
IBM Center for Applied Insights

Fast track to the future

The 2012 IBM Tech Trends Report



IBM



About the study

This is the third annual IBM Tech Trends report. Through participation in this survey and other initiatives, the IBM developerWorks community continues to drive the focus of our research. This year, we teamed with the IBM Center for Applied Insights to extend our research beyond this community.

The 2012 Tech Trends Report is based on a survey of more than 1,200 professionals who make technology decisions for their organizations (22 percent IT managers, 53 percent IT practitioners and 25 percent business professionals). Our respondents come from 16 different industries and 13 countries, spanning both mature and growth markets.¹ To better understand how technology trends are impacting future IT professionals, we also surveyed more than 250 academics and 450 students across these same countries.

Over the coming months, we will be sharing additional findings via our website: ibm.com/developerworks/techtrendsreport. We invite you to visit frequently and share your thoughts.

Mobile technology, business analytics, cloud computing and social business are rewriting strategic playbooks across industries. In these spaces, new business possibilities are emerging faster than many organizations can act on them, with significant IT skill shortages and security concerns threatening progress. Yet, some companies are equipped to innovate at the front edges of these fast-moving technology trends and drive strategic advantages for their organizations. What can business and IT decision makers learn from this elite group of pacesetters?

Fast forward

For the past eight years in the IBM Global CEO Studies, technology has been rising on the agenda of CEOs worldwide. It now outranks all other external factors—even market forces and the economy—as the top driver impacting their organizations over the next three to five years.²

Contributing to this transformation are four pivotal information technologies that are rapidly reshaping how enterprises operate: *mobile technology*, *business analytics*, *cloud computing* and *social business*. The magnitude and speed of these shifts is staggering. By the end of 2012, mobile devices are expected to outnumber people.³ Sources of analytical insight continue to multiply, with the world generating 15 petabytes of new data every day—that's roughly eight times the information housed in all the academic libraries in the United States.⁴

Pundits now debate when—not if—the use of cloud computing will surpass traditional on-premise IT infrastructure. And nearly 1.5 billion people use social networks on a regular basis, with the most recent billion joining in since 2009.⁵ With so many shifts occurring at once, it's not surprising that CEOs rank skills as the number-two driver impacting their organizations.⁶

As part of our Tech Trends research, we continue to explore how companies are responding to the opportunities and risks introduced by new technologies. This year, we surveyed more than 1,200 IT and business decision makers who are determining when, where and how their organizations adopt mobile, analytics, cloud and social technologies.

Nearly two-thirds indicate these technologies are strategically important to their enterprises. However, being an ardent believer in their game-changing potential isn't enough. Organizations face sizable adoption hurdles—severe skill shortages and pervasive security concerns. Yet, a group of Pacesetters is out ahead, positioning their enterprises to innovate, differentiate and better understand and serve customers—by capitalizing on these four emerging technologies.

Given the current trajectory of these trends, it's easy to imagine a world where customers purchase more through mobile devices than computers, where analytics drive the majority of real-time decision making, where cloud becomes the predominant IT delivery mechanism and where more ideas emerge from social networks than from R&D labs. Pacesetters are preparing for such realities. Are you?

Mainstream and coming wave

Business analytics and mobile technology have become mainstream capabilities—already deployed by half of our respondents (see Figure 1). This enthusiasm shows no signs of waning. Over the next two years, nearly 70 percent of organizations are increasing their investments in mobile technology, and over half are intensifying their spending on business analytics.

Cloud computing and social business are at earlier stages of adoption. However, nearly two-thirds of respondents are ratcheting up their investment in cloud, suggesting a major uptick in deployment over the near term.

Threats to innovation

As business demand for emerging technologies rises, enterprises are facing two substantial obstacles: IT skill shortages and security concerns.

IT skill shortages: From bad to worse

Across the four technology areas—mobile, business analytics, cloud and social business—only one in ten organizations has all the skills it needs. These shortages are not trivial or isolated. Within each area, roughly one-quarter report major skill gaps, and 60 percent or more report moderate to major shortfalls.

