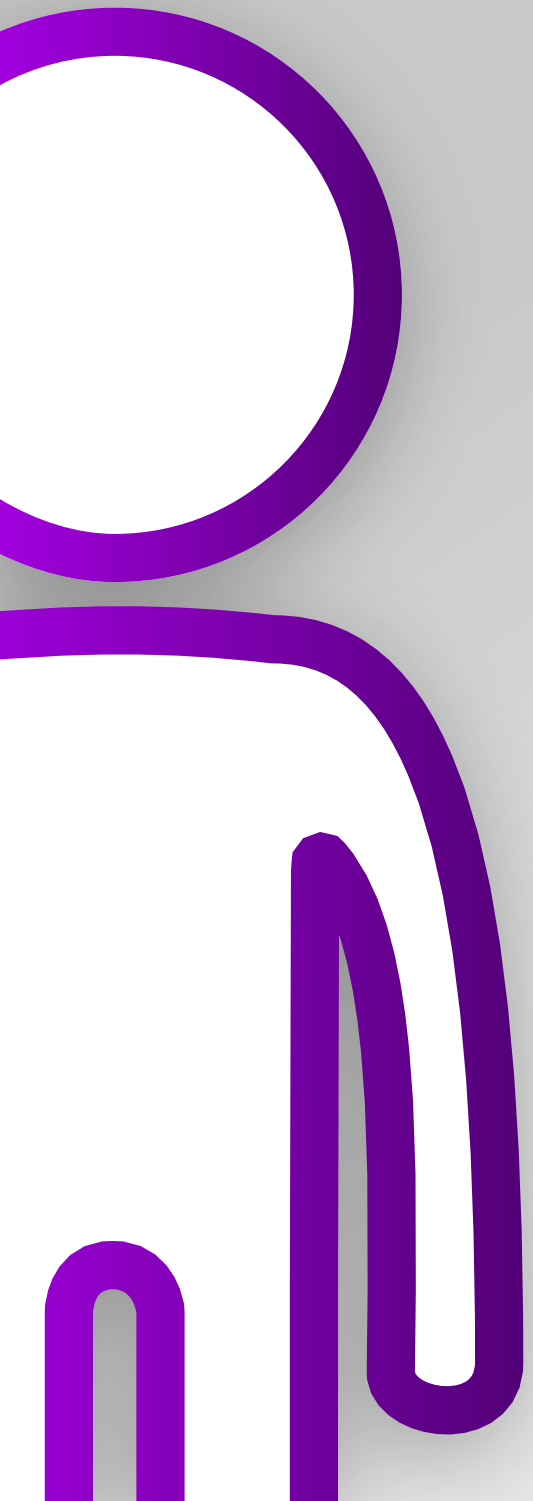
THE ASPEN INSTITUTE
BUSINESS & SOCIETY PROGRAM

accenture

ADVANCING MISSING MIDDLE SKILLS

For Human–AI Collaboration

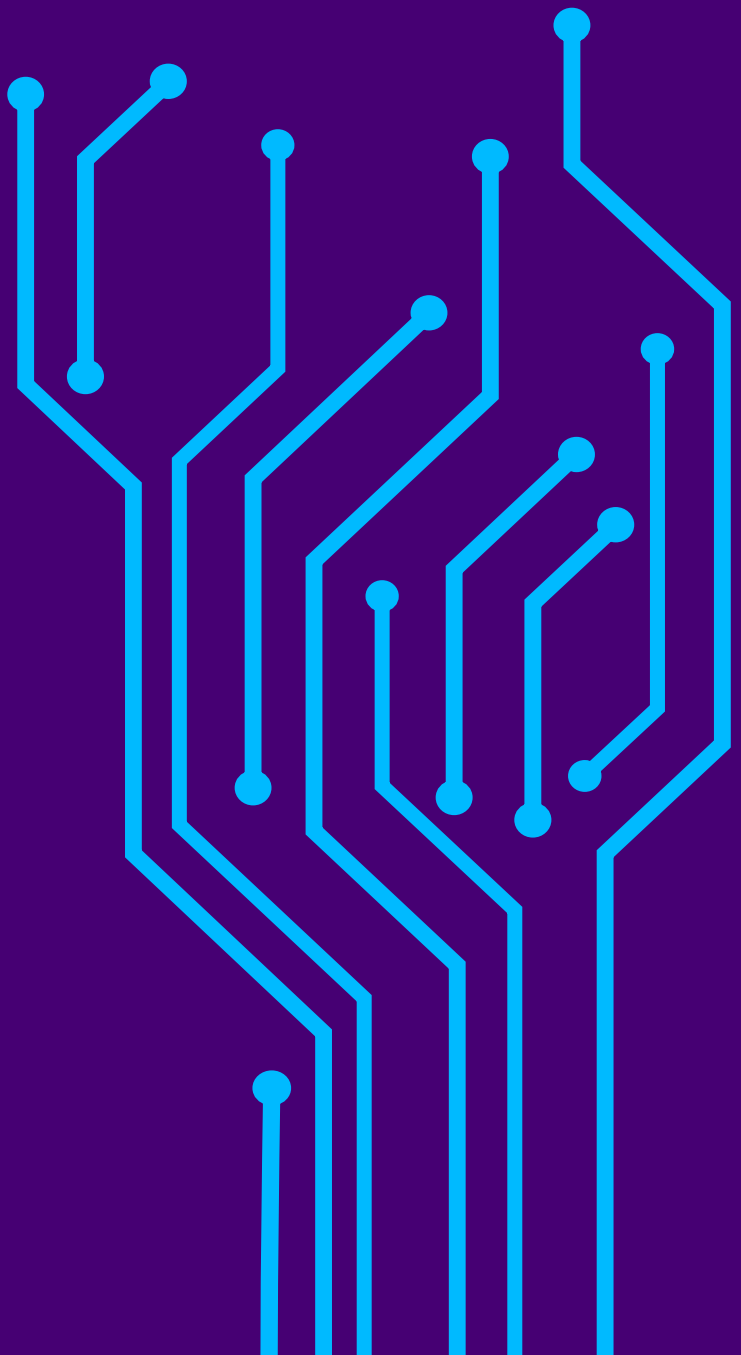


Contents

What will the future of work look like? Will machines be on one side of the room, performing certain jobs, while on the other side, humans carry out different roles? Our research reveals that such a stark division of labor is unlikely. Instead, the in-between space—what Accenture calls "the missing middle"—is where intelligent technology and human ingenuity will come together to create new forms of value. Robots, by and large, will not be taking our jobs. Instead, human-machine collaboration will reconfigure most of the work we do, making uniquely human skills more important than ever.

This paper explores the nature of these skills—higher-level intelligence skills—that we all possess but could use more. Developments in the science of learning show how these exclusively human capabilities can be developed and applied so we can achieve the full potential of the missing middle.

To grow these skills, employees must develop a lifelong learning mindset, while employers must establish conditions to nourish the desire and capability of people, and invest in skills development.



HUMAN SKILLS SURGING

As companies rapidly adopt intelligent technologies, the complex impact of these changes on work is coming into focus. While it is true that some jobs will exclusively be done by humans while other roles will be taken on by machines via intelligent automation, most of the emerging roles will be fulfilled by both working together in the dynamic space Accenture calls "the missing middle."

This human-machine collaboration will augment human capabilities, unleashing productivity advances along with more creativity, innovation and growth. We are leaving the "Information Era", when machines delivered data that improved processes and products, and entering the "Experience Era", during which uniquely human skills will deliver more personalized and adaptive customer experiences (see Figure 1: The Human Skills Surge).

