for storage transformation, with the overall goals of efficiency, agility and lowering management costs.

SDS: perceived benefits and requirements

So what do IT and storage decision-makers have to say about the benefits of moving to a software-defined storage strategy?

A 451 Research study of 100 enterprise storage managers conducted in late 2014 had respondents citing two top benefits – reducing hardware costs and lowering overall storage capex.

Reducing opex was the third-most-cited benefit, further highlighting that cost savings is the principal driver of current SDS strategy.



So where are SDS approaches garnering traction?

It's perhaps easier to start with where they're not: SDS approaches won't initially be used in the heart of the datacenter to run mission-critical applications, unless they can be packaged with fully baked appliances.

Instead, initial SDS adoption will start mainly in storage for non-mission-critical applications – test and development applications, for example – that create large amounts of data that needs to be stored, protected and retained, but without requiring the same level of reliability, availability and serviceability as mission-critical applications running on enterprise SANs.

SDS will also show up this year in the emerging 'hyper-convergence' space. Among other things, the simplicity of converged storage-server architectures merging with SAN-like data-resiliency services has huge appeal.

SDS usage may also develop through the enabling of cloud-based and cloud-like storage capabilities – whether it be through a service provider offering public cloud storage services or an enterprise implementing on-premises private storage cloud.

Awareness of the value and limitations of SDS offerings will accelerate in 2015. While current deployments are largely confined to non-critical applications, SDS offerings will continue to develop and mature along multiple trajectories, creating huge opportunities for innovation.

IV. New FCC Regulations and the Cloud

After much public debate, the US Federal Communications Commission recently passed a sweeping proposal to reclassify broadband and wireless Internet traffic.

Under the new rules, Internet traffic across cable and wireless services is reclassified as a telecommunications service – and not an 'information service' – thereby placing it under much stricter controls with regard to fair pricing and access to Internet-supported networks.

The new rules treat broadband Internet service as a part of civic infrastructure – almost like a public utility – and have kicked off a heated debate on what this all means for the cable broadband market.

Potential Impact

The ruling covers a huge portion of today's US Internet market, affecting three major constituencies – telecommunications providers and ISPs; Internet content, application and cloud service providers (CSPs); and consumers.

In many ways, the FCC has effectively frozen the market in its current state. The new regulations feature 'bright-line rules,' including no traffic prioritization as a paid service, and no blocking or slowing selected Internet content and services.

Despite this transformation of the Internet into a regulated telecommunications service, the proposal still leaves major industry players with considerable power – e.g., ISPs will be allowed to maintain 'reasonable' traffic management procedures to deal with bandwidth hogs, and they can continue to set usage limits.

The FCC also won't force cable providers to separate Internet from TV and telephone – known as 'last-mile unbundling' – and there will be no pricing regulations or new fees or tariffs.

In short, everything broadband providers already do, they will continue to do, including direct negotiation with large customers for service capacity and traffic management. What they *can't do* is use pricing and traffic management to selectively enhance or disadvantage customers based on the perceived value to that customer.

Online content producers and cloud service providers are the major winners here. Overall, this group previously had the most to lose from any shift toward tiered Internet services.

Of course, larger players such as Google could always have negotiated on the strength of their spending, but the FCC ruling protects smaller providers who otherwise would have quickly been pushed into a lower tier by default.

Historically, the Internet economy has always hinged on guaranteed equal access to connectivity – and most online businesses are predicated on that fact. The FCC and the White House are well aware of this, and have generally sided with cloud content and service providers in recent Republican and Democratic administrations alike.

'To preserve and promote the open and interconnected nature of the public Internet' has actually been a US policy directive since 2005. The new FCC rules are the most significant and strongest expression of that policy to date.

What Next?

Previously, Net Neutrality was a de facto agreement arising out of commercial, political and social pressures; now it's codified. The new rules have largely reaffirmed the general public impression that Internet access is a fundamental part of civic infrastructure.

But while these regulations are good for the IT market – and especially cloud service providers – the future of broadband infrastructure is by no means guaranteed.

In their search for higher margins, network providers are still capable of moving the market in yet-to-be-determined new ways that could well result in more fractured access for consumers. But for now, the new FCC regulations are a major step in the other direction.

V. On-Premises: A New Trend in Database as a Service?

As public database-as-a-service (DBaaS) offerings move to the cloud, a 451 Research study indicates that there are still numerous challenges preventing mainstream enterprise adoption – not least of which are people, time, cost, security, and inherent resistance to change.

These challenges have opened the door for private DBaaS, which is fast becoming a new stage in the database industry's evolution.

Data Gravity

When it comes to database workloads, the concept of data gravity points to resources migrating to platforms that store the most data – or perhaps the most *important* data.

It is this data 'gravitational pull' (along with cost and other barriers to cloud adoption) that is leading enterprises to deploy new production workloads on-premises – even when applications have been developed and tested in DBaaS environments.

That's not to say that enterprises aren't highly interested in the potential benefits of DBaaS – many are. But rather than move data off-premises to take advantage of the benefits, many want to replicate such benefits on-premises instead.

The Private DBaaS Solution

'Private DBaaS' as a solution may initially seem counterproductive. But it makes sense in a context where barriers to public cloud adoption are still keeping data tethered to physical datacenters.

Self-interest is also a factor here. For some time, enterprise IT administrators and database administrators (DBAs) have seen their roles side-stepped by 'shadow IT' and the move toward public cloud.

By privately delivering the benefits of DBaaS within their enterprise datacenter, IT managers and DBAs are enabling the flexibility that users have come to expect from the cloud while maintaining private control over mission-critical database deployments.

Delivering such a balance privately isn't easy for IT administrators and DBAs, but it takes advantage of database provisioning and configuration management platforms that are enabling them to meet the requirements of the application developers.

Private DBaaS adoption has not been dramatic – no one changes their database until they need to – but 451 Research expects greater interest in private DBaaS during 2015 as more enterprises evaluate their next-generation strategic data platforms.

Both Orchestrate and IBM's Cloudant Local are recent examples of DBaaS vendors bending to the on-premises requirements of the enterprise.

Orchestrate has launched a managed service version of its database service offering, driven by enterprise demand for a version that can use data stored on-premises. Similarly, IBM has launched a new on-premises version of the software behind its Cloudant DBaaS offering.

Both moves have been driven by customer demand for on-premises deployments.

While Orchestrate is convinced that most database workloads will eventually move to the cloud, enterprises wanted an on-premises version of its current service, which provides API-level access to multiple databases.

Similarly, IBM's Cloudant Local was designed to gain adoption among potential customers that aren't ready to put their data in the cloud, but are still interested in deploying distributed database services within their internal infrastructure.

