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Six keys to unlocking upskilling at scale

Research suggests that with the right mind-set, technological literacy, and community engagement, you can shepherd your entire workforce into the digital future.

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In late 2018, a PwC senior manager named Patricia Miller, age 32, learned about a new opportunity in her Florida office called the Digital Accelerators program. Her local firm was recruiting a group of about 1,000 employees, drawn from a base of more than 45,000 nationally, to become pioneers in advanced technology. These early adopters would spend two months in intensive training and return ready to help their fellow employees succeed in a world of artificial intelligence (AI), robotics, and digitally enabled platforms.

Miller had worked primarily in project management and was just finishing an MBA. She didn't have a technical background. But the notice didn't specify one, so she applied and was accepted. "Here was a chance," she recalls, "to rethink my potential. I saw where the world was going, and I was hungry to be part of it."

Miller rapidly built up the skills necessary to understand and use digital tools, including data visualization and bots. One of the bots she developed consolidated and identified the specifications for automated data-gathering tools. "No more bulky spreadsheets [full of comparative evaluations]," says Miller. "We could just send out a link to the information the bot gathered and interpreted."

A year earlier, this kind of work would have been delegated to IT specialists in the organization. Now, Miller and her newly educated peers were creating relatively sophisticated apps that could, for example, calculate changes in profitability on a week-by-week basis, find and fix annoying "fuzzy duplicates" on multiple spreadsheets, identify indicators of high business risk from masses of data, and summarize long documents in just a few cogent sentences. Approximately 6,000

such offerings have now been posted on the PwC US intranet and used by thousands of other employees. In aggregate, the apps are freeing up staff time for potentially more productive, creative tasks.

“I’m still hearing from fellow employees who’ve added to or expanded on my apps,” Miller says. “It’s really gratifying. And it sets me up to be what I truly want to be: an infinite learner.”

Hearing this story, you might think that these productivity gains were the primary purpose of this initiative. But in fact, they are a welcome side effect. The initiative has a more significant goal for the global PwC network: to facilitate the shift in attitude and ability that will build the kinds of skills, among a broad base of employees and others, that will help society make an effective transition into the digital future.

In every industry, in companies large and small, and at every level of the hierarchy, the need has never been so great for proficiency with digital technologies and the new ways of working that they require. The most established professions of the business world — including accounting, finance, operations, business law, and management itself — are changing dramatically. Employees at every level must keep up with digital concepts: robotic process automation, AI, predictive analytics, cybersecurity, virtual reality, the Internet of Things, industrial platform design, customer experience, electronic ledgers (blockchain), and drones.

PwC has been developing and strengthening an innovative learning program for more than two years. The Digital Accelerators concept is just one element of an approach to what is called digital upskilling. In short, at PwC, we are learning now to do what was previously considered impossible: to help thousands of adults become skilled technological leaders for whom digital proficiency is not just something taught in a classroom or through apprenticeship. It is a way of life.

The digital learning curve

Below, we explain the core concepts of this new approach to learning and why it is so effective and replicable. Today’s approach to adult learning — or what Miller called infinite learning — is a foundational element of the larger upskilling movement: the expansion of people’s capabilities and employability to fulfill

the talent needs of a rapidly changing digital economy.

In a body of [articles](#) on workforce transformation, we explain what we believe the five prerequisites of a successful approach to upskilling. The best approach begins with assessing the current environment and identifying skills gaps and job mismatches. Once that assessment of individuals is complete, a future-proofing strategy must be designed to fill the current and future skills gap and start the training. The adult learning component is tied to the need to embed upskilling into the corporate culture, as we explain later: If the cultural foundation supports the upskilling efforts, the digital learning model described below will flourish. Finally, it's necessary and important to be able to measure success.

