New technology, new mindset

Strategic IT infrastructure to compete in the digital economy

IBM Institute for Business Value

How IBM can help

The digital economy is transforming how people and businesses act, interact and transact. As trusted service providers, IT leaders are evolving their IT infrastructures to embrace new mobile, social and cloud technologies. IBM Systems offers IT leaders the innovative middleware, servers and storage that enable seamless integration with mobile devices and applications. These technologies allow organizations to process high volumes of data for immediate, useful insights and enable consistent operations for better service predictability. For additional information on IBM Systems, visit: ibm.com/systems

Transforming the IT infrastructure

In the ever-expanding digital economy, executives responsible for information technology (IT) infrastructure are scrambling for market advantages. It's not only about technology; today, IT leaders aim to become trusted service providers to their organizations. To do so, they must innovate rapidly, deliver unique customer experiences, and leverage their knowledge of customers and the marketplace. Now, IT infrastructures must connect with ecosystem partners, enhance transaction and analytics services, and build flexible capacity to address changing business conditions. Success also depends on organizations rethinking their IT mindsets, including how they can best fund and finance technology, tap sources of innovation and prepare for an uncertain future.

Executive summary

The advent of the digital revolution has changed the nature of the IT infrastructure conversation from technical to strategic. Customers clamor for greater personalization, and companies face new competitors from previously unrelated industries and unprecedented pressure to innovate. Now, the IT infrastructure conversation covers much more than "reducing costs while keeping the lights on;" it also entails becoming a trusted service provider for the organization.

Emerging business capabilities – such as creating differentiating customer experiences, incorporating customer insights into new products and services, and enabling rapid experimentation – are moving infrastructure decisions from the back office to a core component of an organization's business strategy. And with these new capabilities comes a new set of strategic choices about the hardware, software and networking capabilities needed to drive this digital transformation.

Previous research from the IBM Institute for Business Value (IBV) highlights that seven out of ten organizations recognize that IT infrastructure plays a significant role in driving business results. In addition, over 60 percent of those surveyed were looking to increase their IT infrastructure investment over the next 12-18 months.[1] At the same time, less than ten percent of firms said they are fully prepared to meet the demands of the digital business in supporting cloud computing, analytics, mobile and social technologies.[2]

Forces are hurtling organizations toward more digitally-based forms of engagement. Besides the technology implications for IT infrastructure, we discovered that a fundamental change in mindset has to happen. What core capabilities do these organizations need as they push digital transformation? What mindset changes are needed to lead an IT organization through turbulent times?

APIs are critical to unleash the core assets and **build the necessary "wiring"** among organizations collaborating in the digital economy.

Too often, IT organizations deal with a **mismatch among workloads** they must support **and the computing environment** in which applications reside.

Leaders **think beyond today's needs** and empower their organizations to **capitalize on disruptive changes** of the future.

To answer these questions, we conducted in-depth interviews with 15 companies around the world. We spoke with IT executives in a variety of industries who have responsibility for their organizations' IT infrastructures. These conversations explored the impact of the growing digital economy on their IT infrastructures and the related new demands on their leadership.

Some companies were well along on this digital journey while others were just starting. Still, all recognized that the new digital environment will result in significant changes: not only to the future of IT infrastructure, but also in how the IT organization thinks about itself and the future (see Figure 1).

Figure 1

Companies face widespread challenges as they look to upgrade their IT infrastructures to be more competitive

Market drivers
- Revamped customer expectations with shorter time to adjust
- Erosion of traditional industry boundaries leads to new competitors
- The need to maintain core business while driving innovations at unprecedented speed and scale

Changes in technology
- Enable ecosystem integration
- Optimize transaction and analytics services
- Build flexible capacity based on rapidly changing business conditions

Business capabilities
- Deliver differentiated omni-channel experiences
- Increase customer insight and quickly anticipate emerging needs
- Enable lean experimentation and rapid time to market