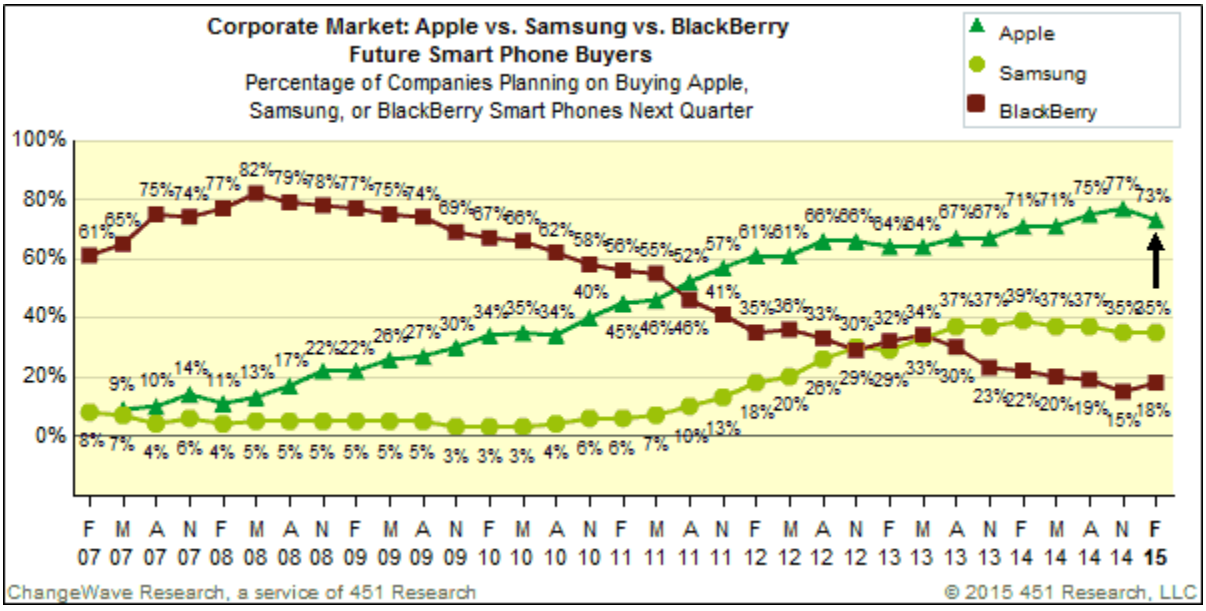
These are two examples of on-premises DBaaS offerings. It remains to be seen whether other established database vendors will bother to launch a stand-alone DBaaS offering. But there is good reason to do so – on-premises is currently a clear trend in DBaaS.

VI. Seasonal Slowdown in Corporate Smart Phone Purchasing

A recent 451 Research ChangeWave survey of 1,536 respondents involved with IT spending within their companies finds that planned smartphone buying is slowing in the second quarter.

A total of 36% of respondents reported that their company plans to buy smartphones next quarter – a 3-point decline from the November survey, and similar to the drop registered a year ago.

Apple vs. Samsung vs. BlackBerry. At the individual manufacturers' level, Apple (73%) continues to dominate planned corporate smartphone purchases – although it's 4-points off its all-time high in our previous survey.



Samsung (35%) remains unchanged from previously – still firmly in second place. Note that this survey was conducted before Samsung officially announced the new Galaxy S 6 models, which are available this month.

In a surprising finding, BlackBerry demand is showing an uptick. After hitting an all-time low in the previous survey, BlackBerry (18%) has increased 3-points – its first improvement since March 2013.

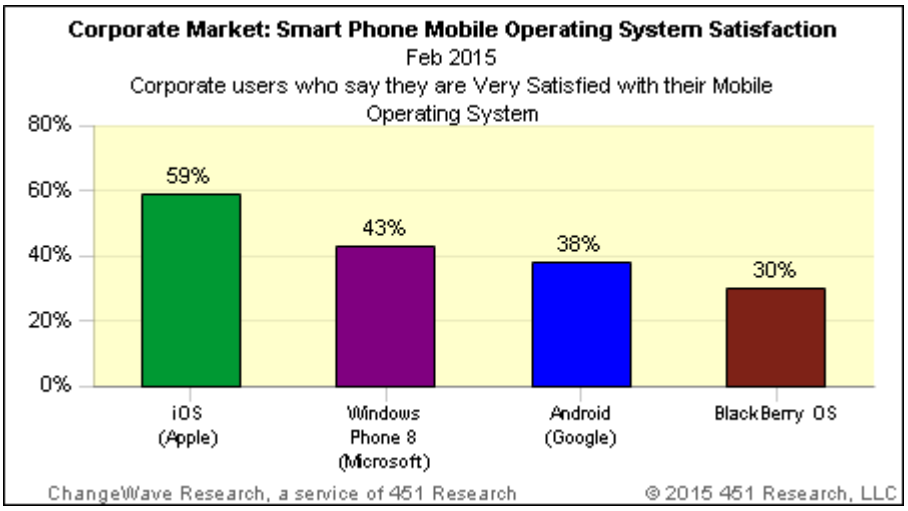
BlackBerry's latest turnaround efforts are focusing on partnerships and mobile enterprise security solutions that integrate with iOS, Android and Windows Phone devices. BlackBerry also recently made several announcements of new software and device releases at Mobile World Congress.

Among other manufacturers, Nokia (7%) has registered a slight increase (up 1-point) in smartphone buying – its first in three quarters. Motorola (8%) is also up 1-point, while HTC (6%) has fallen 1-point to its second-lowest level of the past five years.

Mobile Operating Systems

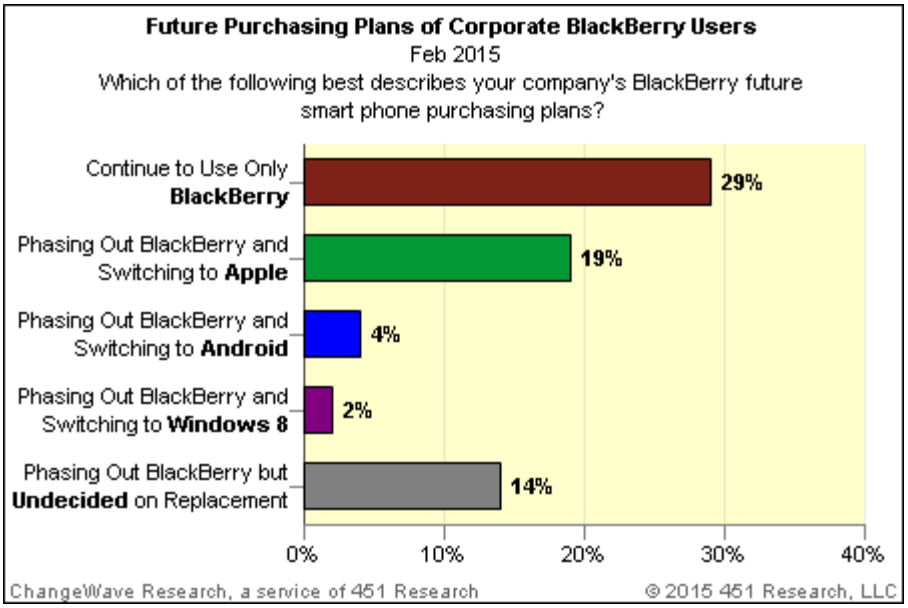
In terms of mobile OS preferences, Apple's iOS (70%; down 5-points) remains the clear leader among corporate buyers, with Google's Android (37%; down 1-point) in second place. Although it's a distant third, BlackBerry OS (17%) is up 1-point – another positive sign for the Canadian company. Windows Phone 8 (10%) is also 1-point higher.