The Information Era required legions of smart engineers to build software, networks and algorithms. But the Experience Era will need people with social and leadership abilities who can improvise and show good judgment, such as those who can train Artificial Intelligence (AI) systems and make sense of the data generated by AI. Training chatbots to be empathetic to customers is the kind of complex, creative activity that will characterize more roles in the future.[1]

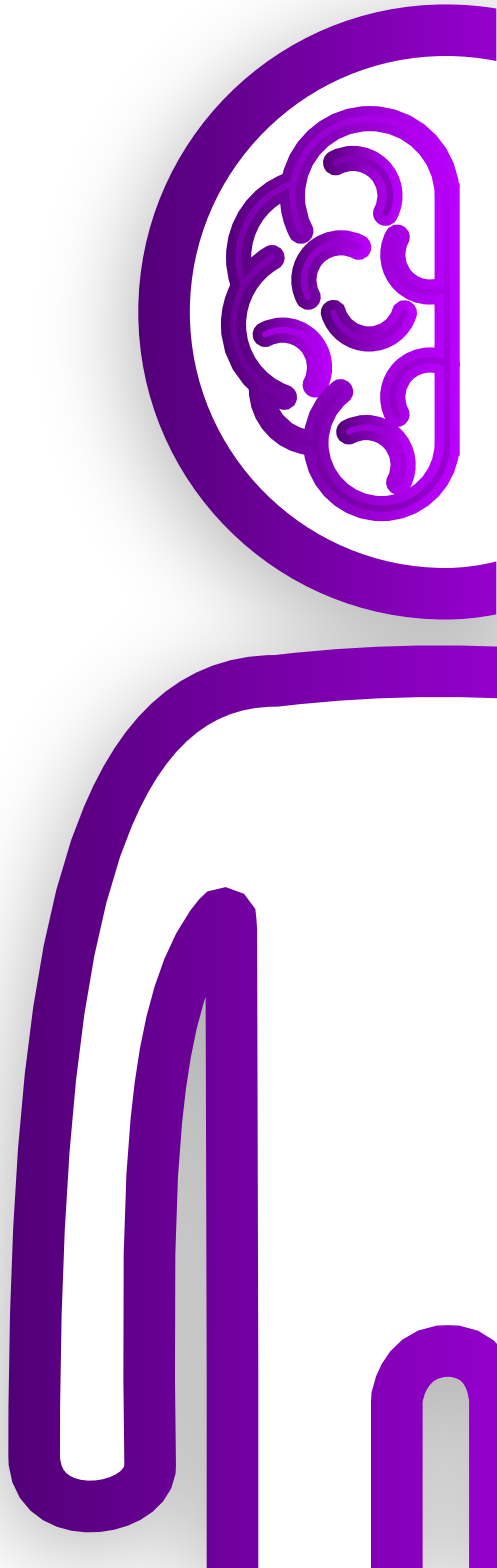
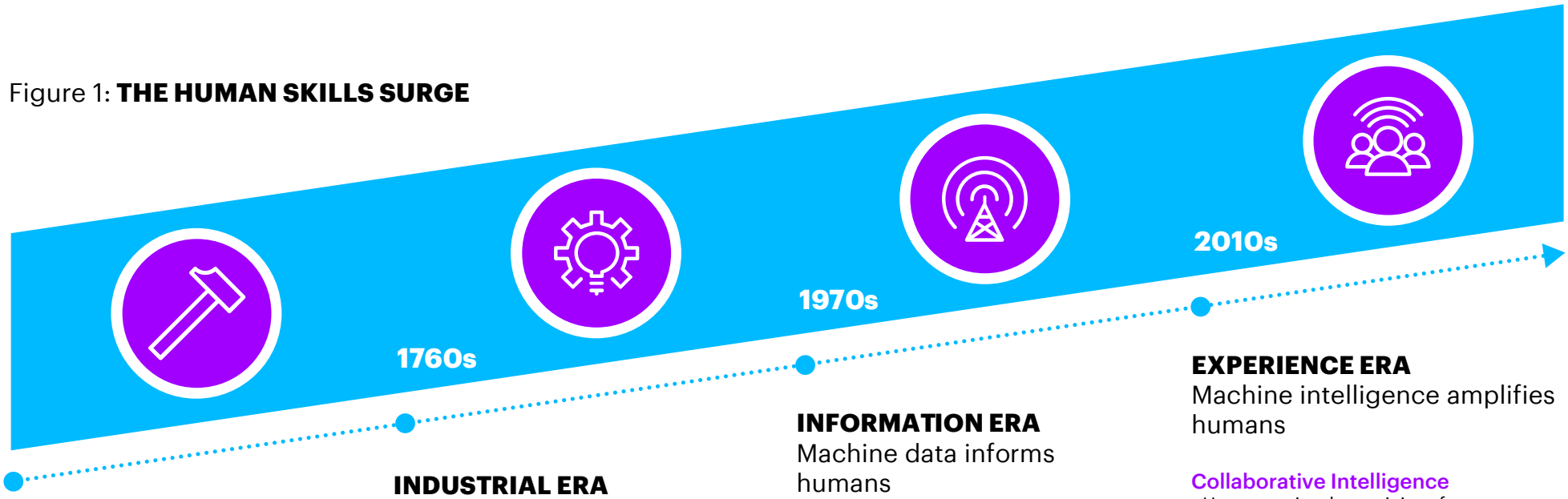


Figure 1: **THE HUMAN SKILLS SURGE**



PRE-INDUSTRIAL
Machine-like humans

Resource Ingenuity
- Creative use of natural resources
- Managing materials and manual labor
- Physical strength, stamina, body equilibrium abilities

INDUSTRIAL ERA
Machine automation aids humans

Operations Management
- Creativity of product and process design
- Managing operations, personnel, finances
- Communication, coordination and organization skills

INFORMATION ERA
Machine data informs humans

Knowledge Management
- Creativity of service design and delivery
- Managing data, information
- Analytical reasoning and STEM (science, technology, engineering, math) or technical skills

EXPERIENCE ERA
Machine intelligence amplifies humans

Collaborative Intelligence
- Unconstrained creativity of Human+Machine
- Managing hyper-relevant experiences
- Socio-emotional intelligence and HEAT (humanities, engineering, arts, technology) or multidisciplinary skills

Source: Accenture Research

Our analysis of the U.S. Department of Labor's O*NET database of occupational data provides evidence of this surge in skills.[2] We analyzed the evolution of more than 100 abilities, skills, tasks, and working styles in the U.S. over the last decade and found that creativity, complex reasoning and socio-emotional intelligence have sharply increased in importance for many jobs.

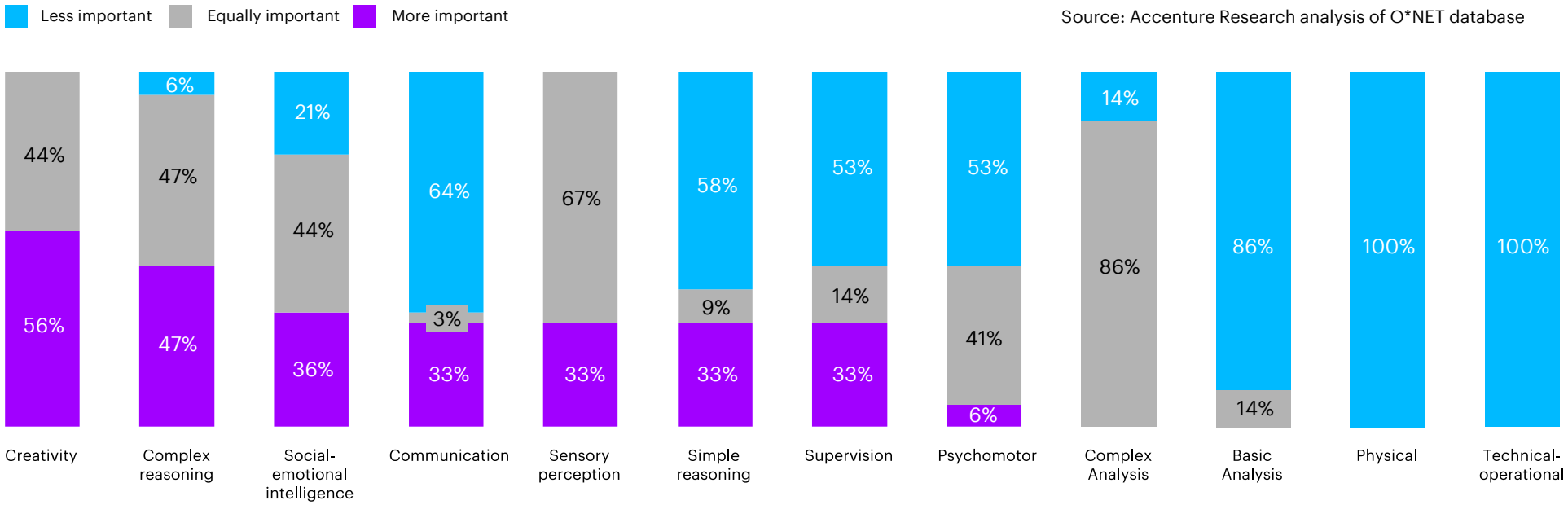
Specifically, more than half of U.S. jobs need higher-level creativity, over 45 percent require more complex reasoning, and 35 percent need more socio-emotional skills than in the past.