Changes in mindset
- Evaluate full spectrum of financial options and implications
- Embrace innovation from inside and outside the firewall
- Empower the organization to capitalize on disruptive changes
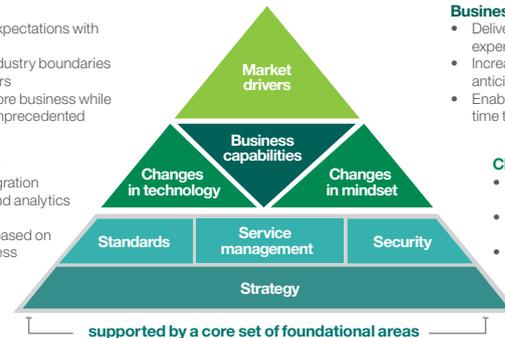
Source: IBM Institute for Business Value.

The move to digital: Changing the IT infrastructure

Three types of technological changes are necessary to stay competitive (see Figure 2 on page 8):

- Enable ecosystem integration
- Enhance transaction and analytic services
- Build flexible capacity to address rapidly changing business conditions.

Enable ecosystem integration

Interviewed organizations recognized that their future success would depend both on their own IT capabilities and the ability to connect with others. In the past, companies were content to rely upon their own internal data and resources to serve customers. Today, participation in one or more ecosystems is seen as a way to accelerate innovation, reduce risks, and provide unique and differentiated offers to customers without needing the entire suite of capabilities to be located in-house.

As described in the IBV report, "The new age of ecosystems: Redefining partnering in an ecosystem environment," an ecosystem is a complex web of interdependent enterprises and relationships aimed at creating and allocating business value.[3] Business ecosystems are mutual and multiplicative, rendering a whole that is greater than the sum of individual parts. Broad by nature, they potentially span multiple geographies and industries, including public and private institutions, and consumers.[4]

Ecosystem participation requires organizations to consider a number of challenges. As one financial services executive said, "The real challenges begin when you start to open up to the public."

"The future of delivering unique experiences is about the ability to tap into a wider ecosystem."

IT Executive Director, Healthcare

Organizations need to consider what types of data they want to share with others and give access to that data only to those specific parties. While some forms of data can be freely shared with a wide range of developers, others must be tightly controlled among a few trusted individuals. Validating what data is being sent and where are both central to controlling this critical asset.

Different ecosystem members may also use a variety of operating platforms that make integration challenging. Even operating similar platforms can be difficult when one member of an ecosystem decides to make a change that may require others to make related modifications.

Lastly, organizations need to manage the workload demands from sources outside their firewalls. While predicting expected workload from internal applications can be onerous, assessing the needs of potentially thousands of other users can be even more so. The magnitude of the challenge becomes more apparent as those in the ecosystem begin to rely on the responsiveness and reliability of data from other parties as part of core customer-facing applications.

Application programming interfaces (APIs) are increasingly the primary vehicle through which connections are made among firms. A travel services provider told us, "We are building APIs to enable ecosystems to connect directly and provide value-added services."

These connections can be made available to selected participants or the general public, and easily incorporated into applications and services developed by outside organizations. From the number of companies that raised this issue, it is clear that APIs will be critical to unleash the insights from internal systems of record and build the necessary "wiring" among organizations collaborating in the digital economy. APIs will serve as the fuel for new forms of innovation and combining capabilities from multiple sources that cross traditional geographic and industry lines.

Enhance transaction and analytic services

At the heart of IT infrastructure is the ability to analyze transactions as they occur, then quickly derive and act on insights from multiple kinds of data. One financial services executive summarized this vital need: "The ability to handle large amounts of both structured and non-structured data is key to our success."

The IT infrastructure challenges associated with managing big data are numerous and well-documented. Most organizations have not kept pace with the demands for data throughput and processing, requiring them to examine how to meet data demands from newer channels like mobile devices.

Companies are recognizing the value of real-time analyses as a form of differentiation. For example, sports entertainment companies are integrating play-by-play inputs, historical dimensions and fan sentiments, and then producing content in motion on-screen during the event. These have taken the fan experience to a new level, making speed and the ingestion of related content even more critical.