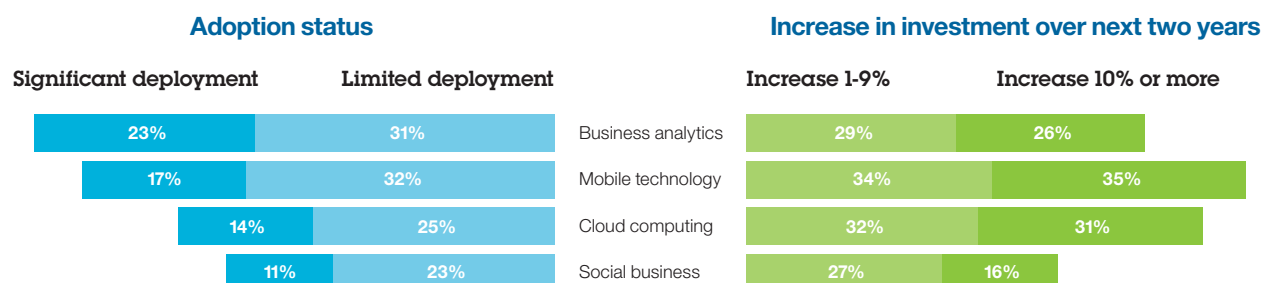


Figure 1: To date, business analytics and mobile are the most extensively deployed. Looking forward, mobile and cloud computing are the top targets for investment increases.

The skills situation, though already troubling, is poised to get much worse (see Figure 2). In our parallel academic survey, when we asked educators and students about their institutions' ability to meet the skill needs of the IT workforce, nearly half indicated major gaps—a deficit nearly twice the size of what businesses are already experiencing. Including those with moderate gaps, totals rise to 73 percent or more.

Growing skill gap



Figure 2: The outlook among educators and students suggests the current shortage of IT skills could get even worse.

The skills problem is more acute in mature markets, with about two-thirds of respondents indicating moderate to major shortages versus roughly half in growth markets. This could pose a competitive threat to organizations in mature markets, given the increasingly global marketplace. Alternatively, for mature-market companies that can effectively tap into available skills in other parts of the world, it could be a way to bridge gaps.

“Technology is changing so rapidly—not just upgrades, but dramatic changes in the discipline itself. Keeping pace is a challenge, not only teaching current technologies, but also forecasting and trying to guess what is coming down the pipeline.”

— Dr. Wullianallur “RP” Raghupathi, Professor of Information Systems, Fordham University

How do growth markets differ?

Compared to those in mature markets, growth-market organizations as a group:⁷

- **Lag in mobile adoption, but have skills in place.** Although growth-market respondents are trailing mature-market respondents (35 percent versus 55 percent) in adoption, they report more readily available mobile skills. Half as many growth-market organizations report major skill gaps (15 percent versus 29 percent in mature markets).
- **Lead in business analytics and social business adoption.** Thirty percent report *significant* deployment of business analytics, while only 20 percent in mature markets show comparable progress; with social business, the split is 16 percent in growth markets versus 9 percent in mature markets.
- **Are investing more in business analytics and social business.** Over the next two years, they will be investing in mobile and cloud computing at similar rates as mature-market firms. However, 34 percent (compared to 23 percent among mature markets) are increasing their investment by 10 percent or more in business analytics; social business shows the same pattern: nearly twice as many respondents in growth markets (22 percent) as mature markets (13 percent) are planning double-digit increases.

Security: Pervasive business problem, not just IT issue

Security concerns consistently rank as the most significant barrier to adoption across mobile, cloud computing and social business. Even in business analytics, where data typically stays inside an organization's firewall, securing and controlling access to data still places as the number-two barrier to adoption.

The core message is clear: IT security is not just a technology concern; it's a broad business issue with far-reaching policy and process implications. Moving into mobile means organizations must address the increased risk of data loss and security breach, device management challenges, and complications introduced by the growing trend toward bring-your-own-device. Analytics adoption forces decisions on data privacy, retention and access control—for both the raw data and derived insights. Cloud computing calls for policies on employee use of public cloud

“Security and privacy are not always treated as first-order problems. Things are deployed and made widely available without regard for security and privacy. In a best-case scenario, security and privacy are thought of as add-ons. Worst case, they’re ignored completely.”