The relative importance of physical, operational and simple analytical skills has waned, even in job profiles focused on physical strengths and machine operation (see Figure 2: Evidence of Human Skills Surge in U.S. Jobs).

For instance, industrial engineers now find themselves interacting more with leadership and shop-floor personnel to develop production and design standards, rather than maintain equipment. Similarly, because of automation, sales personnel write client reports and maintain paperwork less frequently than in the past. Consequently, socio-emotional intelligence for connecting with clients is now more germane to the job.

Figure 2: **EVIDENCE OF HUMAN SKILLS SURGE IN U.S. JOBS**

Change in the importance of skill type in U.S. from 2004 to 2016
(100% = 151M jobs in U.S. as of 2016)



The surge of socio-emotional and multidisciplinary skills is reflected not only in what workers do, but also in the way companies assemble teams. Consider the example set by Autodesk. The leading 3D design software creator is making its AI-enabled Autodesk Virtual Assistant (AVA) more emotionally intelligent. The team includes application engineers and data scientists as well as user-experience designers, creative writers and conversational engineers who design personas, shape linguistic patterns, and improve the user experience. Today, AVA handles about 15 percent of English customer support conversations. Call-resolution times have decreased, and human customer service representatives can now focus on more complex issues.

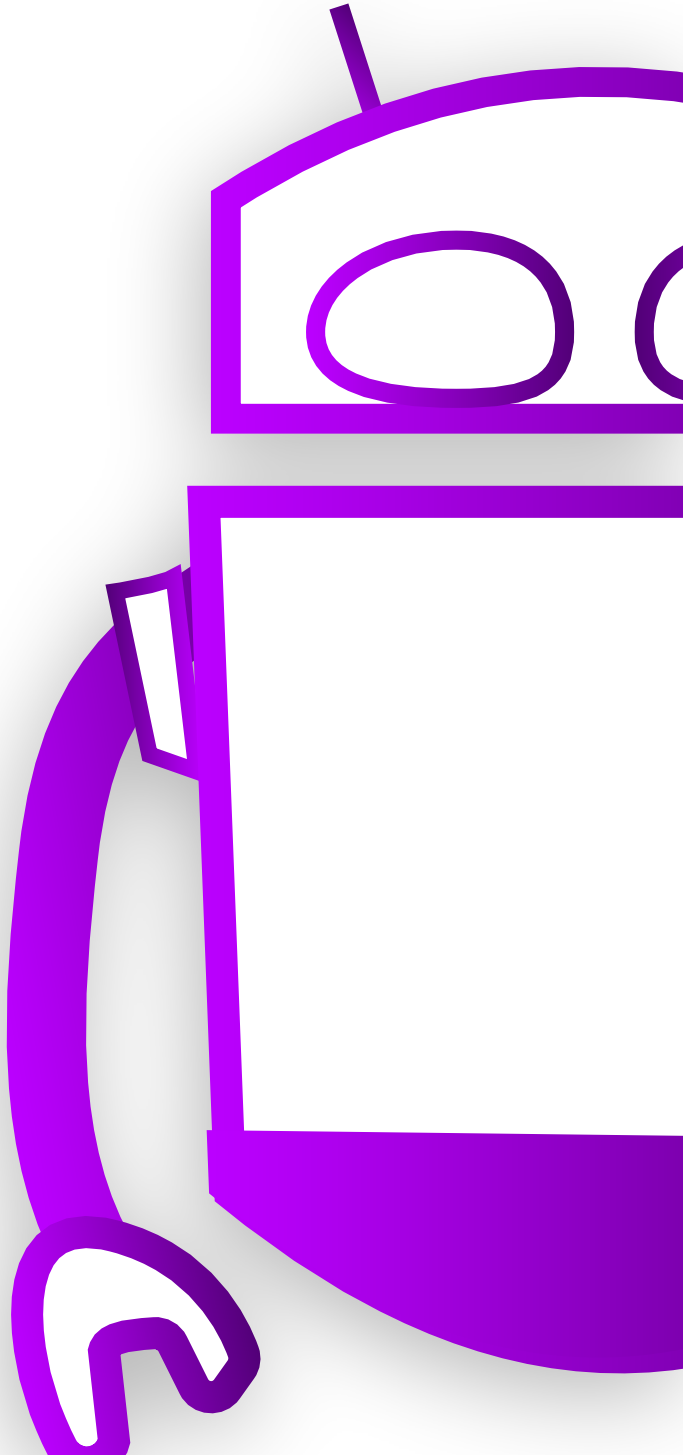
"The companies that do not associate AI with EI (emotional intelligence) are going to miss the mark."—Rachael Rekart, Director of Machine Assistance, Autodesk

For many workers, traditional forms of work have comprised routine and repetitive tasks. The new AI-based workplace, however, will require employees to tap higher-level human-only intelligences (see Fusion Skills and Intelligences). While the skills in the "missing middle" enable working with machines, they don't necessarily require additional expertise in machine learning or robot programming. They require thoughtful people who are better able to apply socio-emotional, creative and complex reasoning skills to the specific needs of the business.

New forms of training are therefore urgently required to help people develop and apply these higher-level intelligences.

Academic studies are proving that training focused on mindset and socio-emotional intelligence is more effective than technical education. In one recent study, MIT Sloan evaluated a 12-month in-factory training program on communication, problem solving, decision-making and stress management. It found the training returned roughly 250 percent on investment within eight months of its conclusion, mainly from boosts in worker productivity and speed with complex tasks.[3]

When creative humans and machines work together as allies instead of adversaries, they enhance each other's strengths. With support from machines, humans are free to apply advanced socio-emotional intelligence to develop a better understanding of customer needs and create entirely new customer experiences. Human conscience and self-discipline will also help companies use AI in an ethical and human-centric way.



IN DEPTH FUSION SKILLS AND INTELLIGENCES

"Human+Machine", written by Accenture's Paul Daugherty and James H. Wilson,[4] describes eight fusion skills—abilities for combining the relative strengths of a human and machine to create a better outcome than either could achieve alone. These fusion skills guide managers and workers in designing and developing a workforce capable of thriving in the "missing middle."

Three of these skills allow people to help machines (the left side of the missing middle); the other three enable people to be augmented by machines (the right side of the missing middle). The last two help people skillfully work across both sides of the missing middle (see About the Research).

We identify the underlying core intelligences of each fusion skill. Intelligences (or competencies) relate to a person's unique aptitude, set of capabilities and ways they might prefer to demonstrate intellectual abilities. We assess these intelligences in the context of academic literature on the many approaches toward human potential. Among them is the theory of multiple intelligences developed by Howard Gardner, the triarchic theory by Robert Sternberg and the growth mindset theory by Carol Dweck. Recent studies highlight the significance of intrapersonal intelligences, including intuition and a growth mindset as the most influential on worker performance.

Andy Clark, David Chalmers and others are on the forefront of an exciting new field of study known as embodied or extended cognition—the theory that what we think of as brain processes can take place outside of the brain.

They propose that people naturally use technologies to augment themselves, incorporating tools and technologies as part of their own cognition. From eyeglasses to bicycles to fighter jets, these tools, when used often enough and at an expert level, can feel like extensions of our bodies and minds. AI brings another dimension to this kind of biotechnical symbiosis.

We propose that the following 10 intelligences will gain prominence in the AI workplace:

(1) physical/sensory abilities
(2) embodied or extended cognition
(3) strategic intelligence
(4) practical
(5) analytical
(6) creative
(7) interpersonal
(8) intrapersonal
(9) moral intelligence, and
(10) growth mindset (see Figure 3: Fusion Skills and Intelligences Matrix).

While these 10 intelligences are not mutually exclusive or exhaustive, they provide a broad guideline for business leaders directing training efforts and forming teams. In the age of human-machine collaboration, these core intelligences will be critical to the future workforce.

Figure 3: **FUSION SKILLS AND INTELLIGENCES MATRIX**

Core intelligence underlining human-only and missing middle roles

Source: Accenture Research deconstruction of fusion skills described in "Human+Machine" book authored by Paul R.Daugherty and James H. Wilson. Refer to the appendix for research approach & definitions.