We acknowledge there are varying [estimates](#) of what it will cost to upskill millions of people around the world as digital technologies change the nature of work. PwC has committed to spending US\$3 billion over the next five years to upskill its workforce of more than 276,000 people across the global network. Here, we look at how to lay the groundwork for a successful upskilling program. We believe that upskilling at scale is imperative to keeping businesses competitive, keeping societies stable, and providing a good livelihood for millions of people. And it starts with learning how to learn.

The six key concepts of the digital learning approach:

- **Shared reality:** The establishment of a common understanding of which new skills are important to a given enterprise and how they can be learned
- **Spaced repetition:** The sequencing of learning opportunities in a way that strengthens the right cognitive circuits and builds new habits and capabilities
- **Citizen-led innovation:** The ability of employees to choose the activities — the skills and the means of learning them — that will make a difference to them and their work
- **Authentic informal leaders:** The deployment of early enthusiasts to spark interest and emotional impact within the organization's culture (in the example above, these were the Digital Accelerators)
- **Social learning:** The use of small working groups, ideally composed of people from diverse backgrounds, to foster collaborative experimentation, mutual support, and collective intelligence
- **Self-awareness:** The tracking and measurement of results in a way that

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accelerates the rate of improvement both for the employees raising their skills and for the initiative as a whole.

These elements have a diverse heritage in learning and management theory, and the way they are implemented will vary from one organization to another. Most or all of them are present, we believe, in every successful effort to raise the caliber of digital skills in an organization. When an initiative is designed effectively, the elements complement one another. Together, these elements create an immersive workplace environment that makes it easy to build new habits and learn new skills, continually reminding people of the progress they've made and the learning yet to come. Just as learning a new language is easier if you move to a community where it is constantly spoken, learning digital proficiency is easier if you are surrounded by other people who are fluent with the relevant technologies.

But such widespread fluency is not the situation in businesses today. Training Industry, an organization and information source devoted to “the business of learning,” [estimates](#) that organizations spent more than \$362 billion on employee training and education in 2018 alone, reflecting a growth rate of 1.2 percent per year. Yet as Harvard Business School professor Michael Beer had already [pointed out](#) in 2016 in *Harvard Business Review*, organizations “are not getting a good return on their investment. For the most part, the learning doesn't lead to better organizational performance, because people soon revert to their old ways of doing things.”

The usual type of *event-based learning*, in which people are sent away to

learn in training events, workshops, classes, or even hackathons, is so separated from the rest of their lives that it's very difficult to carry the insights and skills from the sessions back into daily work. If the new skills are not practiced, they are lost.

A more effective model is *continual learning*: learning that is happening regularly, integrated with the rest of a person's life, and oriented toward his or her own long-term aspirations. When learning takes place through day-to-day experience, it is far more relevant; employees can see the connection to the work they are already doing and the goals they (and their enterprise) already have. This means deemphasizing carrot-and-stick incentives such as bonuses for those who excel and poor performance reviews for those who don't participate. Those incentives may be effective in getting people to take part, but they rarely generate interest or commitment.

Another accelerating factor is self-awareness. Chris Argyris, an influential management theorist, referred to this as “**double-loop learning**”: When people are conscious of changes in the way they think and act, these changes are more rapid, more substantial, and more likely to stick. It's powerful to learn to program an app. It's much more powerful to explicitly realize, *the skill that I'm learning is not just about this particular software development tool. It's learning to solve problems in a different way.* “I love that this program means we keep this newly found expertise in our firm,” says John Heinen, another senior manager and participant in PwC's Digital Accelerators program. “The firm is investing in us, instead of spending several hundred thousand dollars on hiring a third party. The ‘infinite learning’ philosophy has put me in a position to deliver new value to my client, and to navigate the rest of my career.”

New world. New skills.

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Many corporate learning and training efforts fall short because they stop at delivering knowledge — giving employees new information about digital trends and tools, for example, but no opportunities for using them. For example, a conventional course covering blockchain might require an essay or test that demonstrates that the student knows how a digital ledger works, why it requires a great deal of energy, and how it might be adopted by a bank or supply chain. An upskilling effort involving blockchain would involve designing and programming a blockchain-related application relevant to a person's job, such as a prototype electronic ledger to track shared documents. The more directly applicable the learning is to a person's work, the more meaningful it would be as an upskilling experience.