– Dr. Eugene Spafford, Professor and Executive Director of the Center for Education and Research in Information Assurance and Security, Purdue University

services (e.g., file-sharing services), segregation of data within shared or hybrid cloud solutions and ensuring the right data is in the right place subject to the right controls. And with social business, organizations need to consider customer privacy expectations, regulatory compliance, and employee guidelines on confidentiality, acceptable use and protecting the corporate brand.

In each area, organizations are struggling to protect what is arguably their most important asset: information. As one educator put it, “In terms of security, it’s not the computers. It’s not the network. It’s the information. It’s the ‘I’ part of IT. That’s where the value is, and that’s where the danger is.”

Paying attention to Pacesetters

Technology now tops the CEO agenda for good reason. Leaders recognize the magnitude of technological change impacting their organizations. Likewise, the majority of our respondents say emerging technologies like mobile, business analytics, cloud computing and social business are critical to the success of their organizations.

These four trends offer opportunities to break new ground, create new markets and invent new business models – attractive outcomes for companies under pressure to grow their top lines. The question is: Which organizations are better positioned to create these competitive advantages? Early adopters or late arrivers? Those focused on strategic impact or tactical implementations?

We would argue it’s those companies forging ahead faster than others (in spite of adoption hurdles) and using mobile, analytics, cloud and social technologies in more strategic ways. To better understand what sets these companies apart, it’s helpful to contrast approaches across three types of organizations. These groups are based on how respondents rated the four emerging technologies’ importance to their businesses and their enterprises’ pace of adoption relative to competitors (see Figure 3).

Organizational stance on emerging IT

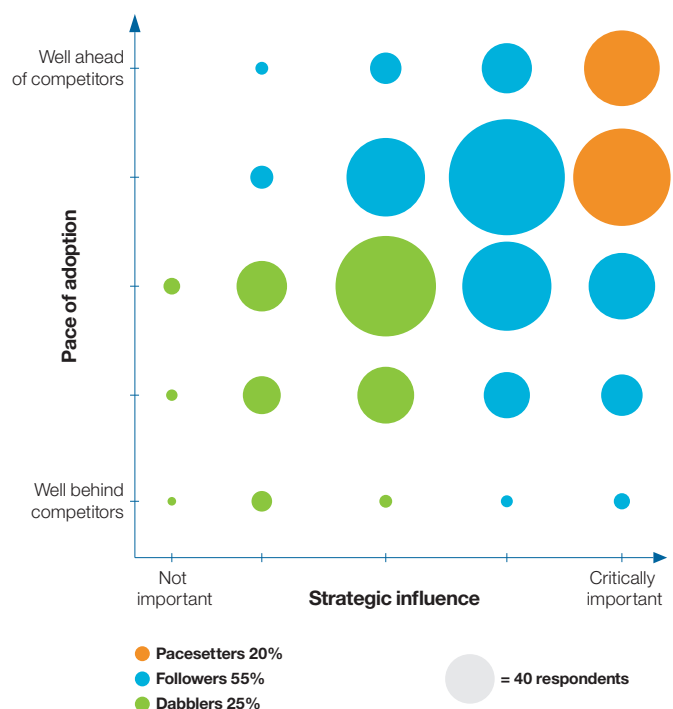


Figure 3: An elite group of forward thinkers is setting the pace for strategic use of emerging technologies.

- **Pacesetters** believe emerging technologies are critical to their business success and are using them to enable new operating/business models. They're also adopting ahead of their competition.
- **Followers** agree that these technologies are important and can provide critical capabilities and differentiation, but they generally trail Pacesetters in adopting.
- **Dabblers** are generally behind or, at best, on par with competitors in terms of adoption. They're less strategic in their use of emerging technologies, namely citing greater efficiency or new capabilities in selected areas.

Interestingly, we found a significantly higher proportion of Pacesetters in growth markets (35 percent compared to 15 percent in mature markets). Pacesetting organizations in these rapidly growing economies are not only adopting emerging technologies faster than their competitors, they also place greater weight on their strategic importance.

What sets Pacesetters apart

Compared to Followers and Dabblers, Pacesetters are more likely to exhibit three distinguishing traits that help them capitalize on the potential of mobile, analytics, cloud and social technologies: They're decidedly more market driven, analytical and experimental.