GETTING THE RIGHT SKILLS

Today, 61 percent of activities in the missing middle require employees to do different things, and to do things differently. That means reimagining processes and committing to lifelong learning.[5]

Almost half of the executives Accenture surveyed recently said they consider the growing skills gap as one of the top three trends affecting their workforce strategy.[6] Our research reveals that workers and business leaders have very different perceptions of the skills gap:

- Business leaders, on average, believe only about a quarter of their workforce is prepared to work with AI and machines. Many leaders find it challenging to encourage employees to make time for learning new skills.

- Yet, over 60 percent of workers have a positive view about the impact of intelligent technologies on their work. Over two-thirds of workers recognize the importance of developing their own skills to work with intelligent machines.

- Many workers feel their companies should do more to help. They cite lack of time (48 percent), lack of sponsorship (37 percent) and lack of resources (36 percent) as the biggest barriers to developing new skills.

How can companies and employees find common ground and reconcile their differences?

Based on our research and analysis, we believe three dimensions are essential to successfully developing the human skills and higher-level intelligences that will enable human-machine collaboration:

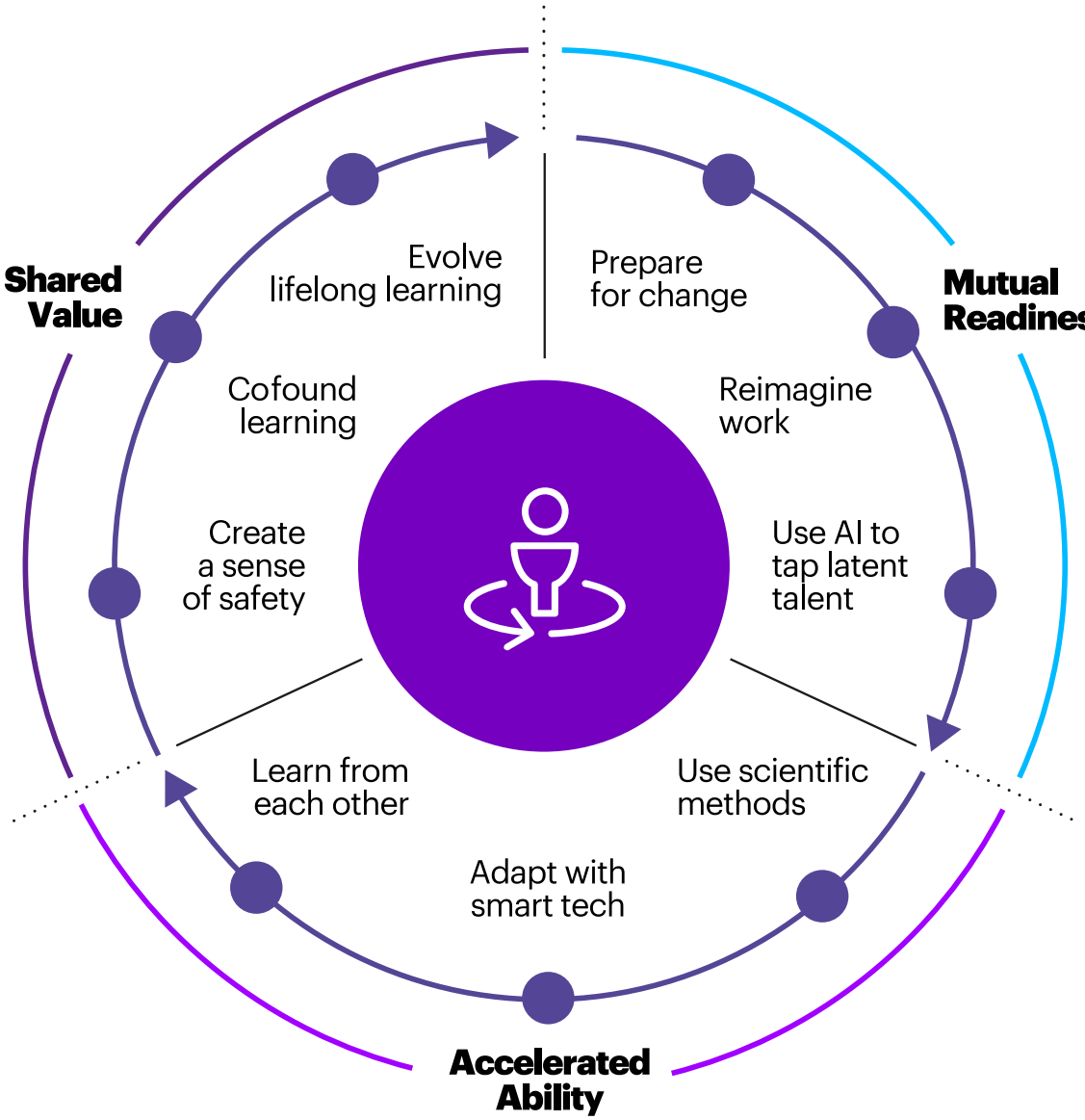
1. Mutual Readiness: Everyone must be ready to change and invest in training to prepare for a world of human-machine partnerships.

2. Accelerated Ability: Educators and learners must call upon scientific techniques and smart technologies to learn faster, stretch thinking and tap latent intelligences.

3. Shared Value: Together, employers and workers must create and maximize the motivation to learn and adapt.

Let's look at some examples of companies that have found success in executing one or more of these three dimensions.

Figure 4: **THREE DIMENSIONS OF SKILL DEVELOPMENT**



MUTUAL READINESS

Companies should commit to long-term investments in workforce skills development, while employees should start adapting their skills for AI. But this readiness to change is feasible only when both company and worker have opportunities to realize their common aspirations in the new workplace.

Prepare for change

Executives need a clear long-term strategy and should be able to outline the top business initiatives for the coming years, communicate the possible workforce implications and build support structures to transition employees. Change-management planning must precede any AI-driven business initiative.

Consider how a large fintech company prepared for AI-led change: When the company implemented an AI-based call center agent to handle simple "low-severity" customer service issues, many job tasks became redundant. The company had to let some employees go, but gave the remaining majority an opportunity to learn how to handle "high-severity" cases alongside the chatbot.

Success hinged on careful planning and focused execution. The AI initiative was communicated to employees between one and two years ahead of time. Top management made sure to outline a strategy and fully explain which skills would be required and which would become unnecessary for alternative roles within the company.

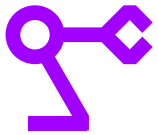
Employees factored the changes into their own career planning and mapped their forward route with line managers—electing either to stay and upskill, move to a different role with training or move to a similar role elsewhere.

Reimagine work

Leaders should shift from “planning the workforce” to “planning the work.” They must assess which tasks will be needed and which skills will be required to fulfill those tasks. They also need to map internal capabilities to new roles and then develop new skills to bridge talent gaps.

PlainsCapital Bank, one of the largest independent banks in Texas, reimagined the nature of the work its people were doing. After it introduced digital banking services, demand for human bank tellers started to decrease. The company then combined the tasks of on-site teller, adviser and customer service agent, creating the role of Universal Banker. Universal Bankers need better interpersonal skills, strong problem-solving abilities and more creativity, as well as knowledge of the products and the customer experience.

To fill these new jobs, the bank changed the selection process to behavioral-based interviewing, based on the belief that how someone acted in past situations can be a predictor of future performance. Once PlainsCapital finds a good match from a pool of internal candidates and identifies where they need skills development, the organization provides the relevant training, whether in technical skills, soft skills or both.



Use AI to tap potential and align aspirations

Predictive AI algorithms can recommend job tasks and training programs suited to each worker. As such, companies should seek out everyone's hidden talents, transferrable skills and life aspirations with the help of AI. The algorithm's baseline assessments can then be validated through discussions between employees and their managers or mentors before charting a course of action.

At Nestlé, leadership clearly communicates why workforce change is positive for both individuals and the business, and empowers employees to facilitate decision-making. Joint decision-making between employees and line managers accounts for 90 percent of the effort to successfully transition employees to new work.

While the organization provides work opportunities and support structures, the employees plot out career paths that align with their personal interests and aspirations. Employees cultivate a growth mindset about technological change, which helps them persist through learning challenges.

"Our approach to finding the right person for the job is focusing on the potential of the individual for the future challenge(s), rather than existing skills and capabilities."—David Gaal, Nestlé Italy Head of Talent

ACCELERATED ABILITY

Use scientific methods

Executives can draw on neuroscience techniques to reduce learning time, increase retention and optimize the brain's capacities.