This type of learning is geared toward raising performance. This approach involves building people's strategic acumen so they can come up with new ways to solve real-world business problems, using the new tools as part of the solution. A performance-raising module on blockchain might involve prototyping a blockchain system, perhaps one for a bank or medical practice that allows data sharing while maintaining privacy. In the past, only a few people could design such a system, and they might need supercomputers to do it. Now, the work can be done by a midlevel employee with a laptop and a smartphone.

As more people acquire new skills, a positive reinforcing cycle is generated for the entire organization. When people grow used to building and testing apps, they incorporate digital technology into their lives. The network effect, active in most organizations, means that digital proficiency will become part of more conversations, and eventually part of the corporate culture. This, in turn, speeds up the pace of digital learning, and the capability of the enterprise accelerates while the cost continues to go down. It's like a human version of Moore's Law, and it's visible after just a year in the organizations that have put this into practice.

Shared reality

Columbia University social psychologist E. Tory Higgins explained, in his 2019 book *Shared Reality: What Makes Us Strong and Tears Us Apart*, how human understanding of what matters — the way people discern information as trustworthy or not — depends on the context of relationships. When you talk about

things habitually in a group you trust, you tend to regard those things as worthwhile, and your commitment toward them grows. “Our shared realities,” writes Higgins, “become the world we live in and know. Sharing is believing.”

The evolution of this insight has changed motivational research. One of the most effective starting places for motivating people to change habits is the development of a new shared reality. Every component of an upskilling initiative takes advantage of this aspect of human nature, but the shared reality must be defined right at the beginning. That’s where the top of the organization and the initiative design come in.

The compelling nature of a shared reality starts not with its substance — what is being said — but with its context: who is saying it and why that person or organization is credible. In the case of an organization, this suggests a baseline of comfort and commitment that senior leaders don’t just talk about, but embody. People pay close attention not just to what leaders say, but to what they do and, most importantly, to where those leaders are directing their own attention.

In announcing the new experience, members of the C-suite need to clarify how much of a commitment they are making by talking up the investment, in money and senior management time. They must be visible models of the digital culture, building their own skills and knowledge. There needs to be a common language built around a consistent message that is clear and frequently repeated. Higgins’s research suggests that these factors help people internalize a message and make it part of their “self-guide.”

In companies that have introduced upskilling initiatives with knowledge-based apps, the most popular topic is digital culture. More than half of the employees at PwC who use what we call our Digital Fitness app have clicked on that theme. In PwC’s [23rd Annual Global CEO Survey](#) of more than 2,000 CEOs, of those who said their companies had made significant progress in upskilling, 60 percent reported that it had strengthened their corporate culture, compared with 22 percent among those who said their companies had made little progress on upskilling.

One by-product of digital upskilling is the blurring of the line between the IT function within a firm and everyone else in the firm. In conventional procurement, for example, the IT staff is seen as an intermediary between the company

and the vendors, purchasing, adapting, and configuring the tools. In this new shared reality of digital upskilling, IT work is integrated with other work, and the vendor provides tools used throughout the enterprise. A system, rather than being built up over months or years and then being released in regular upgrades, is now continually worked on by people throughout the company.

There must therefore be a change of attitude within the IT function. Instead of packaged solutions, IT now provides platform environments that are continually being developed. At the same time, it is vital to keep the enterprise safe from intruders, to protect sensitive data, and to make the customer experience stronger.

To bolster a firm-wide shared reality, leadership at PwC, for example, communicated clearly that no employees would be left behind if they made an effort to play a part in the change. “We are investing in you and your tomorrow,” said senior leadership. And there is good reason today for other firms to do likewise. People are realizing that the human capacity for learning carries on beyond an initial training period, despite a historically prevalent view to the contrary — a view that could doom a firm-wide upskilling initiative. Stanford University psychology researcher Carol Dweck posits that a good description of people’s ability to learn is the *growth mind-set*.