"IT infrastructure matters in the use of analytics, where we are advancing from descriptive analytics to diagnostic/prescriptive analytics. These capabilities are enabling us to begin personalizing education programs/tracks for individual students."

Superintendent, Regional educational system

"We need the ability to handle tournament peak traffic demands to provide the best digital experience for fans."

Executive Technology Advisor, Sporting event management

A second concern is the need to analyze data in a cost-effective and secure manner. Traditionally, analytics have been performed in a computing environment separate from the data location. But data migration reduces system performance and introduces security and reliability issues. Some companies store multiple instances of large data sets on various servers around the globe; each instance increases the risk of security breaches, as well as data inconsistencies and duplications.

In addition, the use of analytics in mission-critical applications has heightened the need for insights that are "always on," available and accessible. Systems reliability is not optional when customers and other ecosystem partners are highly dependent on them.

A financial services executive said, "There is a greater need to keep applications up 24x7x365 and deploy changes with no off-line windows." Not only do organizations need to be able to predict and address potential outages before they occur, the IT infrastructure must be resilient enough to move workloads to other environments when one does.

Build flexible capacity to address rapidly changing business conditions
Operating in a more customer-centric, innovative environment requires more than a structurally sound IT infrastructure. It requires the ability to adapt rapidly to changing circumstances, whether it is created during a one-time event such as Black Friday, or a seismic change associated with a new product introduction. An inability to shift quickly to meet these demands can result in lost revenue, negative brand awareness, and rapid customer departures to awaiting competitors.

Developing an IT infrastructure that can address rapidly shifting internal and external customer needs was a key theme with many study participants. This was true across multiple time horizons, from the need for longer-term planning to short-term execution. At its most

basic level, an IT infrastructure needs to be able to handle periodic peak demands while managing the cost associated with excess capability that is idle most of the time. Predicting these surges in demand can be difficult, especially when there is a lack of collaboration among operating units and those responsible for IT infrastructure.

Our respondents often mentioned the problem of unexpectedly high network and transaction demands caused by a new marketing campaign or product launch that was announced without their prior knowledge. A transportation systems executive said, "New promotions can quickly go viral because of social media. One airline gave away free seats, which caused an influx of tens of millions of reservation requests through our system with no advance notice."

Even with predictable demands on the IT infrastructure, IT organizations find themselves with a mismatch among the workloads they need to support and the computing environment in which these applications reside. Too often, applications with less resource-intensive requirements reside on systems with greater computing power – preventing the optimal usage of the company's overall systems capacity. Further complicating the picture, workload requirements change over time as new capabilities and services are rolled out. For example, as companies evolve from a few, larger monolithic services to many, smaller microservices, the need to balance computing resources on a dynamic basis continues to increase.

We also discovered how companies are increasing their flexibility by allowing end users to set up their own infrastructure environment through a standard self-service environment. By automating the process through which users can set up development and test environments, IT organizations have made it far easier for individuals to create applications and rapidly test new ideas and concepts.

However, with the ease of self-service comes the need to manage the lifecycle of all the new hosted applications. A healthcare executive said after adding self-service capabilities that reduced the provisioning time for IT infrastructure from weeks to hours, "We have 1,500 virtual machines now in production. In the past, we have never had 1,500 of anything."

Figure 2

Changing the IT infrastructure: Key questions

Enable ecosystem integration	• How effective is your organization in selectively exposing valuable data without compromising enterprise security? • To what extent can your infrastructure support diverse connectivity requirements from external organizations? • How do you measure and manage API traffic to guarantee service level agreements and maintain continuity?
Enhance transaction and analytics services	• To what extent does your organization have sufficient computational power to process the increasing quantity of data created every day? • How effective is your organization's IT infrastructure in supporting the analytic applications needed to provide business insights? • How reliable is your infrastructure in providing 24x7x365 access for critical customer-facing applications?
Build flexible capacity	• How effectively can your organization adjust capacity to match rapidly changing business conditions? • How does your organization allocate resources based on the priority and variety of workloads to improve resource utilization? • To what extent are individuals able to provision IT infrastructure on a self-service basis?