The survey took a close-up look at company satisfaction with smartphone operating systems. Here Apple continues to lead, with 59% of iPhone business users reporting they're *Very Satisfied* with iOS.



Windows Phone 8 (43%) edges out Android (38%) for second, while BlackBerry (30%) brings up the rear.

In a key finding that illustrates the huge challenge BlackBerry still faces, only 29% of companies that currently provide employees with BlackBerry smartphones say they'll continue to do so going forward.



VII. The Brill Awards: Uptime Institute and Datacenter Excellence


Ken Brill

The Uptime Institute – an independent division of The 451 Group – has selected its winning case studies in this year's Brill Awards for Efficient IT.

The Brill Awards – created in honor of Uptime's late founder, Ken Brill – extend the scope and replace the Green Enterprise IT Awards, which were founded in 2008 by Ken Brill and focused on datacenter energy and resource efficiency.

Notably, most of the 13 winners this year came from the enterprise datacenter side (rather than the commercial side). Two organizations in particular – Boeing and United Airlines – received Global Leadership Awards for their demonstrated excellence across multiple disciplines and regions:

Boeing: The Boeing team was selected for its holistic approach to IT efficiency. The company achieved significant savings by focusing on new server hardware technologies and integrating the requirements and capacity plans into their latest datacenter designs.

Their new IT hardware procurement strategy reduced power consumption by 30% and also provided a 50% reduction in floor-space requirements. Moreover, the adoption of blade servers

and converged infrastructure reduced Boeing's electrical and communication cabling by more than 60%.

The team also deployed a third-party datacenter design to match equipment density requirements and used hot-aisle containment and indirect air-side economization to achieve significant capital expenditure and energy savings.

United Airlines: The United team was selected for its robust yet energy-efficient datacenter designs, as well as the successful integration of its IT and critical facilities management teams.

As a result of its merger with Continental Airlines a few years back, United realized that it was essential to merge IT services. With that goal in mind – and eight datacenters to manage – the company put a long-term plan in place to condense its facilities into two datacenters.

To meet that goal, United designed and began the buildout of a new greenfield 167,000-square-foot complex, inclusive with a 25,000-square-foot, 4MW – expandable to 6MW – datacenter near Chicago. The facility was commissioned in October 2013 and became operational in February 2014.

United also merged its IT management structures, developing a Critical Infrastructure Services (CFS) team to manage its new datacenter. The CFS team supports all United datacenters, reservation centers and airport IT infrastructure assets around the globe under a single team.

This integrated structure has remediated the traditional siloed nature of IT and facilities teams, and created a cooperative environment for buildout, maintenance, security and capacity planning for United's IT resources portfolio.

In both cases, these two Global Leadership Award winners exhibited efficiency in datacenter and IT operations in the broadest sense of the word – including capital deployment, technology, design, operations and overall management.

The Brill Awards honor and bring attention to datacenter best practices and innovation on a global scale. Congratulations to this year's winners.

VIII. Cloud Price/Performance Comes Under Pressure

When you buy electricity, a kilowatt hour is a unit of measurement that doesn't change regardless of provider.

In cloud, there is no such unit. Consumers essentially decide their own units when purchasing from a cloud provider. While there's no set measure that end users consume, the closest cloud increment is actually a virtual machine.

Virtual machines are typically composed of compute, storage and memory capacity, which are metered on an hourly basis for each unit consumed. When buying cloud, end users basically decide what size virtual machines they want.

Importantly, ten hours of a 'medium' virtual machine is different from 10 hours of a 'large' virtual machine. In theory, end users expect to receive more for the additional expense of a larger one.

But what exactly do they receive more of? And what is the real quantifiable benefit when you buy a virtual machine?

The three measures used for what an end user receives are CPU, disk and RAM allocations. Normally, VM sizes are defined and priced in these terms on cloud providers' websites. But do those metrics reflect reality?

PerfKit is an open source project that provides comparisons on a range of applications deployed to AWS, Google and Azure virtual machines.

By running the same application across a range of cloud setups, end users derive simple benchmarks for VM purchases.

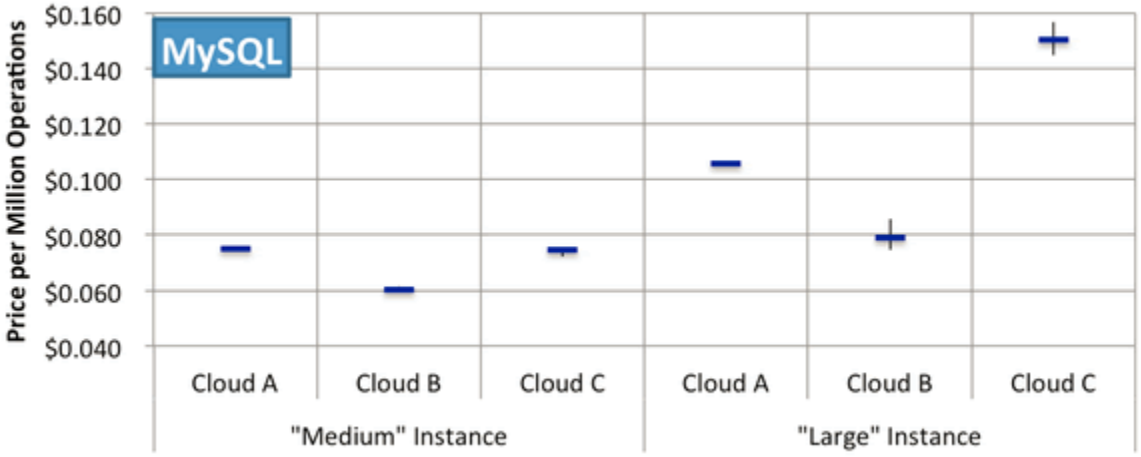
In short, a standard set of tests curated by an independent committee of MIT and Stanford academics simulates the typical experience of an end user utilizing those three cloud providers.

451 Research analysts used PerfKit to compare cloud price/performance with data from its Cloud Price Index for a range of data applications. The charts below show the price per performance unit achieved for MySQL, MongoDB, Hadoop and Cassandra application deployments with these three cloud providers.