More market driven

When we looked at what prompts organizations to adopt the four emerging technologies, an interesting pattern emerged. Dabblers and Pacesetters respond very similarly on internal drivers—such as adopting mobile to increase workforce efficiency or deploying business analytics to reduce enterprise costs.

However, as shown in Figure 4, their views on external, market-driven motivations differ dramatically, with Pacesetters often outnumbering Dabblers two to one. Pacesetters want to more deeply understand their customers using social and analytic means, and engage them more effectively through mobile applications. They're more intent on identifying new markets via analytics, differentiating their products and services through mobile technology and bringing innovation to market faster using analytical insights, social collaboration and cloud computing.

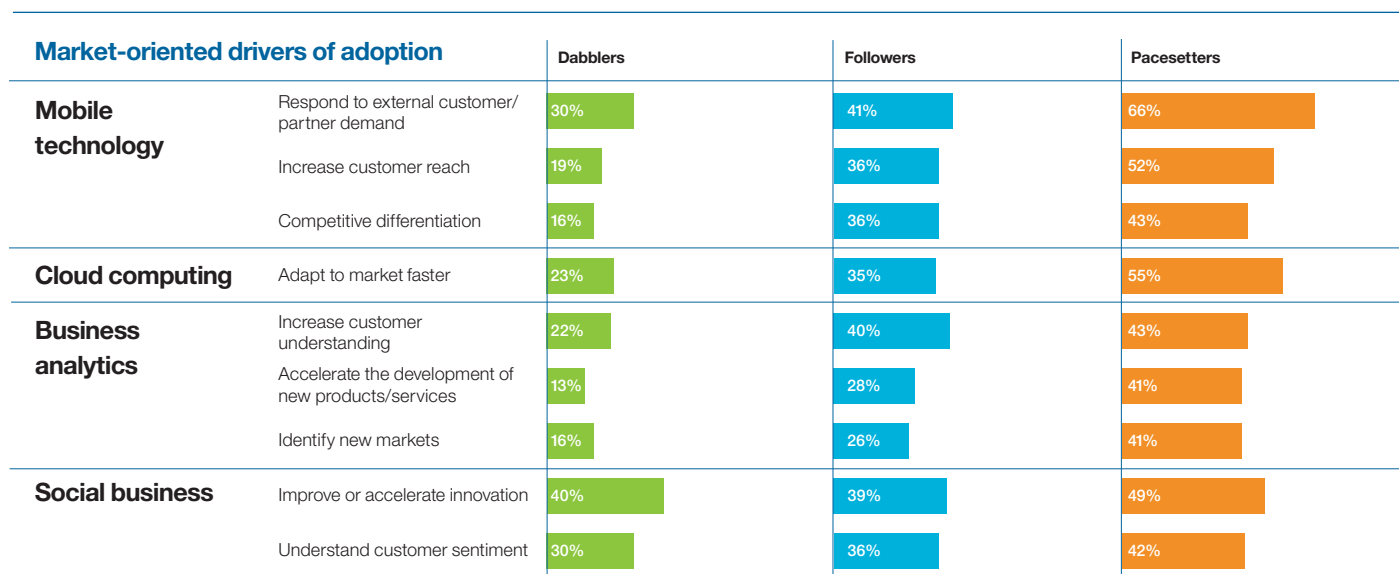


Figure 4: When it comes to adoption, Pacesetters are far more likely to be motivated by the desire to differentiate, innovate and serve customers better.

More analytical

Pacesetters are serious about building strategic advantage from the deluge of data coming their way. Compared to Dabblers, they are more deeply involved in data modeling (see Figure 5). Even more important, they're significantly ahead in equipping their organizations to act on data discoveries by providing graphical dashboards and delivering insights to front-line employees. As one leader remarked, "The historical crop of analytics reporting isn't cutting it anymore. We need to apply mathematical models in real time—and focus on 'executable analytics.'"

Where Pacesetters are furthest ahead is social analytics, which closely aligns with their market-driven nature. Nearly four times as many Pacesetters as Dabblers have significant deployments in this area.

Across the entire sample, the top barrier blocking the adoption of analytics is having too few people with knowledge that spans a broad range of IT and business disciplines. Yet, Pacesetters are making headway here, too—only 28 percent consider it an obstacle, in contrast with 41 percent of Dabblers. Pacesetters understand the need for experts in math and statistics, but they also recognize the need to blend these skills with business knowledge.