Source: IBM Institute for Business Value.

More than technology: Changing the mindset of the IT organization

At the same time the digital economy is forcing companies to rethink their underlying IT infrastructure technology, our interviews make it clear that IT organizations must reimagine their existing mindsets. "Mindset" encompasses everything from funding sources to organization structures, governance and measurement systems. Beyond simply deciding whether applications should run on a cloud versus an on-premises solution, the IT organization must address what it means to add value in an age of industry consolidation, the impact of shorter product lifecycles, and fears of missing the next potential wave of growth.

Three goals emerged from our discussions to change the existing paradigm of the IT organization (see Figure 3 on page 15):

- Evaluate the full spectrum of financial options and implications
- Embrace innovation from both inside and outside the firewall
- Empower the organization to capitalize on disruptive changes.

Evaluate the full spectrum of financial options and implications

Investing in new technology can be tough, given that IT budgets are often under pressure. The cost of managing today's sprawling and dynamic environments weighs quite heavily upon the shoulders of IT executives. "Maximizing" existing computing resources has typically meant avoiding (or at least delaying) another upgrade, another server or another data center.

"Tradeoffs between capex and opex models need to be in line with the business strategy."

AVP, IT Engineering, Insurance company

The digital economy is forcing companies to be even more creative about aligning costs to business benefits, and improving payback periods and cash flows while reducing the time to new innovations that can drive growth. IT organizations are being asked to become even more adroit at understanding their financing options relative to funding constraints, so they must evaluate the implications of these different models.

Cloud computing has enabled organizations to increase their overall utilization of existing IT assets without significant incremental investment. Other utility models, such as pay-per-use and software-as-a-service also affect how IT assets can and will be managed in the future. Spreading investments over time can often ease immediate cash flow concerns. As a result, these new models have spurred a dialogue about managing various expense models, namely: *capital expenditures (capex)* versus *operating expenditures (opex)*. Therefore, it is critical that organizations initiate their funding discussions at the start of a project.

In reality, however, we find that many companies still wrestle with these difficult discussions too late in the purchasing cycle, when fewer options are likely available. Further, financial systems and procedures that have governed IT spend have not necessarily kept pace with technology changes. For one government-regulated utility, regulations set IT spending as a fixed percentage of previous capital expenditures, making it tough to shift to more flexible and variable compute models. Thus, the team needed other ways to manage these costs as capital expenses, while providing necessary organizational flexibility.

Even in non-regulated environments, internal financial practices and controls may not fully consider changes related to the use of new technology. An entertainment executive said, "Our organization is short on capex but not opex. We're moving to an opex model, and our finance team cannot keep up with the changes. They see rising opex as a major concern, but hadn't noticed that capex was shrinking."

A healthcare provider also stated, "All financial controls are still capex driven, and finance will not allow capex re-allocation to opex without breaking internal guidelines and reporting structures. There are IRS (tax agency) constraints, including a fundamental aspect of non-profit organizations preventing them from transferring capex and opex from one division to another." Alone, each of these examples may seem to be isolated situations; together, they underscore that organizations need to be able to better align IT operations with business goals and financial objectives.

The disposition of existing IT assets may also be underutilized as companies move to new technology environments. Such assets could potentially have notable residual value – which can be applied to new IT assets that accelerate a company's digital transformation. As companies aggressively move to strike a balance between capex and opex models, it is critical that they can take advantage of these prior investments.

"No one can do it all and be good at all. We need partners."

Senior Manager of Corporate Sales Operations,
Telecommunications company

Embrace innovation from both inside and outside the firewall

Digitization is changing the nature of innovation. As traditional products and services are created using digital capabilities, data becomes more of a tradable asset. As new business models redefine industry platforms, IT infrastructure will become more than a back-office service; it will be the proving ground for the future of the organization.