Neuroscience is illuminating how the brain acquires, stores and uses information. Researchers are learning how the brain responds to rewards and feedback, how the use of game-play (or gamification) can forge emotional connections and reduce cognitive overload, and how to adjust for differences in learning ability.

Above all, neuroscience is challenging the conventional notion that our brains are static after age 20 or so. Recent studies on neuroplasticity have discovered that our brains, including the "social brain," continue to change in both structure and function. These findings suggest that higher levels of cognitive and socio-emotional intelligence can be developed with the right mental training at any age.

"Mindfulness" interventions that encourage present-moment awareness have proven benefits for cognitive processing, raising IQ levels and improving resilience.[7] Participants in Accenture's Mindfulness program, for example, reported notable improvements in their ability to focus and prioritize tasks and collaborate within teams.

Enable learning with smart technologies

Leaders should offer experiential and interactive programs so workers can learn at convenient times. Training with intelligent, mobile technologies can accelerate progress on the learning curve.

In an Accenture survey, 77 percent of organizations said they are planning to introduce, or are already using, digital personal assistants and other AI tools to help improve personal productivity.[8] Indeed, the potential to enhance learning and productivity using smart technologies is both substantial and inclusive: With the pervasiveness of technology, almost anyone can access a robot tutor or virtual teaching assistant matched to their learning need, style and pace. AI-based adaptive learning platforms with built-in analytics can personalize coaching and feedback.

Virtual reality (VR) and augmented reality (AR) are being used to simulate real-world situations, onboard new employees and even train people in the development of socio-emotional skills. Fidelity Investments, for example, uses VR for empathy training. A Fidelity employee is "transported" between a call center and the customer's living room so they can understand the impact of listening and helping the customer through real scenarios.[9]

Not only do they lower training costs, VR and AR technologies are more effective. A global industrial services company found a 34 percent improvement in workers' performance when they used an AR headset to communicate information instead of a traditional instruction manual.[10]

Education companies are bringing the best of AI and neuroscience to corporate learning and development. Startups like the Silicon Valley-based Socos Labs, the Lausanne-based Coorpacademy and the Paris-based Insideboard offer adaptive learning experiences using AI algorithms and scientific principles. These companies customize modules to make learning more entertaining and easier to absorb.

"If designed well, AI can make work itself a growth experience—projects that offer life-building knowledge and support the individual's all-around development."—Vivienne Ming, Founder and Chair, Socos Labs

Bring people together to teach each other

People learn best from others—whether through one-on-one coaching or from knowledge exchanges in a larger group. As such, companies should nurture in-person engagements, share knowledge in the community and welcome outside-in learning, while providing role models to inspire learners.

Google helps employees keep their skills current and valuable by fostering peer-to-peer connections. Workers move around the organization and learn new skills on the job, not by attending mandatory training seminars. Some 80 percent of all tracked training at Google is now done through g2g (Googler-to-Googler), a voluntary network of 6,000-plus employees who dedicate a portion of their time to helping peers learn.

Volunteers can participate in numerous ways—teaching courses, providing one-on-one mentorship and designing learning materials. In one example, thousands of Googlers went through an Android training boot camp run by the people who developed Android. Google notes that an employee-to-employee learning program is not about cutting costs, but about creating a culture that values knowledge sharing.[11]

Danone, the French multinational food-products corporation, also encourages learning from the outside in and enables cross-fertilization of ideas through "learning expedition" programs with startups, universities, non governmental organizations and the public sector.[12]

To explore new careers, experienced individuals are now opting for internships inside the company or even outside. A key part of AT&T's retraining effort is the experienced internship program, which lets workers who have added skills try out a new position for a limited test run. For example, one 20-year veteran of the company used the program to make a switch from billing systems to team facilitator in the software interface development unit.[13]

Accenture's Talent Platform accelerates skills in New IT

The Accenture Future Talent Platform provides a personalized, interactive and on-demand learning solution, helping companies develop their workforces in critical areas such as digital, cloud, security and artificial intelligence. Subject matter experts can curate learning boards for a better, faster learning experience, and users can interact with each other by following, commenting and contributing to their favorite boards. A mobile app enables learners to pick up new skills anytime, anywhere and allows leaders to track learning progress—in real time.

Accenture has been using the Future Talent Platform internally to reskill more than 165,000 people globally in the latest digital technologies—or New IT—for the past two years. Users can explore more than 3,500 learnings boards curated by emerging technology experts within Accenture and from its partners. Now, Accenture is bringing these learning capabilities to other companies to help them reskill their employees and run agile, intelligent businesses.

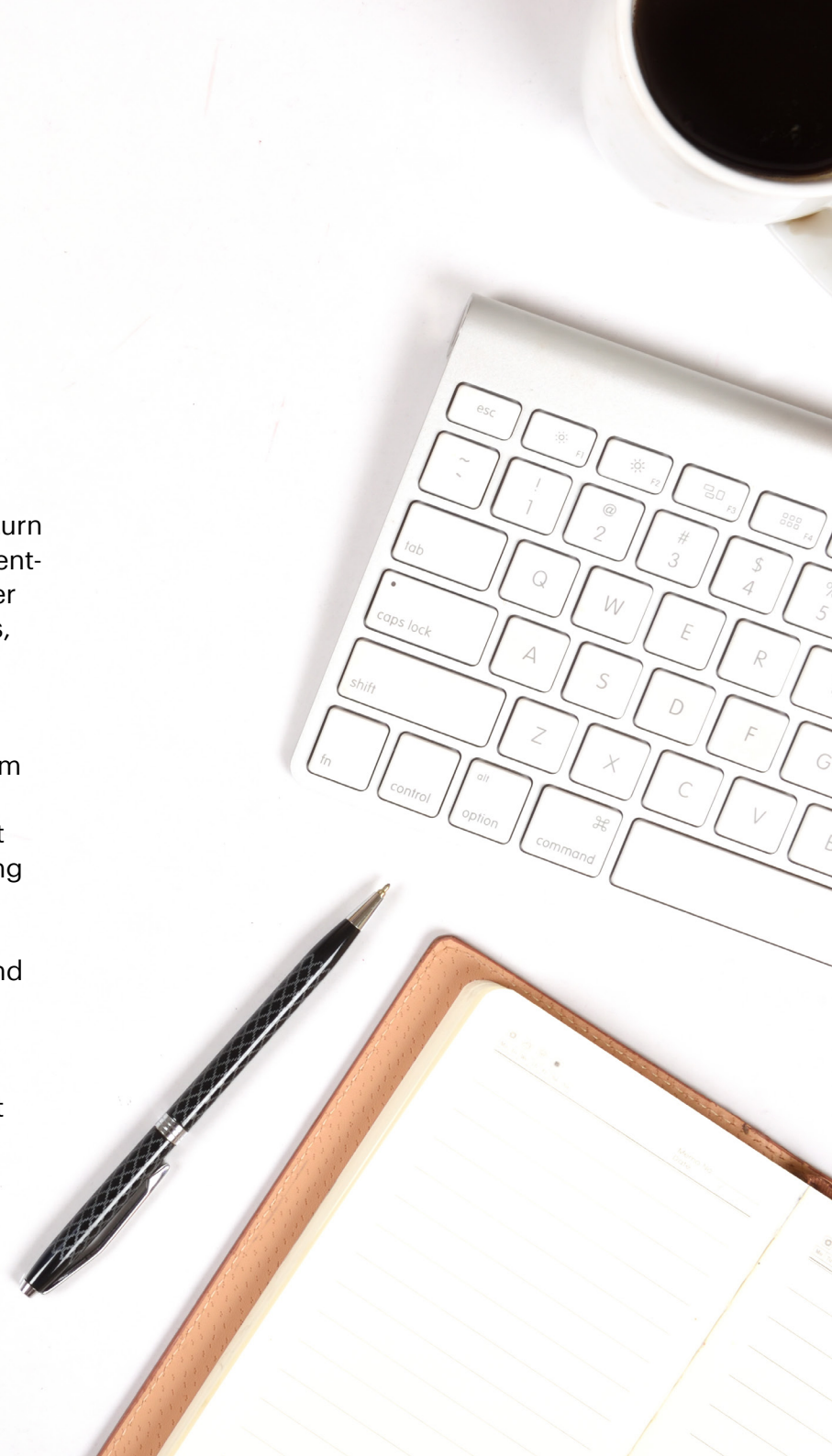
SHARED VALUE

Companies must recognize and uphold the value of education and lifelong learning, which includes giving employees time to adjust and extend their abilities. Employees, in turn, must co-invest their time and effort to acquire new ways of working.