"Advanced analytics don't work in silos; you have to break them down. Business, IT and mathematical data experts have to work effectively together to produce relevant insights."

— James Taylor, CEO, Decision Management Solutions

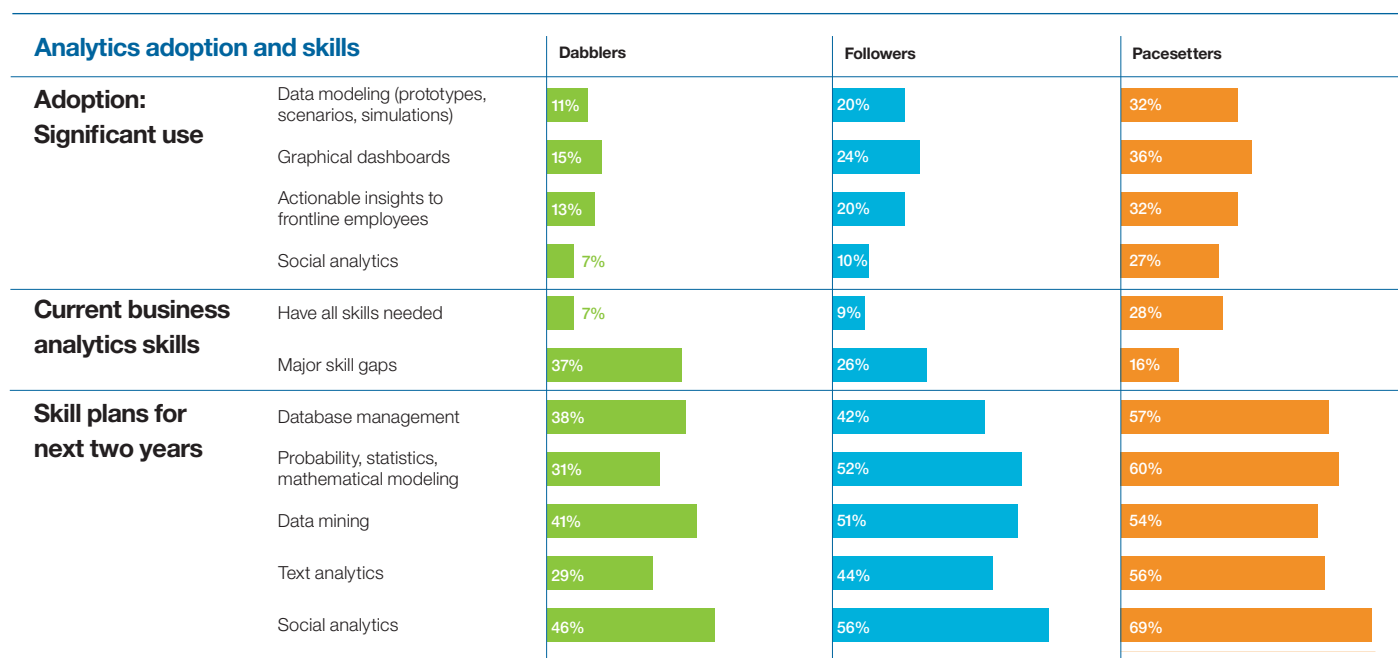


Figure 5: Pacesetters are more likely to use analytics and develop sophisticated analytical skills that equip them to handle "big data."

More experimental

Across the board, Pacesetters are adopting mobile, analytics, cloud and social technologies faster. But where Pacesetters outdistance their peers the most is not in broadly accepted areas—their biggest leads are in newer spaces.

For example, the majority of companies now use social media to engage customers. However, Pacesetters are also rapidly capitalizing on social capabilities *inside* their organizations, adopting enterprise social networking extensively at nearly four times and crowd-sourcing innovation at more than five times the rate of Dabblers. Similarly, in cloud computing, both Pacesetters and Dabblers are adopting popular approaches like private cloud and software-as-a-service at high rates. Yet, Pacesetters are six to seven times more likely to have significant deployments of newer cloud concepts, like hybrid cloud and community cloud.⁸

So, how are Pacesetters staying this far ahead? Do they get some sort of head start? As it turns out, they do. Rather than wait until there's business demand for new IT skills, Pacesetters start building skills ahead of time—just in case (see Figure 6). Pacesetters are nine times more likely to experiment with technologies that don't yet have a clear business application, and twice as likely to proactively develop skills to meet anticipated needs.