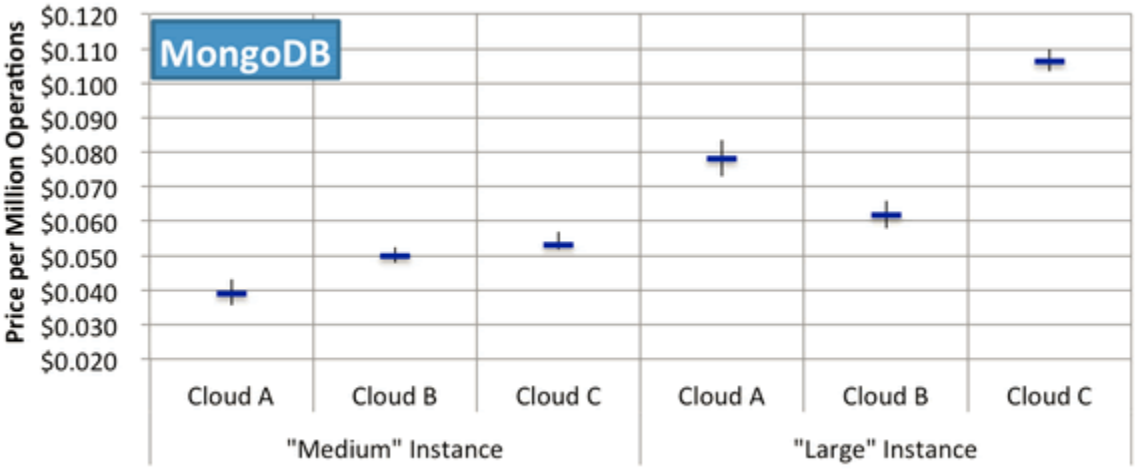
The data is anonymized for a number of reasons: first, this limited number of samples shouldn't be seen as evidence of similar performance in all situations. Second, the configurations of different benchmarks will affect the relative price/performance between providers.

Note that the horizontal bars in these charts show average values, and the vertical bars show minimum and maximum values.

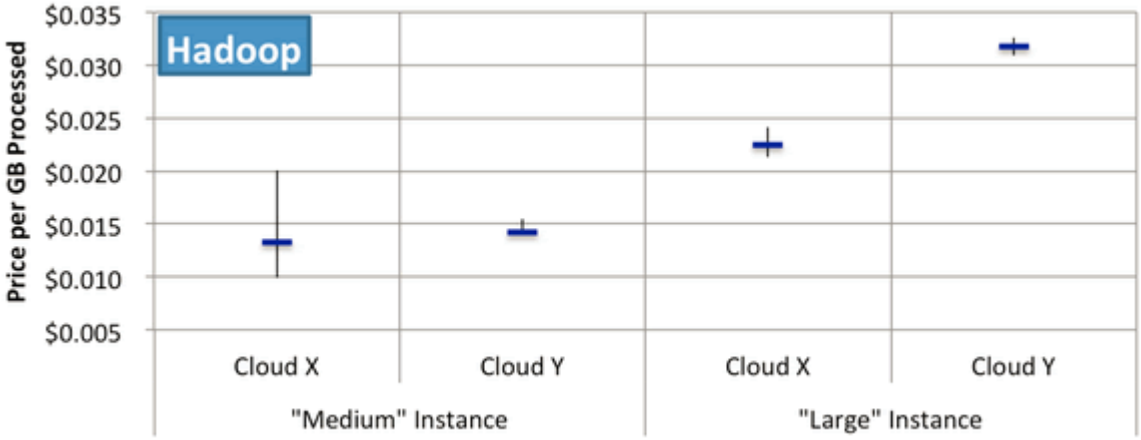
MySQL Application Deployment Comparison



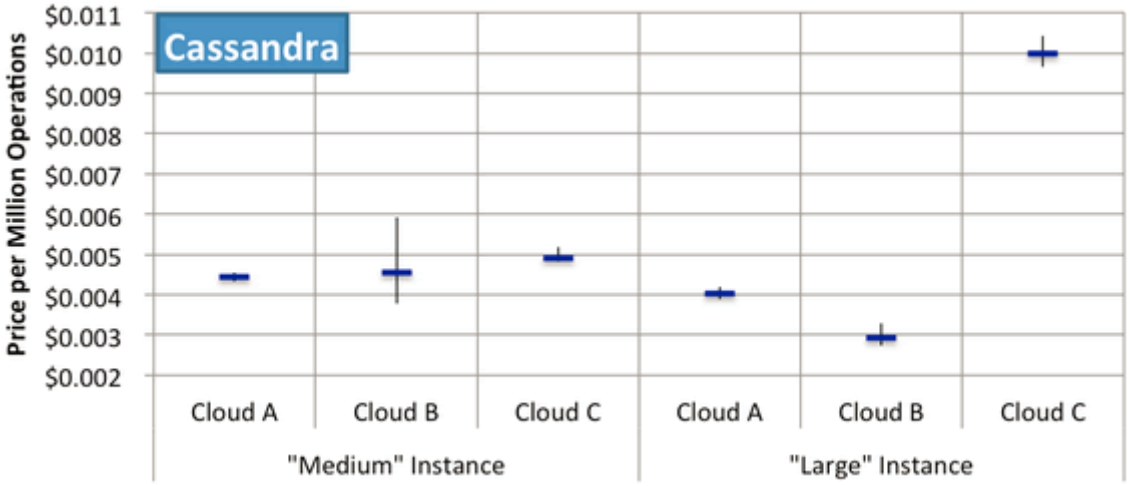
MongoDB Application Deployment Comparison



Hadoop Application Deployment Comparison



Cassandra Application Deployment Comparison



Several trends are immediately apparent in this cloud price/performance data.

First, published metrics on virtual machine 'sizes' are not a reliable basis for assessing performance. There are substantial differences among providers in the value of VMs of the same size.

Second, it's generally better to scale horizontally (adding more virtual machines) rather than vertically (buying bigger virtual machines). While this isn't particularly easy with database applications, when it can be done, the savings add up.

For example, if we had an enterprise application that needed to process a hefty 10,000 transactions per second, it would cost $2.73/hour for 39 medium VMs. But running the application on 26 large VMs would cost $3.65 per hour – 25% more.

What do these results show? Variation. Published VM capacities actually mean little, and price/performance varies depending on the size of VM tested, the time of day and the provider.

The best option to guarantee price/performance is to test the application in a real-life scenario, to do it for a combination of VM options, and to do it multiple times.

However, few CIOs have the resources to dedicate to this task, and value isn't necessarily their top priority at any given moment. Getting an application running on the cloud at all is seen as a win, without the need to squeeze every penny.

But as cloud matures, CIOs are coming under pressure to achieve greater cost savings – and benchmarks like those shown here can provide valuable, real-world approximations.

In the future, we expect more and more CIOs will be using benchmarks like PerfKit to squeeze providers for better performance at a better price.

IX. Renewable Energy and the Datacenter

Earlier this year, Apple and Google each announced $3bn investments in renewable energy projects. Both companies are part of a small but growing number of datacenter operators with deep pockets that are increasing the proportion of energy they use from renewable sources.

Are Datacenters Plugging into Renewable Energy?

There are a variety of motivators for datacenters to go green (regulations, corporate social responsibility and financial wins, to name a few). But some are going further, aiming to eventually operate carbon-neutral or even energy-neutral facilities.

451 Research recently looked at the key drivers and obstacles for powering datacenters with renewable energy.

What's the Motivator Here?