Danone recognizes the intangible value associated with a trained, engaged workforce. The company has set a strategy called “one learning a day” to give each employee opportunities to learn.[14] Danone has invested significantly in upskilling to nurture the company’s culture as a competitive advantage. So far, Danone says, employees are motivated by the availability of career-development guidance and training.

Discover Financial sees tangible value in paying for workers to go back to school. Discover’s Tuition Reimbursement Program has yielded a 144 percent return on investment in the form of lower talent-management costs (people stay longer and are being promoted into new jobs, saving recruitment costs) and higher productivity (less absenteeism).

Employees participating in the program receive, on average, annual wage increases that were at least 41 percent greater than those for non-participating employees, achieve more promotions (+21 percent) and lateral transfers (+9 percent), stay longer (+0.5 percent) and take fewer unplanned days off (-0.4 percent). Discover estimates the total financial benefit at US$18.5 million across all four factors assessed, or net savings of US$10.9 million after deducting the investment cost.[15]



Create a sense of safety and well-being

Executives should foster well-being among employees about the AI transition, and understand that each person is unique and will be motivated and inspired by different things at different points in time.

To learn and create, people need to feel psychologically safe. If an AI-driven change to the workplace makes employees anxious, even the most-thought-out retraining programs may flounder.

Give employees ample time to adapt and prepare for new tasks and support them with wellness and counseling programs. The online mental health services provided by AI-human hybrid platforms like Wysa and Juno Clinic to IT professionals in response to job loss concerns in India's technology outsourcing industry are one example.[16]

Then, to maximize workers' potential, organizations must inspire them by stoking their passions and interests and helping them grow. Studies have shown that extrinsic factors are less effective for learning and creativity than intrinsic motivation.[17]

Walmart has spent around US$2.7 billion in education, training and higher wages—an investment that includes 200 brick-and-mortar Walmart Academies, which have produced 225,000 graduates as of the end of 2017. Its Pathways training program offers associates a clear career path from entry-level positions to management jobs with more responsibility and higher pay.[18]

Co-fund learning

Leaders should co-develop (i.e., crowdsourced learning content) and co-fund (i.e., shared financing) skill development programs with employees as well as with educational institutions, governments and nongovernmental organizations.

For example, the Aspen Institute Future of Work Initiative has proposed tax-advantaged "Lifelong Learning and Training Accounts" in the United States.[19] These accounts would be funded by workers, employers and government, and would be available to workers anytime during their careers to pay for education and training. Lifelong Learning and Training Accounts would provide a better-trained workforce, help retrain mid-career workers, improve unemployed workers' job prospects and ease reliance on the safety net.

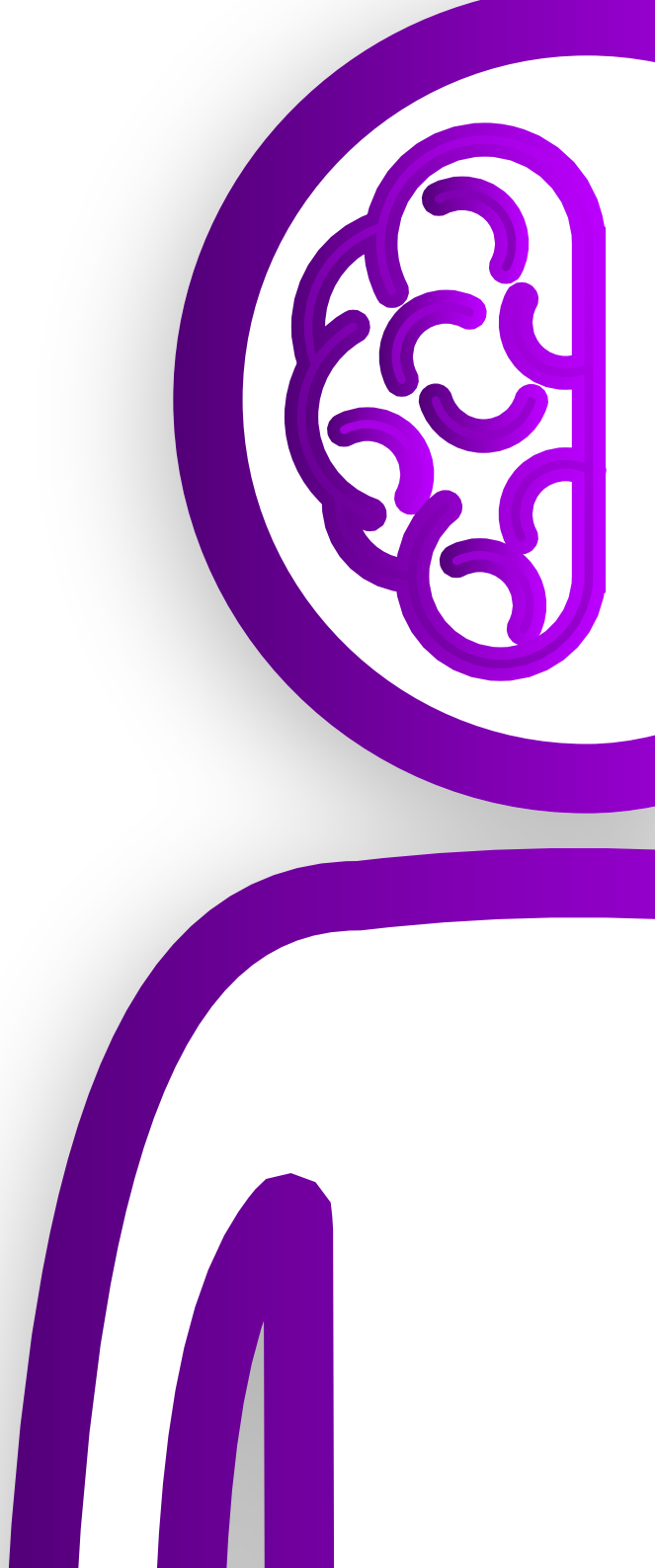
Consider Singapore, which has established a national movement called the "SkillsFuture." The government offers a variety of resources, including study subsidies and direct credits, to help citizens attain mastery of skills at any stage in life—schooling years, early career, mid-career or silver years. The government has also set up a dedicated "Task force for Responsible Retrenchment and Employment Facilitation." Seven in 10 retrenched workers who were helped by this task force in 2017 were able to find jobs within six months.[20]

Encourage lifelong learning

Leaders should track performance outcomes, engagement and evolving aspirations to continuously reimagine work and lifelong learning, while keeping a long-term perspective on the workforce.

Salesforce's learning platform, Trailhead, provides employees and customers with an interactive way to learn at their own pace and navigate new career paths. Trailhead offers more than 450 virtual badges and super-badges, which prove the learner has applied their skills to advanced real-world business tasks.

The platform has helped several Salesforce employees acquire "remote" skills to change roles and break into careers that otherwise would not have been available to them. For instance, after learning how to code on Trailhead, one employee moved from a recruiter job to an engineering role. Another with specialization in nursing used Trailhead to get up to speed at her new job as a Salesforce solution engineer. Importantly, employees can display these badges on their online profiles to showcase transferrable skills.[21]



IN DEPTH TRAIN OR HIRE?

Accenture research and the 2019 World Development Report found that the most-sought-after trait nowadays is adaptability: the readiness to respond to unexpected circumstances and learn quickly.[22] For many, it's a challenging trait to aquire.

More than 40 percent of executives surveyed by Accenture said hard-to-change processes are hindering their efforts to train employees in new skills. And one-third of employees said they expect AI will make their jobs more complex, adding to their workload and increasing pressure to perform.[23] A fear of being displaced by new hires looms large for many workers.

Leaders can alleviate the situation by striking the right balance between training and hiring. Companies are under so much pressure to fend off disruptive competitors that they often decide to hire talent from the outside rather than make a long-term investment in retraining their own people.

An Accenture survey found that only 3 percent of companies are planning to significantly increase their investment in skills-development programs in next three years. But long-term competitiveness requires a highly engaged workforce made up of both existing employees (who are likely to be motivated to learn and develop) and outside hires (who bring in new expertise and perspectives).

When determining the right balance, executives should consider several factors, such as the type of skills that are needed, whether those skills are in adjacent roles and the urgency of the business need. Sometimes an outside hire may be the most sensible option. An executive at a large financial services company we interviewed says the task of teaching quantitative skills to a person with a non-quant background can be very difficult and he prefers to hire from the outside (see Figure 5: Essentials for finding the common ground).