Being experimental, though, does not suggest Pacesetters are careless—especially with security and privacy. Across all four technology areas, Pacesetters are more likely than Dabblers to have adequate security policies in place. And more than 40 percent of Pacesetters are working to significantly improve security in their existing mobile applications, compared to only 10 percent of Dabblers.

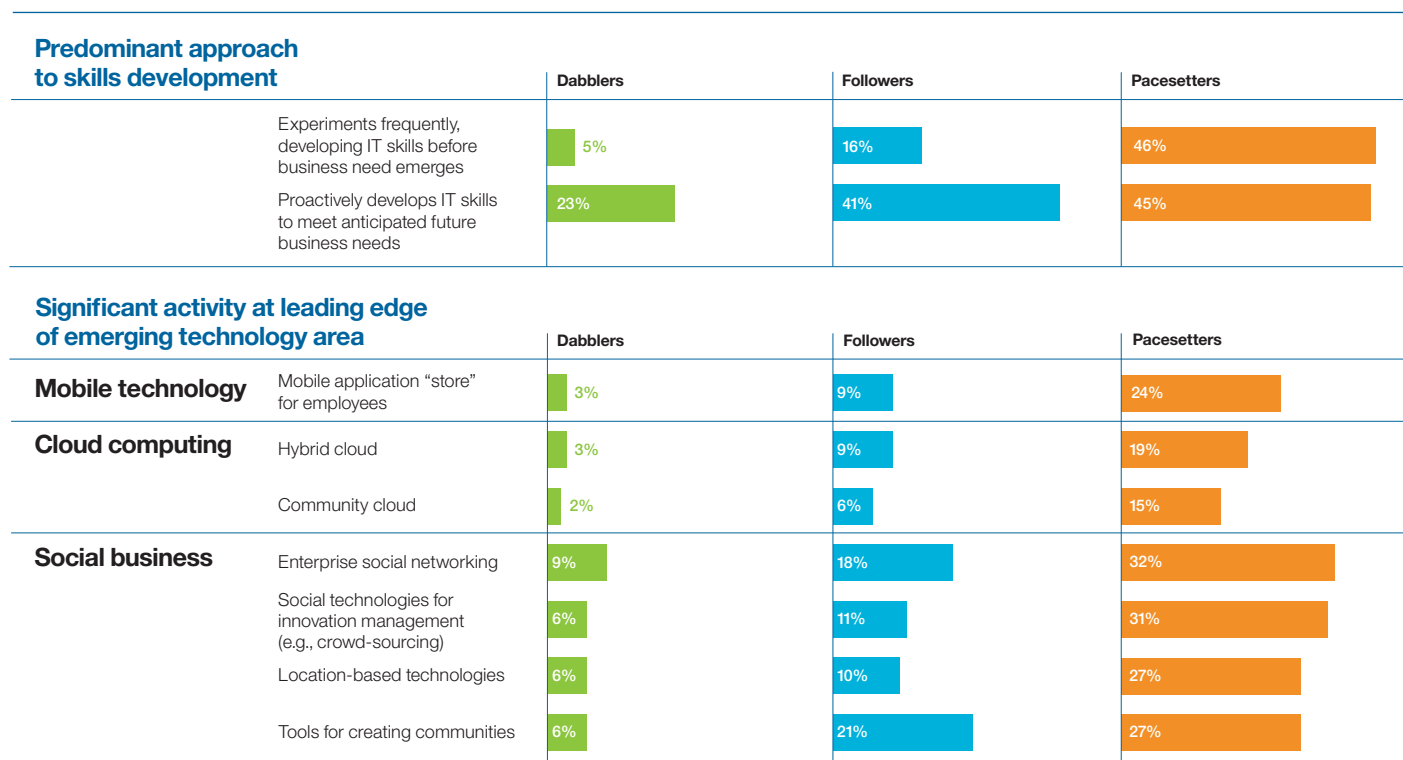


Figure 6: Pacesetters are much more experimental and proactive in developing skills and are forging into newer technology spaces more rapidly than peers.