“Scientists are learning that people have more capacity for lifelong learning and brain development than they ever thought,” Dweck wrote in her 2006 book *Mindset: The New Psychology of Success*. “People may start with different temperaments and different aptitudes, but it is clear that experience, training, and personal effort take them the rest of the way.” Those who believe in the growth mind-set — those who believe that with a plan and sufficient effort and support, they can realize most or all of their goals — are more likely to succeed. For that reason, it’s in everyone’s interest to foster a culture in which human capability is assumed to be infinite.

Spaced repetition

One strong contribution that cognitive psychology has made to digital learning is the concept of neuroplasticity. This concept says that repetition of a particular practice, focusing attention in the same way each time, reinforces the neural

activity associated with those practices. In effect, the focus of attention rewires the brain circuits. As the new behavior gradually becomes habitual and automatic, the person's ways of thinking and acting change accordingly. A digital future initiative can be designed and set up to foster that type of neuroplasticity so that digital skills and innovative ways of thinking, which may feel unfamiliar at first, soon become second nature. Once that happens, the change in performance accelerates.

That's why it is powerful to have what cognitive psychologists call **spaced repetition**: the continual practice of new activities, ideally several times a day or more, but with enough time between them to prevent the new behavior from being forced or rushed, and to allow the brain circuits to have a chance to rewire themselves. Spaced repetition can be a challenge to organize because it requires scheduling and planning. Some of PwC's initiatives set a goal of having a concept repeated at least four times within 60 days.

This repetition happens through a variety of channels, tailored to the habits of employees at a particular company. Typically, employees can browse a library of articles and videos related to advanced technologies. There might be a podcast series and YouTube videos targeted toward commuters (**A to Z of Tech** and **Tech while You Trek** are two developed by and used at PwC) or interactive games that help employees increase their proficiency and knowledge. Online collaborative workshops are also possible, as are face-to-face digital labs where cross-functional teams solve problems together.

All of this should be curated through employee experience efforts: apps, online tools, and regular face-to-face sessions all provide opportunities for tuning in. An app might prompt participation with a running tally of each employee's progress, sending pop-up signals to smartphones or laptops. These should be designed not to distract or burden employees, but rather to give them reminders based on their own digital behaviors of the opportunities that exist for raising their skills and solving problems.

Although an initiative should not rely solely on extrinsic motivation, that is, rewards and penalties (because they shift people's motivation to the transactional side and thus diminish genuine interest in learning), keeping score can be useful in fostering spaced repetition. It represents a more "gamified" approach

to daily life. Employees might thus earn points for making progress in gaining skills, perhaps redeemable as merchandise.

Tracy Sas, a human capital data manager in the PwC Tampa office, is a member of a team of colleagues who have become “power players” in a digital learning game. “We divide up topics — one person might take blockchain, I’ll take AI, and that way we can divide and conquer when it’s time to take the quiz,” she says. A winning individual might earn \$35 and a winning team well above \$100 to be divided however the team chooses. At any point, there might be 8,000 people playing, learning while having fun. But for Sas, the important thing is the momentum behind the initiatives. “The whole initiative shows all of us why digital upskilling is so important — and how we can use it in our daily tasks,” she says.

Citizen-led innovation

The term “citizen-led” suggests that every individual is a decision maker, choosing the projects that he or she will work on and participating in a community of innovators. But a free-for-all is the wrong approach. There needs to be a dedicated platform for collaboration. People should be encouraged to propose new ideas for tools, post prototypes, recognize the value of one another’s submissions, refine them in a transparent way, and gain digital skills. The platform should provide a fully participative innovation laboratory, giving people access to AI, data analytics, and visualization functions. These in-house platforms follow the model established by social media sites like GitHub, where coders can post bots and apps and can review and use tools that others have posted. In this way, everyone can benefit from these new apps and bots.