The implications for IT infrastructure professionals are numerous. For one, organizations need to consider how IT infrastructure can be used as a catalyst for innovation, in addition to being a platform for traditional operations. This includes: providing guidance to innovators on how to best leverage different infrastructure models; identifying potential vendors and tools; and embedding infrastructure specialists on innovation teams. As data scientists play an increasingly important role in corporate innovation, their need to work directly with infrastructure experts who can build the desired analytic processing environment creates a new, critical partnership between the business and IT.

Organizations need to connect with partners to deliver services. They will have to work more closely to combine insights that create new sources of business value. Above all, our study participants stressed the need to bring in new ideas from outside the organization. Consider the following quotes from three different industries:

"With digitization, it is more feasible and common to have partners to create the 24x7 environment for you instead of doing it all in-house yourself."
– CIO, consumer products company

"You cannot sustain development activities within your own boundaries. Get the community involved beyond your organization to take advantage of external innovation." – IT Executive Director, healthcare provider

"In today's world, we all need partners – you cannot do everything yourself." –Superintendent, regional educational system

This need for closer integration has technical implications on infrastructure. It also raises issues about collaboration among ecosystem partners, intellectual property rights, and security and privacy. Addressing these cross-organizational capabilities, whether they involve external infrastructure providers, business partners or the general public, requires a new focus from IT infrastructure professionals.

Empower the organization to capitalize on disruptive change
The shift toward digital competitiveness requires companies to consider what changes need to be made, along with how to develop a culture that welcomes the continuous change associated with an unpredictable business environment. None of our respondents anticipate that either the pace or impact of changes in the IT landscape will slow down. The IT executives we talked with are not overly concerned about managing today's demands, but there is uncertainty about the future. An executive told us, "We'll cross and conquer the unknowns when we get there. Not everyone is comfortable with this approach, but it is needed for rapid change."

"Embrace a culture of ongoing change. Welcome the new world instead of fighting it."

CIO, Consumer products

To help with this, IT organizations need to provide "spaces" (physical, virtual or both) where teams can experiment with new tools and approaches. Several companies told us that the use of specific R&D groups within IT infrastructure areas – as well as the delineation of "now" versus "next" projects – provided opportunities to test new technologies without distracting them from day-to-day infrastructure and data center requirements.

Respondents also emphasized the need for IT organizations to rethink their human capital strategies to build more adaptive, service-oriented staffs. An executive said, "We are working to transform our talent model from developing hard-core engineers to service providers." Several cited the workforce's shifting demographics that lead to dual demands: preserving the knowledge of older workers with experience in maintaining legacy systems, while attracting and developing millennials who are equipped with knowledge of cloud and big data technologies.

Figure 3

Changing the IT mindset: Key questions

Evaluate the full spectrum of financial options and implications	• How aware is your organization of the variety of financial options that could be accessed to fund IT innovation? • To what extent are your technology spending decisions aligned with your organization's financial strategy? • How can you convert the residual value of existing infrastructure assets into funding for new projects?
Embrace innovation from inside and outside the firewall	• How effective are you at harvesting the best knowledge and ideas in your ecosystem? • To what extent do the relationships with your existing IT partners need to change to foster more effective innovation? • How does your organization balance the need for internal versus external resources to support effective innovation?
Empower the organization to capitalize on disruptive changes	• How do you proactively monitor and address the evolving demands in your ecosystem? • How effective is your human capital supply chain in identifying and developing the talent needed to exploit the changing market? • In what ways does your culture deal positively with continual change and uncertainty?

Source: IBM Institute for Business Value.

For more information

To learn more about this IBM Institute for Business Value study, please contact us at iibv@us.ibm.com. Follow @IBMIBV on Twitter, and for a full catalog of our research or to subscribe to our monthly newsletter, visit: ibm.com/iibv

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Notes and sources

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2 Ibid.

3 Davidson, Steven, Anthony Marshall and Martin Harmer. "The new age of ecosystems: Redefining partnering in an ecosystem environment." IBM Institute for Business Value. July 2014. http://www.ibm.com/services/us/gbs/thoughtleadership/ecosystempartnering/

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