Out ahead:**Driving top-line results through analytical insight**

With boutiques in airports and high-end shopping districts across nearly 90 countries, L'OCCITANE en Provence is an international retailer of body, face and home products. To capture the attention of its customers without overwhelming their email in-boxes, the retailer set out to deliver highly personalized messages using the power of analytics.⁹

Through a cloud-delivered analytics solution, L'OCCITANE captures and analyzes customer behavioral data, compiles it with customer-submitted profile data and continually optimizes segmentation information. This allows the company to email promotional offers to target segments that have specific product affinities. Equally important, the solution produces segmentation results quickly, allowing the retailer to rapidly test new offers and respond to changing market conditions.

Delivering more relevant offers has radically improved campaign results, helping L'OCCITANE boost online revenue by nearly 2,500 percent and conversion to sale by almost 1,700 percent. With guesswork now replaced by fact-based insights, the company is better equipped to offer customers what they really want.

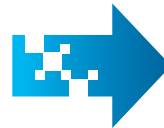
Where Pacesetters are headed next

Similar to the overall sample, more than 75 percent of Pacesetters are increasing investments in mobile and cloud computing over the next two years. Unlike most Dabblers, however, they're betting heavily on business analytics and social business; two to three times as many Pacesetters are raising those investments by 10 percent or more.

Pacesetters' top skills development objectives over the next two years in each area include:

**Mobile—Advancing mobile application skills faster than Dabblers**

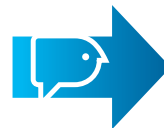
Seventy percent of Pacesetters are building capabilities in mobile integration, mobile security and privacy, and mobile application architecture, design and development. Dabblers have a similar focus on the first two, but lag considerably on skills to develop new mobile apps.

**Business analytics—Equipping to harness big data while Dabblers remain sidelined**

Pacesetters' top analytics skill target is operational or financial risk management and analysis—with nearly twice as many Pacesetters as Dabblers focused here. But most striking are the polar-opposite views on skills to mine big data. For example, among Pacesetters, 28 percent have already developed expertise in probability, statistics and mathematical modeling—and another 60 percent are eagerly developing those capabilities. Meanwhile, 41 percent of Dabblers say they anticipate *no need* for these skills.

**Cloud—Approaching cloud more strategically than Dabblers**

More than 70 percent are developing skills in cloud security, cloud administration and enterprise cloud architecture. Dabblers have similar plans for security and administration, but trail on architecture. This distinction suggests Pacesetters are approaching cloud computing more strategically, determining how to best use the technology's capabilities and integrate it into legacy systems. Meanwhile, Dabblers may be reacting tactically to mounting pressure to implement something via cloud.

**Social business—Combining expertise across technologies unlike Dabblers**

Nearly one-quarter of Pacesetters have already built the expertise needed to extend social business solutions to mobile and to perform social analytics—and another 69 percent are continuing to develop those skills. These ambitions show Pacesetters' intent to combine technologies—mobile and social, social and analytics—to drive even greater business value for their organizations. In stark contrast, more than one-third of Dabblers say they don't need any "social on mobile" or social analytics skills, suggesting they might not yet recognize the synergies among these technologies.

Actions for business and IT leaders

The IT skills gap is large and expanding.

Pacesetters are ramping up their skills and blending expertise to deliver stronger solutions.

Think deep and wide when building skills

- Encourage skill development across a range of disciplines, not just specialization within silos.
- Design diverse teams and use social tools to assemble the right expertise at the right time.
- Extend skills mission beyond IT. Help business leaders become smarter consumers of analytics and raise IT security awareness enterprise-wide.

Actions for IT practitioners

Concentrate on integrating expertise

- Deepen specialized skills while broadening knowledge across new areas.
- Combine areas of expertise to deliver more value. For example, apply security and privacy expertise across platforms.
- Strengthen business acumen. High-impact solutions require knowledge of the business and marketplace, not just IT.
- Use social tools to solicit and supply needed expertise.

Pacesetters are far more experimental and use social approaches to develop innovations.