Global power demand for datacenters expanded to 40GW in 2013, a 7% increase over 2012, according to a Greenpeace 'Clicking Clean' report.

There's no definitive source on what percentage of this energy originated from renewable sources, but the US Energy Information Administration estimates that about 11% of world energy consumption is from renewable sources.

Most datacenters derive only a tiny percentage of their energy from grid renewables. But a number of Internet companies with large hyperscale facilities report that as much as 100% of the energy powering certain facilities is now derived from renewables.

In Q1 2015, for example, Apple announced it was investing $1.9bn in two new European datacenters that will be 100% powered by renewables. Apple also announced an $848m solar investment in California even as Google announced a significant wind turbine project in the state.

While many factors play a role, these organizations see clear financial benefits from investing in renewables, including significant government subsidies/tax breaks and ancillary benefits.

Carbon Regs

Renewable energy investments are often driven by regulation and reputational concerns.

The UK's CRC Energy Efficiency Scheme began in 2011 and was a serious attempt to put a price on datacenter carbon emissions. It was eventually scaled back, however, and then in 2014 datacenters were ultimately given an exemption.

Note that the European Union's Energy Efficiency Directive (EED) introduced in 2012 requires organizations to produce accurate and approved reports on total energy usage, which could help drive adoption of renewables.

But outside of Europe, regulations play a much smaller role. While there are various US state-level initiatives to help renewable energy adoption, there are no national datacenter carbon tax or cap-and-trade schemes on the horizon.

Grid Renewables

While a growing number of datacenters are investing in large-scale, on-site renewable projects, most facilities are still only able to access renewable energy from the existing power grid due to the cost and complexity of on-site generation.

However, grid-based renewable energy has its own challenges, mainly price, which is an important reason why it hasn't been adopted more widely in the datacenter industry. Grid renewables are currently more expensive on average than equivalent fossil fuels. The recent drop in oil prices has exacerbated this difference, at least in the short term.

This may well change going forward. Take the price of solar photovoltaic technology, which dropped by 70% from 2009-2013 and has enabled commercial solar-power pricing to reach parity with the existing grid in Germany, Italy and Spain.

Some datacenters are reacting to these price changes by acquiring grid-based renewables – either through power-purchase agreements (like Google and Yahoo have done with local wind farms) or indirectly via renewable energy certificates.

While financial mechanisms like renewable energy certificates are complex and open to criticism over their true environmental value, an increasing number of operators see value in investing in renewables – and their actions are likely to convince and may even force others to ultimately follow their lead.

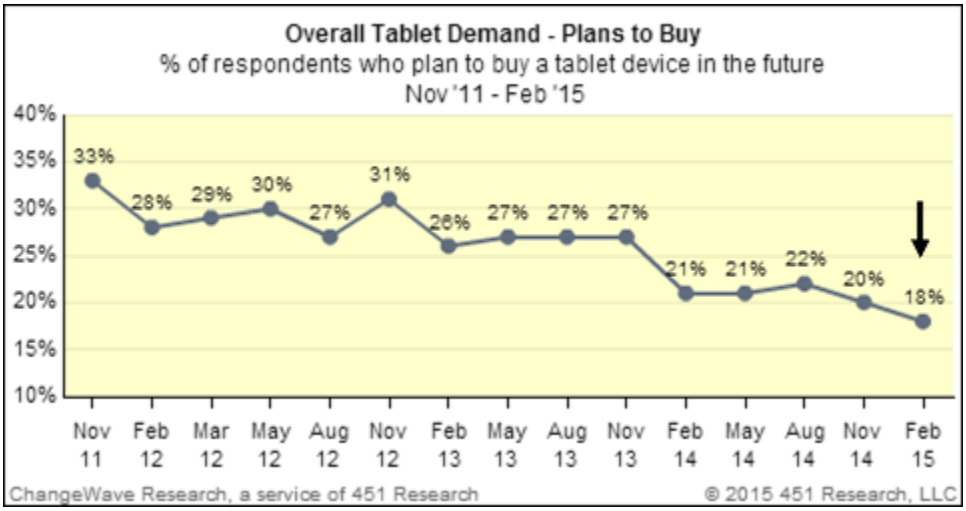
X. Tougher Outlook for Consumer Tablets

Over the past year, 451 Research's ChangeWave surveys have shown softness in the consumer tablet market. Major reasons have been the growing use of 'phablets' and the fact that consumers are finding their existing devices sufficient.

A February ChangeWave survey of 2,343 primarily North American consumers focused on what's in store for the tablet industry going forward – including planned buying, customer satisfaction and the demand for bigger screens.

Tablet Demand

After the weak holiday tablet-buying season, the survey results show consumer demand at its lowest level in a ChangeWave survey. Just 18% of respondents say they plan on buying a tablet in the future – down 2-pts from the previous survey in November.



An important factor in this slowing demand is the longer replacement cycle for tablets compared to smartphones.

The survey asked respondents how often they normally replace their tablets and smartphones – and as the following table shows, consumers are holding on to their tablets nearly a year longer than their smartphones (3.5 years vs. 2.8 years).

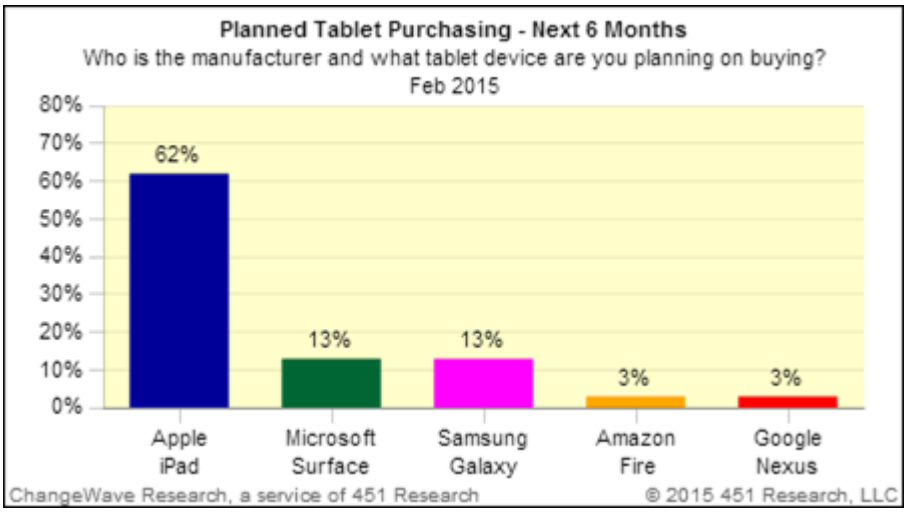
Please tell us how often you normally replace each of the following devices.