"Ultimately, we will need to reskill existing employees as there will soon be a huge imbalance in supply and demand. We also have a moral obligation to train the future workforce in association with the broader education system."—Kees van der Vleuten, former Global Transformation Director, VEON

But favoring excessive hiring over retraining may not lead to positive outcomes. For example, the move into online banking forced one midsized bank to close almost half of its branches, affecting thousands of staff members. Rather than invest in retraining, the company chose to make 90 percent of staff redundant and retrain only 10 percent to work in call centers. To fill other new roles in the online banking business, the company hired new people. The move damaged morale among remaining workers, even those whose jobs were not at risk.

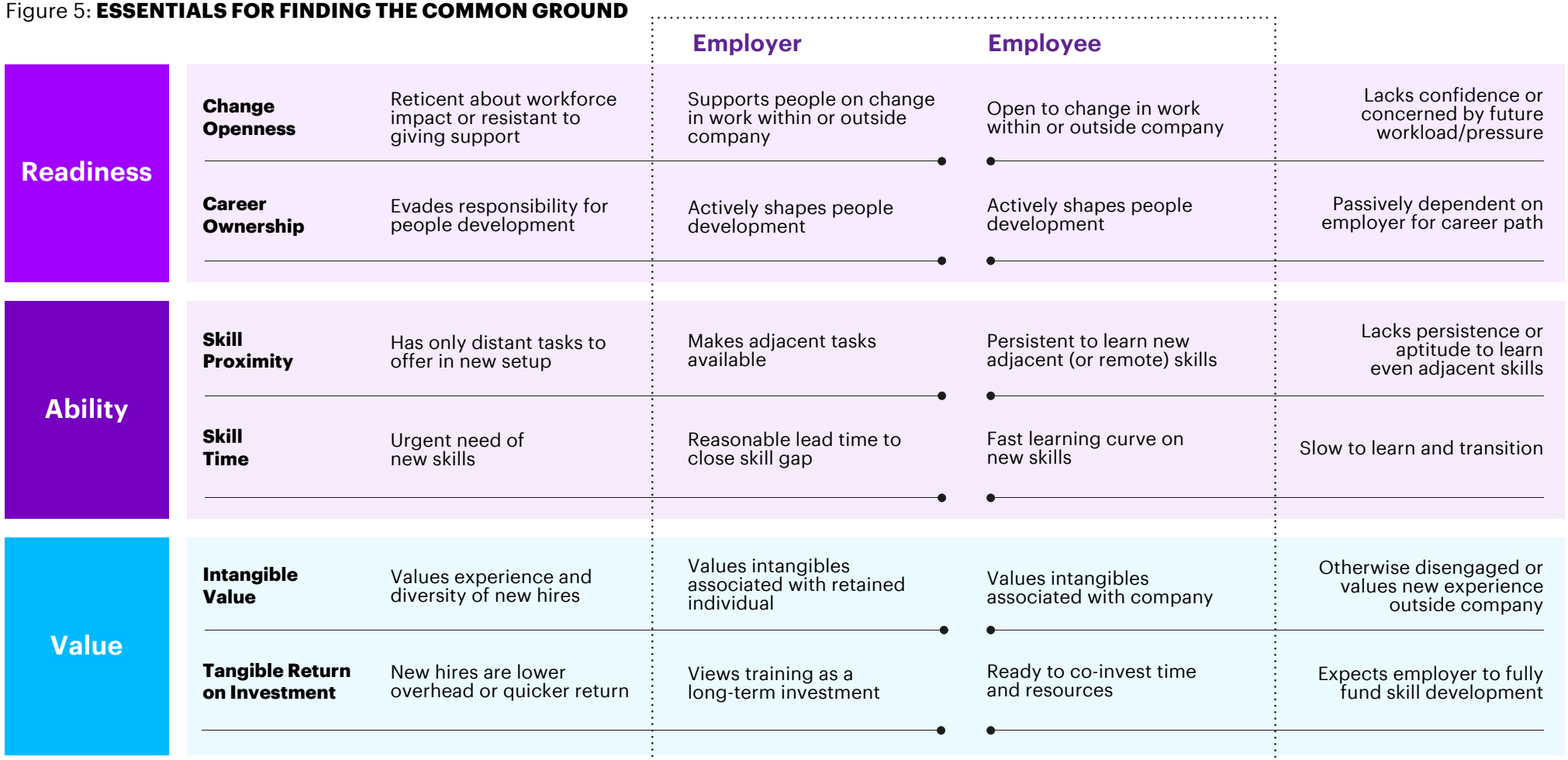
Even if companies are hiring outside for certain skills, they can simultaneously transition current employees to "the new." When a large payments company introduced a predictive AI solution to better understand employee engagement and retention, it added new people to the HR team—70 percent were new hires. The external hires brought in the necessary data and computer science skills, but also helped retrain the remaining 30 percent on statistical analysis, creating a new department: HR Analytics.

For any transformation to be successful, companies must consider the impact of technology on the individual worker. Consider the experience of a global logistics company that launched a digital transformation program to automate business processes.

The initiative backfired because the company focused too much on the benefit to shareholders and not enough on employees. Some people's work became a lot more complex, but it didn't benefit them personally. In fact, a post-transformation assessment revealed that the majority of workers had not adopted the new processes and were still using Excel spreadsheets—defeating the very purpose of digital investment.

Additionally, a lack of investment in the workforce can have negative consequences on employee engagement, productivity and, ultimately, company reputation and brand. If employees feel that employers are invested in their development, they are more likely to be motivated to work harder and stay longer in the workplace, improving productivity and retention. This creates a virtuous cycle, attracting new and better talent who know they will have opportunities to learn and grow.