Sponsor sandboxes

- Give IT staff the leeway to “play” with new technologies.
- Provide infrastructure to host experimental systems; consider cloud computing to experiment at lower risk and cost.
- Fuel innovation by crowd-sourcing ideas from your own staff.

Seek out experiential learning

- Take advantage of opportunities to try new technologies. For example, check out downloads on **IBM developerWorks**.
- Experiment “in the open.” Make experimental systems available internally, allowing quick iterative refinement.

Security is a major adoption barrier—and requires focus beyond IT.

Pacesetters are establishing security and privacy policies ahead of their peers.

Treat security as a business imperative

- Prioritize investments in security technology and skills development.
- Develop strong security and privacy policies to protect information assets.
- Collaborate with other organizations and academia on solutions.

Make security a personal priority

- Become an expert on security and privacy within your area of expertise.
- Better understand the global business context. Privacy laws and cultural expectations vary by country.
- Lead the charge to design security in from the start, not as an afterthought.

Figure 7. Becoming a pacesetting organization requires committed action by both leaders and practitioners.

Positioning for competitive advantage

These days, the rapid pace of IT change is a frequent topic of boardroom conversation. The 2012 Tech Trends Report provides a unique glimpse into the organizations that are actually setting that pace, highlighting approaches worth emulating.

CEOs are clear about the external factors impacting their organizations most: technology and skills.¹⁰ To effectively address these interconnected imperatives, business and IT executives need new approaches for bridging skill gaps and helping their organizations capitalize on the strategic potential of emerging technologies. Figure 7 outlines actions that can help you as a leader move your organization into pacesetting position.

Shifting the organization into high gear will require the support of IT professionals as well. In a business environment where nine out of ten enterprises need more skills in mobile, analytics, cloud and social technologies, practitioners with this expertise will continue to be in high demand. If you want to be at the forefront of these trends advancing your career, consider the actions in Figure 7 to hone Pacesetter attributes on a more personal level.

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The IBM Center for Applied Insights introduces new ways of thinking, working and leading. Through evidence-based research, the Center arms leaders with pragmatic guidance and the case for change.



Notes and sources

¹ The growth markets studied include the BRIC countries and South Africa, the country with the largest gross domestic product (GDP) on the African continent. Mature-market countries studied include the United States, Japan, Germany, France, United Kingdom, Italy, Canada and Spain. To smooth any geographic distortion, responses were weighted based on 2011 GDP data from The World Bank:

<http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries>

² “Leading Through Connections: Insights from the Global Chief Executive Officer Study.” IBM Institute for Business Value. May 2012. <http://www.ibm.com/ceostudy>. This research is based on in-depth interviews of more than 1,700 CEOs from around the world.

³ “Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011–2016.” Cisco. February 14, 2012. http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

⁴ Barrera, Clod and Wojtowecz. “Cloud Leads Five Storage Trends for 2011.” *CIO*. January 27, 2011; “Data Powers of Ten.” Cal Tech Concurrent Supercomputing Facility. 1999.

⁵ Israel, Shel. “Age of Context: Social Media Becomes a Mature Platform.” *Forbes Tech*. August 29, 2012. <http://www.forbes.com/sites/shelisrael/2012/08/29/age-of-context-social-media-becomes-a-mature-platform/>

⁶ “Leading Through Connections: Insights from the Global Chief Executive Officer Study.” IBM Institute for Business Value. May 2012. <http://www.ibm.com/ceostudy>

⁷ The growth markets studied include the BRIC countries and South Africa, the country with the largest GDP on the African continent. Mature-market countries studied include the United States, Japan, Germany, France, United Kingdom, Italy, Canada and Spain.

⁸ Hybrid cloud is a combination of two or more cloud infrastructures (private, community or public) that remain unique entities but are bound together by technology that enables data and application portability. Community cloud is used by a specific community of consumers from organizations with shared concerns (e.g., mission, security requirements, policy, etc.).

⁹ “L'OCCITANE en Provence.” IBM. http://www-01.ibm.com/software/success/cssdb.nsf/CS/KJON-8PYVWT?OpenDocument&Site=default&cty=en_us

¹⁰ “Leading Through Connections: Insights from the Global Chief Executive Officer Study.” IBM Institute for Business Value. May 2012. <http://www.ibm.com/ceostudy>

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