A curation team needs to evaluate each contribution submitted to the laboratory platform and make sure it works, isn’t a duplicate of another tool, has properly documented logic and application, and can be found using commonplace search terms. People will tend to download the apps and bots that are highly rated. As with any social media platform, people can see how many downloads that particular artifact has had and can read others’ comments about it.

Letting employees decide what they are going to work on and what features they will include involves a leap of faith for many enterprise leaders, but there is

more at stake than just motivation and engagement. Employees who innovate their own projects will create software that no one else would create, and that may turn out to be invaluable.

At PwC, for example, a member of the first class of participants in the Digital Accelerators program was working in M&A and as a tax advisor. He was stuck with the rote task of gathering and analyzing billable hours for clients, which could take up to two hours per client. During the training he built an AI program that could do the task in 15 seconds. Citizen-led innovation is **effective**, in part, because it brings double-loop learning into play. People soon realize that they are not just learning programming or learning how to use a software development tool; they're learning how to solve problems in a different way.

Authentic informal leaders

Nearly every employee of a business can learn to be digitally proficient, capable of mastering advanced technology in a significant manner. But some will get there sooner, if only because they are prepared to make the effort. Thus, each year of a digital future initiative, some percentage of the workforce — in PwC, it's 5 to 7 percent — should be recruited as explicit early adopters. (Patricia Miller and John Heinen were both in the first class of PwC's Digital Accelerators program.) One name for this type of staff member is an *authentic informal leader* (AIL). Jon Katzenbach, James Thomas, and Gretchen Anderson used this term in their 2018 book **The Critical Few: Energize Your Company's Culture by Choosing What Really Matters**. "They're the people who are already, in their daily lives and jobs, demonstrating just the kind of behaviors that you want to encourage and promote," the authors write. "In addition, many of them are also excellent at sensing and articulating the moods and opinions and emotions of others, so we refer to them as 'emotional sensors' as well."

Different companies may call them by different names, but these employees are always understood to be cultural exemplars. They are people who adopt the requisite digital mind-set right at the beginning of the effort (they've probably already held it), immerse themselves in knowledge, and dedicate themselves to teaching others their skills and helping reimagine how work can be done more productively. They can also be recruited into design efforts, to help senior

leadership recognize the progress that is being made, and adjust the initiative accordingly.

Don't confuse AILs with supervisors or managers. What defines them, more than any formal role, is their attitude and their influence on the feelings and behaviors of those around them. People rely on AILs for advice and guidance, and most of them are already attuned to the organization's priorities and culture before an upskilling initiative starts. That's why they volunteer or apply to be recruited for it. Because their role is voluntary, and often related to their temperament, they need particular types of support in an upskilling initiative. For instance, they need to continue training — to stay in touch with one another and the intensive shared reality of their work — while resuming their regular jobs. They will be part of a digitally accelerated community and should have time reserved on the job to enable them to keep learning.

They also need credibility among their peers. Although the group should not be seen as threatening, an invitation to join it should be seen as something to compete for. AILs tend to gain a kind of elite status, based in part on the value their work provides others.

Social learning

An immersive upskilling initiative should go beyond digital interaction. There should be in-person training sessions, with 30 to 50 people gathered together. It is important for people to be in continual contact with peers going through the same learning process and using the same tools. They can trade ideas, learn from trial-and-error experimentation, and see what others are coming up with.

Team discussion is based on a kind of synthesis known as abductive reasoning. Many conventional teams are inductive, starting with a theory and looking for data that applies; others are deductive, trying to form hypotheses only after all known data is gathered and analyzed. Abductive reasoning, by contrast, is an iterative process. You start with the data you have and test it, drawing a preliminary hypothesis and continuing to adjust the concept over time. The types of problems that most people will encounter in business are likely to be solved more quickly and effectively through abductive reasoning.