	Consensus Estimate
Smart Phone	2.8 years
Tablet	3.5 years
Laptop	4.3 years
Desktop	4.9 years

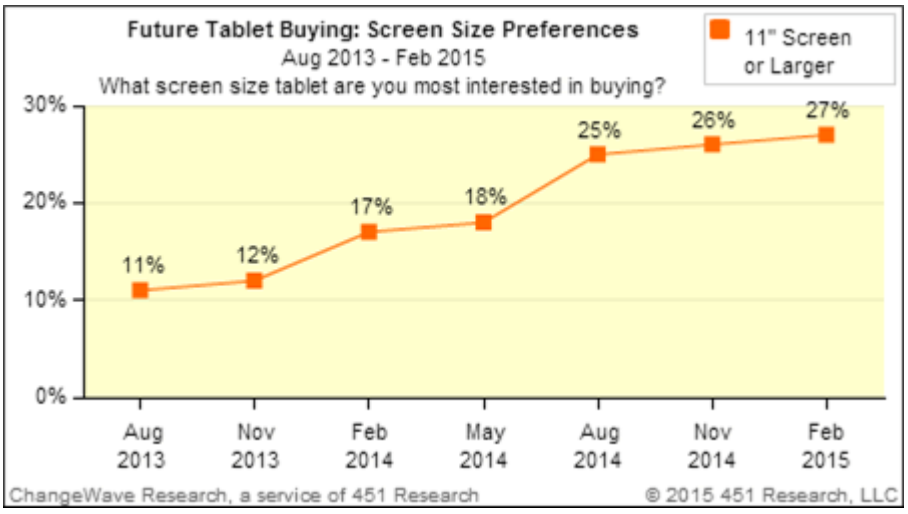
Another key impact on tablet demand is the growing use of 'phablets' (i.e., smartphones with a 5" screen or larger). In the latest ChangeWave smartphone survey, respondents who own both a phablet and tablet were asked how the use of their tablet has changed since purchasing a larger-screen phone.

Phablet owners were nearly *seven* times more likely to say they're using their tablet *Less Frequently*(47%) vs. *More Frequently* (7%).

Tablet Manufacturers. Focusing on planned buyers over the next six months, Apple remains the clear leader – with 62% saying they'll purchase an iPad. Microsoft (13%) and Samsung (13%) tied for second.

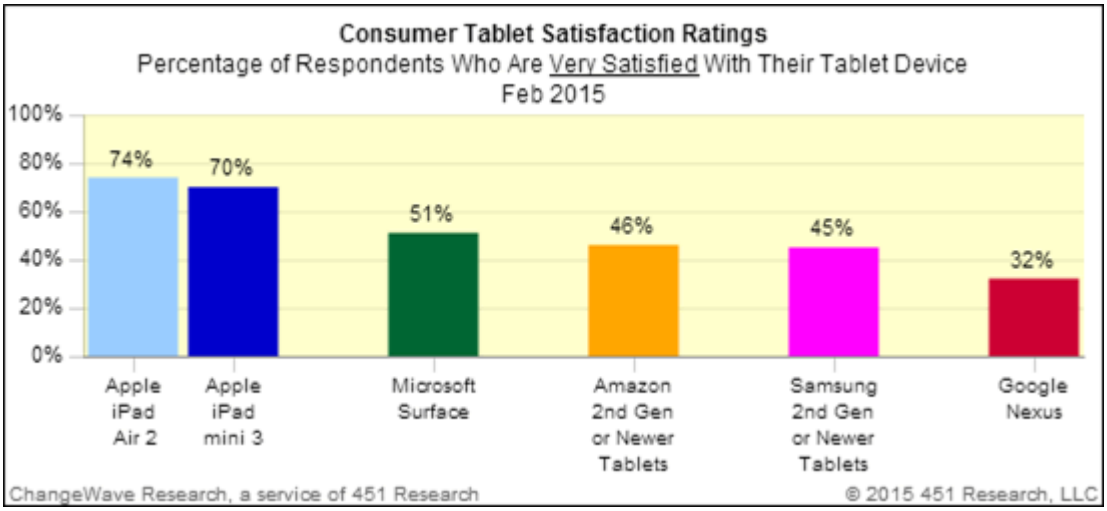


Screen Size Preferences. Consumer interest in larger-screen tablets continues to grow – with 27% of planned buyers now saying they're interested in purchasing a tablet with an 11" screen or larger.



Even so, tablets with 9-11" screens continue to be the most popular choice (42%).

Customer Satisfaction. Apple leads the industry in tablet satisfaction – with three-in-four (74%) iPad Air 2 owners and 70% of iPad mini 3 owners reporting they're *Very Satisfied*.



Microsoft (51%) is holding on to second in satisfaction, followed by Amazon (46%) and Samsung (45%), with Google (32%) bringing up the rear.

XI. Cloud 2.0: Going Mainstream

At the March Microsoft Hosting Summit, Michelle Bailey, 451 Research's VP of Digital Infrastructure, reported that enterprise IT is moving to 'Cloud 2.0' – which heralds a fundamental shift in the cloud computing market.

The move is reminiscent of a previous technological shift during the late 1990s, when the booming Internet market began talking about 'Web 2.0.'

While 'Web 2.0' was a made-up term with no technical meaning, it had a context: The Web was transitioning from a limited technology (i.e., showing viewers content over a public network) to a limitless platform for distributing content and enabling user interaction.

Many analysts believe that today's global online economy really began with that shift toward 'Web 2.0'. And after viewing the results of our recent 451 Alliance Cloud Computing Trends Survey, it looks like a similar transition is now occurring in cloud computing.

The survey found that the great majority of enterprises (69%) are now spending money on higher-order cloud functions like security, managed services and application hosting. Moreover,

self-identified 'early adopters' are deploying more than half of their applications (51%) in a cloud environment – either on-premises or off-premises.

The Cloud Competitive Landscape

A host of interesting changes are appearing at the dawn of 'Cloud 2.0.'

End users are now actively seeking out more than one cloud provider, and they're looking for services to support revenue-generating operations. In short, cloud services are now mainstream, and are turning into a means of production for the enterprise.

Cloud providers, in turn, are pitching positive business outcomes to their customers while trying to increase their appeal by partnering with complementary vendors. Microsoft's cloud strategy has moved in this direction as it builds out its channel providers for hybrid Azure cloud deployments. It's also adding new features to support mobile apps and database services, such as MySQL, Redis and HDInsight.

Amazon Web Services is another leader here, having emphasized for years the value of its cloud services and partnerships, along with its core infrastructure offerings. AWS now boasts an army of consulting and technology partners, which, despite its technical acumen, it could never have built alone.

In addition, AWS is continually finding new ways to use its cloud platform – such as the MySQL-compatible database service, Amazon RDS for Aurora – along with new ways of generating revenue.

Google is a third consumer-oriented cloud giant with a well-established platform of cloud content services.

Just like Internet content moved from static to dynamic, 'Cloud 2.0' is moving from simply delivering infrastructure to the building of complex ecosystems. To adapt in such a highly competitive environment, savvy providers will have to offer far more automation and integration to their end-user clients – and be highly responsive to the needs of enterprises moving to the cloud.

XII. Disaster Recovery for the Cloud Generation

A February survey of 1,264 members of the 451 Global Digital Infrastructure Alliance looked at key enterprise datacenter trends, including budgets, IT infrastructure spending and disaster-recovery plans.