Figure 5: **ESSENTIALS FOR FINDING THE COMMON GROUND**

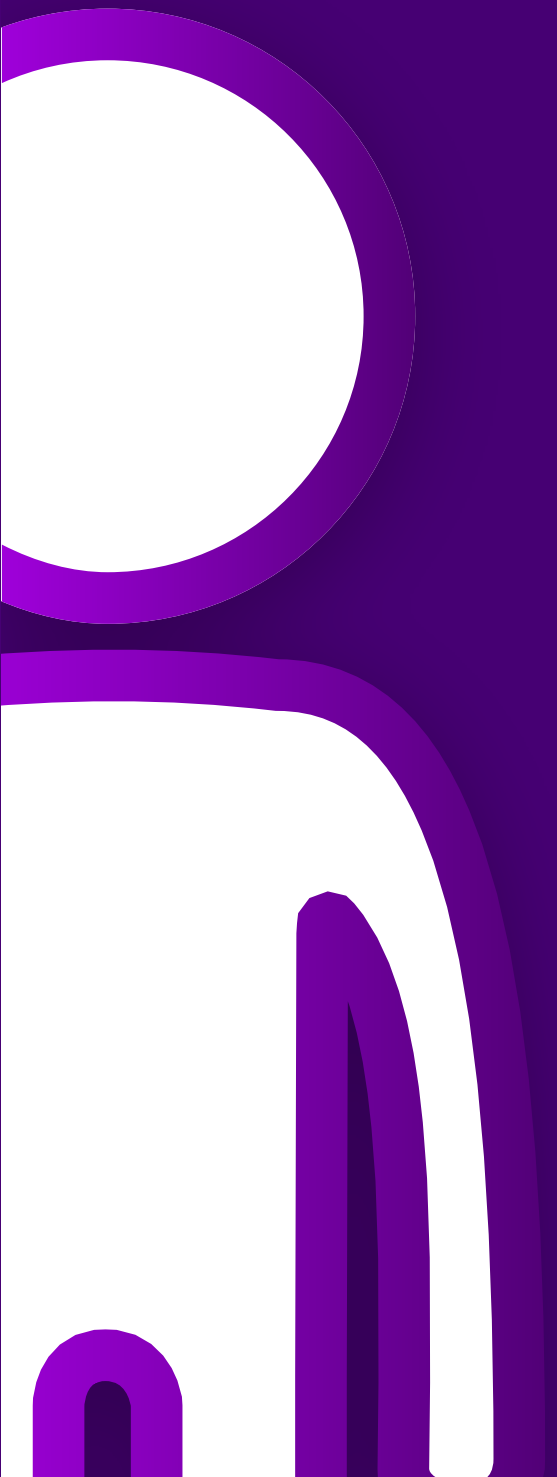


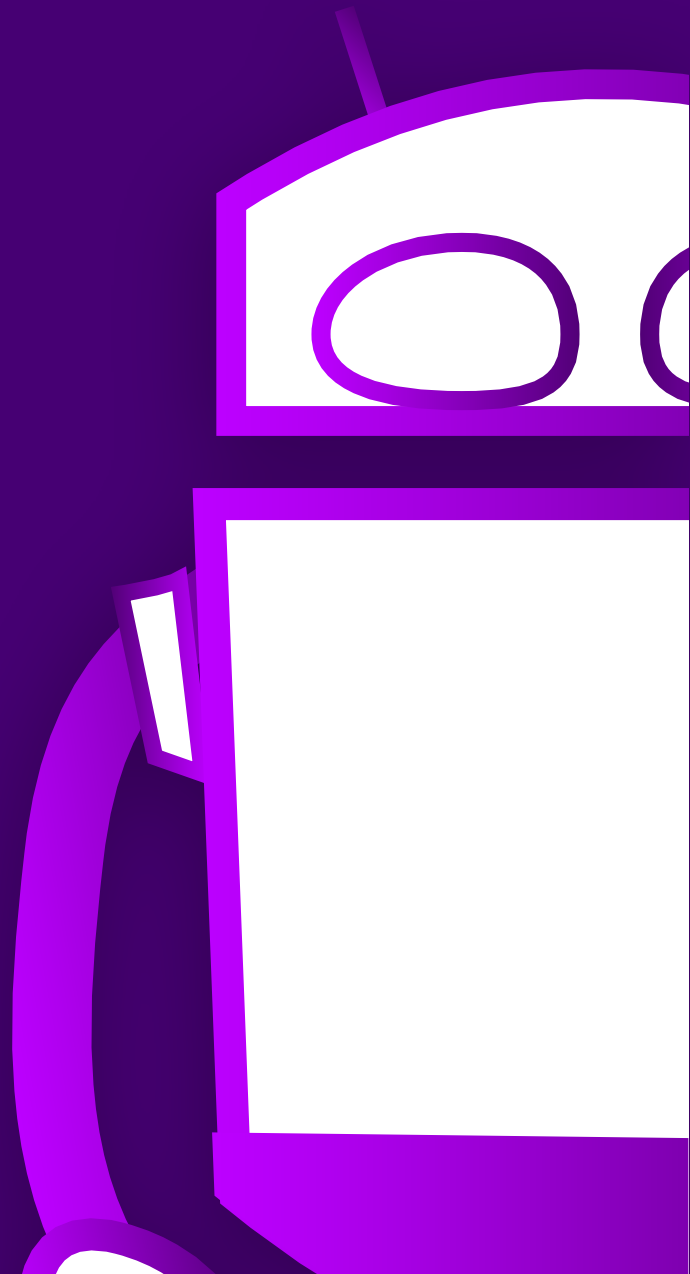
Source: Interview-survey of executives in Accenture and Aspen network

THE WAY FORWARD

There is no substitute for uniquely human qualities and characteristics like empathy, creativity and the ability to provide context for decision-making processes. But that does not mean the human workforce can stand idly by during this AI revolution. To make the most effective use of AI, workers need to develop different, deeper skill sets.

Advancing the missing middle skills is a matter of cultivating the right mindset, and that will prove to be the greatest responsibility for leaders. But the transition to the future workforce cannot be successful unless both executives and employees walk this journey together. We must all get ready to change, call upon scientific techniques and smart technologies, and embrace a lifelong learning mindset. Companies must reinvent organizational structures and processes to allow workers to be part of the process, while workers must embrace every opportunity to learn—for the long run.





ABOUT THE RESEARCH

Accenture and the Aspen Institute Business and Society Program (BSP) jointly conducted this research between January and August 2018 via interview surveys of nearly 40 company executives and subject matter experts. Accenture is an exclusive 2017-2018 Artificial Intelligence Content Partner for the Long-Term Strategy Group of the Aspen BSP. The objective of our partnership is to encourage an innovative approach to developing future workforce strategies that allow the collaboration of people with artificial intelligence to create business value and wider societal benefits.

To develop the Fusion Skills and Intelligences Matrix, we adopted a three-step approach to build on the fusion skills framework described in "Human+Machine, Reimagining Work in the Age of AI", written by Accenture's Paul Daugherty and James H. Wilson and published in March 2018.[24]

Approach to map fusion skills & intelligences

STEP 1

DECONSTRUCT

For each human-only activity and missing-middle role, identify the long list of personal aptitudes required.

STEP 2

RECONSTRUCT

Broadly categorize the long list of personal aptitudes into core intelligences as described in academic literature.

STEP 3

MAPPING 1 & 2

For each human-only activity and missing-middle role, map the core intelligences as dominant or basic to create the "Fusion Skills and Intelligences Matrix" (see Figure 3 on page 9).

STEP 1 Deconstruction of Fusion Skills in the Missing Middle

Missing middle	Fusion skill	Definition	Aptitudes identified
Humans manage machines	**Re-humanizing time**	The ability to increase the time available for distinctly human tasks, like interpersonal interactions, creativity and decision-making in a reimagined business process	• Interpersonal • Creative • Analytical, Practical
	Responsible normalizing	The act of responsibily shaping the purpose and perception of human-machine interaction as it relates to individuals, businesses and society	• Ethical • Contextual awareness, Analytical, Strategic • Enterprising, Gritty
	Judgment integration	The judgment-based ability to decide a course of action when a machine is uncertain about what to do	• Analytical, Perceptive • Intuition • Ethical
Humans manage machines	**Intelligent interrogation**	Knowing how best to ask question of AI, across levels of abstraction, to get the insights you need	• Business-savvy, Curiosity • Strategic, Imaginative
	Bot-based empowerment	Working well with AI agents to extend your capabilties and create superpowers in business processes & professional careers	• Tech-savvy • Practical
	Holistic melding	The ability to develop robust mental models of AI agents to improve process outcomes	• Intuition • Perception
Humans manage machines + machines augment humans	**Reciprocal apprenticing**	Performing tasks alongside AI agents so they can learn new skills; and on-the-job training for people so they can work well within AI-enhanced processes	• Practical • Inspiring • Trustworthy, Ethical
	Relentless reimagining	The rigorous discipline of creating new processes and business models from scratch, rather than simply automating old processes	• Imaginative, Creative • Enterprising

Source: "Human+Machine" book authored by Paul R. Daugherty and James H. Wilson, published by Harvard Business Review Press (2018)

STEP 2 Academic Theories of Multiple Intelligences

Intelligence	Accenture description adapted from academic literature	Academic literature reference
Physical/sensory	Physical movement, coordination, flexibility and sensory perception	Howard Gardner (1983)
Embodied or extended cognition	Ability to internalize technologies and objects in human thought	Andy Clark and David Chalmers (1998), Weisberg and Newcombe, Dror and Harnard
Strategic	Foresight, visioning, systems thinking, critical thinking, partnering, motivating and empowering others	Michael Maccoby, Oxford and Harvard Business Press (2001, 2007)
Practical	Ability to use existing knowledge and skills to find solutions and achieve goals	Robert Sternberg's triarchic theory (1997)
Analytical	Ability to analyze, critique, judge, compare, evaluate, assess, including logical-mathematical intelligence	Robert Sternberg's triarchic theory (1997)
Creative	Ability to use knowledge and skills to create, invent, discover, imagine, suppose, predict	Robert Sternberg's triarchic theory (1997)
Interpersonal	Capacity to detect and respond appropriately to feelings, motivations and desires of others; cooperation and communication ability	Howard Gardner (1983), Harvard University (1999)
Intrapersonal	Capacity to be self-aware and aware of inner feelings, values, beliefs and thinking processes; understanding of collective intelligence or intuition	Howard Gardner (1983), Gerd Gigerenzer, Max Planck Institute for Human Development (2011)
Moral	Capacity to understand right from wrong; empathy, compassion, conscience, self-control, respect, kindness, tolerance, fairness	Michele Borba (2001), Doug Lennick-Fred Kiel (2005), Beheshtifar, Esmaeli, Moghadam (2011)
Growth mindset	Adaptability and a love of learning; belief that effort or training can change one's qualities and traits	Carol Dweck (2000), Stajkovic and others (2015)

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