Social learning is accentuated when the teams are diverse; members should be

drawn from a variety of backgrounds. If they span geographic, functional, and even organizational boundaries, the team is more likely to approach problems with a fresh perspective and to solve problems more effectively. The team ultimately benefits from constructive conflict among the points of view they bring to bear. Interacting with one another enriches the group's insights, bringing out advances in skills, thinking, and performance. (Harvard Business School professor Amy Edmondson and HEC professor Jean-François Harvey call them “extreme teams.”) Research on [collective intelligence](#) shows that teams set up to take advantage of diverse perspectives in this way score higher on problem-solving tests and other intelligence tests than the same people operating on their own. A wealth of [academic literature](#) supports this.

Self-awareness

Most assessments of learning progress are conducted to justify credentials — there's a point at which the student passes or fails. But in digital learning, the engagement and improvement never end. Most people will be advancing their skills throughout their working lives. Therefore, the value of assessment is different: It exists for learners and their colleagues to understand what they have done, and what there is left to do.

In this initiative, start by asking the employees what measurements matter most to them. Typically, these will include metrics related to:

- **Productivity:** What percentage of time is now spent on essential but unproductive tasks, compared with before?
- **Acumen:** What types of skills and competencies are now evident in work that the individual has done?
- **Satisfaction:** How do employees feel about the initiative?
- **Confidence:** How assured do employees feel about their career opportunities?
- **Peer review:** How popular are the apps that the team has designed?

Some of the data will be gathered through surveys, others through observation of activity. A digital assessment app (at PwC, we have a [Digital Fitness app](#)) can become like a fitness tracker, recording people's online activity and the ways in which they use their new skills. The data can also be used in aggregate to

improve the overall upskilling process. Connections can be made, for example, between individual choices and assessment results; between the types of technologies explained and the steepness of the learning curve; and between the design of the initiative and the overall employee retention rate. At PwC, as we extract insights from the data about more than 100,000 users, the insights will influence the design and delivery of future initiatives.

First steps and next steps

Prepare for an upskilling initiative as you would for any other large-scale transformation. The [PwC model](#) has five distinct steps:

- **Assess current environment and identify skills gaps and mismatches:** Identify the size and nature of an organization's skills gaps and mismatches, where to start, and what to prioritize.
- **Build a future-proof skills strategy:** Build strategic plans to deal with the skills gaps that have the most impact on delivering business value.
- **Lay the cultural foundation:** Evaluate and adjust policies, processes, and incentives to reinforce and encourage culture in an organization's upskilling efforts.
- **Develop and implement upskilling:** Create and deploy programs that harness the organization's culture and use key behavioral economics principles to deliver the right learning experience and rapid results.
- **Evaluate return on investment:** Measure the return on investment from upskilling programs.

Put a group in charge of thinking about measuring progress, monitoring risk, involving leaders across all levels, recognizing moments to pivot, and plotting how the efforts will scale gradually through the entire organization — and perhaps the value chain as well.

The most successful efforts leverage the network effect, the powerful motivational force involved in personal connections. People will move themselves if they can see and feel the positive impact that similar changes have had for people they know. The more people join, the more others will see the value in joining; when there are systems that scale up, greater numbers of people lead to

greater value. Over the next three years, PwC is rolling out this program across its network in 157 territories.

There will be quick wins along the way. PwC's CEO Survey suggests companies further along in the process are more confident about their future growth prospects, for example. But do not give in to the temptation to only go after quick wins and abandon the transformation a year in. Businesses have to be prepared to invest in their infinite learners. The aspirations associated with this type of adult skill building are immense.

In 2020, we expect to see people in advanced companies doing what everyone will do routinely in 2030 — while still getting practical results on the ground. Initiatives like this will be their rites of passage, perhaps as critical to their success as a college degree is now. The pioneering companies have reason to be proud of their efforts, and of the way they are unleashing the capacity for resilience and learning that seems to be part of human nature. That's what will enable all of us to meet the challenge posed by our rapidly changing times. +

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