The survey found that four out of five (82%) organizations currently have some level of disaster-recovery architecture deployed. Even among companies with more than 1,000 employees, the percentage remains at 83%, which means 17% of large organizations reported no fallback procedures are in place.

When this group was asked why they don't have a disaster-recovery plan in place, most responded that it was just too expensive, or there wasn't a good enough business case to justify the expense.

But as new and existing technologies lower the barrier of entry to disaster recovery, will the percentage of organizations without plans in place shrink?

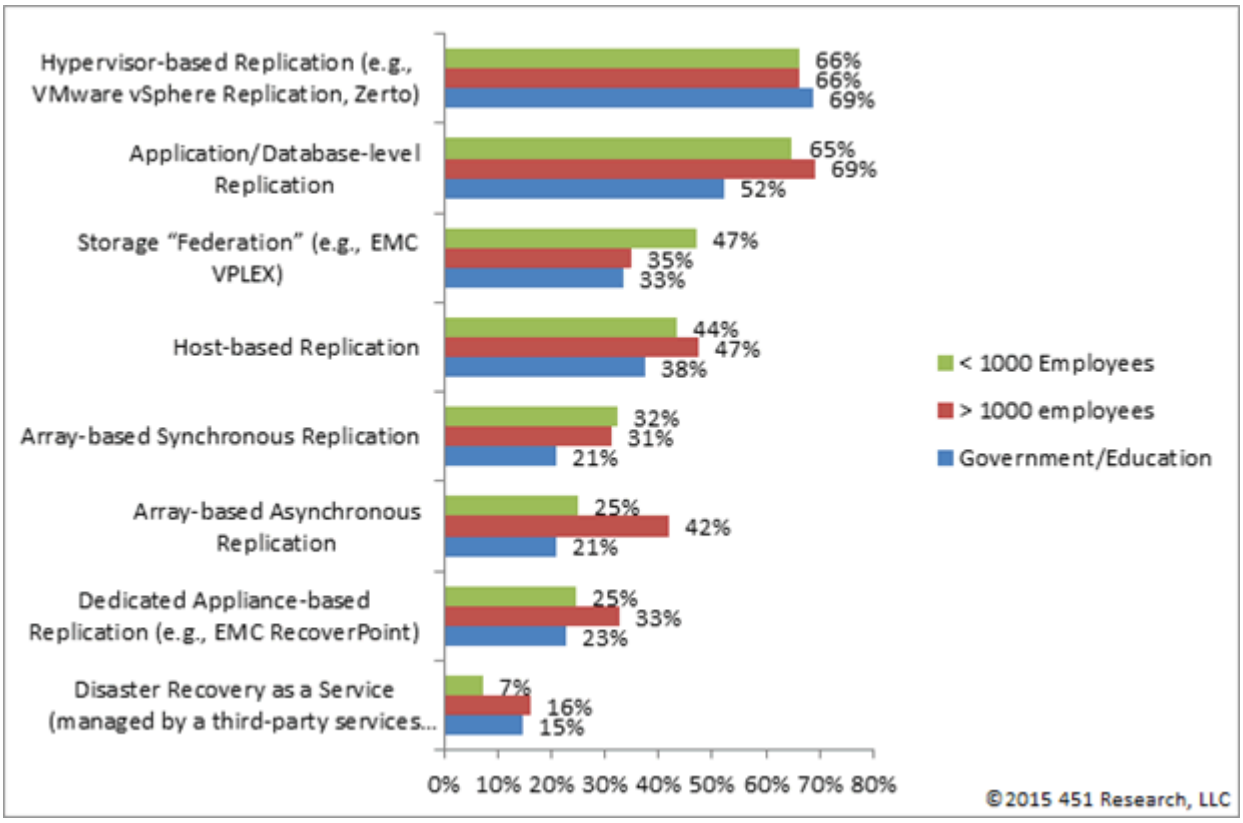
Disaster Recovery: Enabling Technologies

Disaster recovery is still far from realizing the ideal where every application recovers within minutes of an outage. Rather, most organizations currently employ a tiered approach – where high-priority workloads receive the most consistent attention.

This is made possible through various technologies, the most common being application- and hypervisor-based replication.

As hypervisor tools have matured in recent years, they've lowered the barriers to entry to complex disaster-recovery implementations.

Q. What technologies do you use to enable your Disaster Recovery?



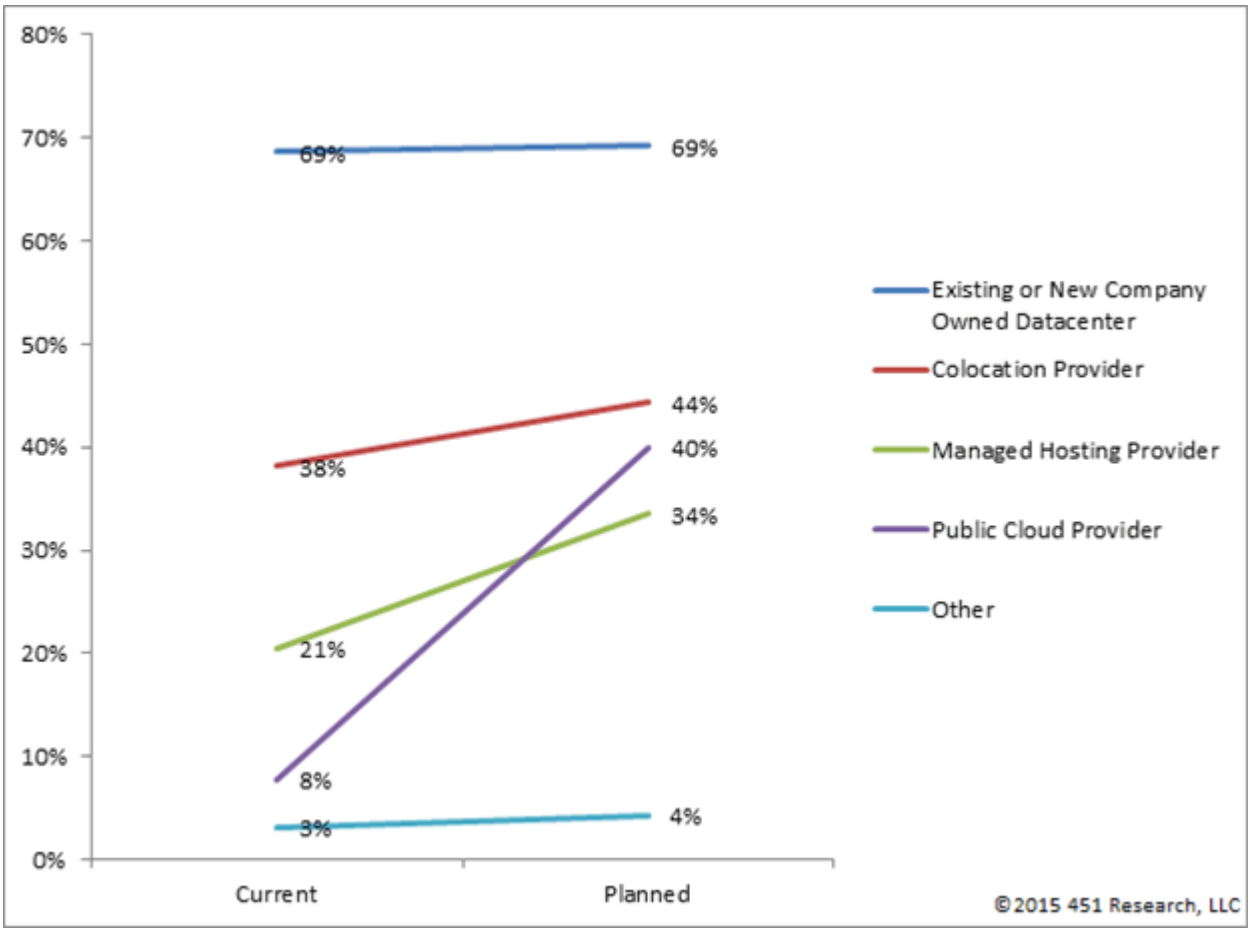
Importantly, in terms of current disaster-recovery deployments, the February 451 Alliance survey shows the most common site used is a company-owned datacenter (69%). But when we

look at future deployments, we find a huge jump in respondent interest in the use of public cloud and managed hosting providers.

Disaster Recovery – Current and Planned Deployment Locations

Q. Which of the following types of sites or services does your organization use for disaster recovery?

Q. Which of the following types of sites or services do you anticipate will be used for your organization's future disaster-recovery architecture?



While 8% currently use public cloud providers, a whopping 40% anticipate using public cloud providers for future disaster-recovery deployments. In addition, managed hosting providers, which are currently used by one in five organizations (21%), are also benefitting from the move to the cloud, with one in three respondents (34%) citing them as a future disaster-recovery location.

As the above chart points out, the disaster-recovery market remains ripe for disruption by cloud and service providers. Cloud provides technical, geographic and cost solutions to the operational roadblocks that are preventing many organizations from deploying disaster-recovery solutions.

Clearly, public cloud and managed service providers are offering compelling disaster-recovery solutions. They are attracting attention not only among those who already have DR, but also among the one in five organizations that still have no disaster recovery.

XIII. Analytics: Security's 'Spackle'

As much as the word 'analytics' is overused, it nonetheless provides vital support to today's enterprise security products.

These products typically have some built-in data analysis tools, such as alerting and reporting based on pattern matching. But security events and their clues can be so complicated that organizations end up needing help to make sense of what's being reported.

Security firms offer analytics to try and make their products easier to use. Analytics can help make sense of a flood of data from a wide range of sources – correlating events that would otherwise go unnoticed.

Whether it be user access, database queries, OS configurations, malware activity or network traffic, analytics go beyond simple reporting to fill in gaps that organizations don't even know they have. In this sense, analytics act as a kind of virtual 'spackle.'

Security Analytics Use Cases

There are several ways that analytics are today being used to bridge security gaps:

Analytics at Particular Layers. The more visibility a security product has, the more analysis needed. A simple network-monitoring tool can easily track open and closed connections among devices, but deep-packet inspection can uncover many more details about content, protocols in use and anomalies.

Analytics Between Layers. Generally speaking, events don't happen in isolation; they are part of an environment that includes the network, operating system, applications and other system components.

Security technologies increasingly pull together data throughout the stack that can correlate the actions of insiders that might otherwise go unnoticed.

Adding Threat Intelligence Details to Your Analytics. Your organization may have a good grasp of what's happening within its infrastructure, but when trying to detect intrusions, it helps to have a bigger picture of what's going on outside it.

Threat intelligence specifically adds details on tools, tactics and associated events that tell the organization what else to look for – and what else it should anticipate.

Noise Reduction. Big-data availability isn't always ideal for the enterprise. One of the most common complaints heard from CISOs is that they have more data than they can handle. Thus, we now have firms specializing in filtering and analyzing data from the analytics themselves.

Bottom Line

The above examples are just some of the ways in which analytics can improve security technology.

Unfortunately, complexity begets complexity – so even as large enterprises adopt 'analytics for their analytics,' there could also eventually be too much security 'spackle' for the moving parts to work smoothly.

Security analytics may soon be everywhere, but your organization is best served by using them deliberately and thoughtfully, rather than grabbing every analytics tool out there. Going forward, CISOs and IT staff need to be aware of exactly what security analytics their organization is using and why.

XIV. Mobile World Congress 2015: The Future of Wireless Connectivity

Mobile World Congress 2015 brought more than 93,000 participants to Barcelona to check out the advancements being made by industry movers and shakers.

Along with new technologies on display, the event offered a peek at new products and strategies that companies are rolling out across the mobile landscape.

Device hardware takes center stage at MWC2015

With many handset vendors launching multiple devices, a major focus of Mobile World Congress was on device hardware improvements, with software taking a backseat.

Within the space of a few hours, HTC and Samsung launched their latest flagship smartphones – the One M9 and Galaxy S6, respectively. And while HTC opted for incremental improvements to its signature phone, Samsung struck a bolder note by unveiling a completely revamped device.

Other vendors, such as Huawei, LG, Sony and Microsoft, announced a variety of lower-tier smartphones and wearables – postponing the launch of any other new flagship smartphones to a later date.

Microsoft and Jolla also emphasized their upcoming new operating system releases – Windows 10 and Sailfish 2.0, respectively.

Microsoft will release its multi-device Windows 10 later this year, featuring 'one experience, one platform, one store' benefits. Jolla, meanwhile, emphasized its commitment to security for its open source browser, and touted its refusal to use consumer data as a way to advertise and profit.

LTE-M vs. Upstarts for Low-Power IoT

As expected, the Internet of Things (IoT) also dominated Mobile World Congress – with exciting connected cars and devices, wearables, and imaginative smart cities taking center stage during the event.

In response to new IoT technologies and the underlying connectivity requirements, LTE-M wireless technology was presented as the IoT architecture of the future.

LTE-M supports reduced bandwidth impact (up to 1Mbps), smaller signaling buffers and a much longer battery life (at least five years). It should be available by 2017, but that still leaves an ample window of opportunity for other competitive low-power options to prove their mettle and – even more importantly – their economic viability.

Shaking and Baking with 5G

We're in the early days of 5G technology, and Mobile World Congress featured two press conferences from telecom organizations in the process of defining 5G standards and architectures.

Next Generation Mobile Networks Alliance unveiled a 5G White Paper with an extensive collection of use cases and a proposed architectural model. Likewise, the European 5G Public Private Partnership presented its vision document on how 5G will benefit Europe.

Suppliers aren't about to be left out in the rush to 5G, and many showed early device prototypes with elements of 5G technologies.

The effort to bring 5G to market is accelerating, and the Mobile World Congress showed the priority being placed on this. Deep questions remain, however, on the scope and practicality of the sweeping visions being put forth by its earliest adopters.