9

The Impact of Changing Workforce Demographics and Dependency on Technology on Employers' Need for Expert Skills

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This chapter examines how workforce demographics and technology are impacting how human expertise is perceived and defined. First, it focuses on the changing composition of the U.S. workforce, which is increasingly more diverse compared to previous decades (in educational attainment, age, gender, and race). It looks at how this diversity has changed the typical profile of today's CEOs and entrepreneurs. Second, it explains how the digital revolution and the exponential use of artificial intelligence in the workplace have created new demands in labor needs and employee skills in for-profit and nonprofit organizations. The author posits that the combination of these changes is reshaping how human expertise is perceived and defined, especially in technology fields.

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Workforce demographics, needs, and employer expectations have changed considerably since the 1990s. This continued change results from an evolving economy, globalization, rapid technological development, and a generational mix of Baby Boomers, Generation X, Millennials, and Generation Z. In 2020, for the first time in history, the global population of adults over the age of 65 is going to surpass that of children under the age of 5 (Friend, 2017) and in only 16 years' time (2014–2030), it is expected to grow by 300 million (United Nations, 2020). Such trends can be attributed to a decreased fertility rate and an increased life expectancy. In the U.S., the workforce profile has also changed significantly. The total number of participants in the labor force has continued to increase due to a growth in population; however, according to the U.S. Bureau of Labor Statistics (2019), the labor force participation rate has decreased since 2015 and it is estimated that, by 2026, it will decline to 60% (US BLS, 2019). Also, today's workforce is generationally diverse in workers' gender, race, education, and age. Most organizations have three generations on staff, each with its own set of work values and skills: Baby Boomers, Gen Xers, Millennials, and Gen Zs (see Table 9.1), with women representing about half of the workforce. The changes in workers' race reflect those of the general U.S. population, with an increasing representation of Hispanic and Asian workers. Finally, the workforce is more educated. More people complete secondary education than ever before, attend universities, and take advantage of mid-career reskilling or credentialing (Buckley & Bachman, 2017). In 1992, only 25% of Americans held a bachelor's degree versus 40% in 2017 and it is expected that by 2025, two-thirds of the U.S. labor force will have post-high school education (Buckley & Bachman, 2017).

The workforce demographic changes are seen at all levels of the organization, including in the corporate suite (C-suite). Yet, in 2019, top executives continued to be less diverse than the rest of the labor force (Roberts & Mayo, 2019). In the 1990s, 50% of CEOs had a bachelor's degree (versus 97% today), and 49% had obtained a master's or doctoral degree (versus 74% today). Between 1995 and 1999, women CEOs represented an average of 0.28% of CEOs versus 6% today (Pew Research Center, 2018). In 2004, 27 of the top companies had a racial minority CEO compared to 62 companies in 2019 (Statista, 2019). Also, in the

Table 9.1 Work values and skills by generation

Baby Boomers (1946–1964)	Generation X (1965–1980)	Millennials (1981–1995)	Generation Z (1996–)
Lived to work	Worked to live	Means to an end	Money and salary matter a great deal but want personalized career experiences. Gen Z prioritizes diversity, tech, and the greater good
Developed skills to enhance work at one company	Gained skills that would lead them to the next job	Gain skills that would make them more of an asset, better contributor, more well-rounded worker	Organizations need to tailor work around the curated skill set of a Gen Z worker. Organizations should invest in learning and skill/capability development. Gen Z proactively seeks out learning opportunities to enhance skills and prefers to learn independently via online platforms, such as online tutorials
Work ethic was valued as more important than acquiring new skills	Skills were more important than work ethic. They gained more skills through education and experiences within and outside of the company	Creativity and passion, along with job satisfaction remain of high importance. Skills could be obtained from a diverse arena	Draw on skill sets from diverging fields. Consider a traditional four-year college education more important than ever before.

(*continued*)

Table 9.1 (continued)

Baby Boomers (1946–1964)	Generation X (1965–1980)	Millennials (1981–1995)	Generation Z (1996–)
Loyal to the company	More loyal to themselves	Loyal to their cause	Expects to stay at a company for less time than Millennials. Want to work at organizations whose values align with their own. Want diverse and entrepreneurial opportunities with the safety of stable employment, and they may offer more loyalty to companies that can offer this.
Skills are an ingredient to success but they are not as important as work ethic and "in-person" time	Accumulation of skills will lead to the next job; the more they know the better. Work ethic is important, but not as much as skills	Training is important and new skills will ease stressful situations. Motivated by learning / want to see immediate results	Most diverse and highly educated generation. Want to gather a variety of different skill sets, rather than declaring a singular specialization (marketing majors want coding and data analytic skills; computer programmers want literature and creative skills).

Adapted from "Generational Differences Chart", (n.d.). *West Midland Family Center and "*Welcome to Generation Z" (Gomez, Mawhinney, & Bett, 2020)

1990s, the average age of chief executive officers was 56.4, with a tenure of 8.3 years. According to a Crist Kolder and Associates' Volatility Report, in 2019, over half of CEOs in Fortune 500 and S&P 500 companies were between the ages of 54 and 61.

These changes directly affect the stereotypical image of CEOs and entrepreneurs of a white, educated male above the age of 40 (Entrepreneur, 2018). Based on U.S. Census Bureau data, the Harvard Business Review (HBR) found that the average founding age of entrepreneurs is 42

(Azoulay, Jones, Kim, & Miranda, 2018). In the tech industry, starters are often younger, reflecting their tendency to be more tech-savvy consumers (Azoulay et al., 2018). In fact, common stereotypes surrounding modern entrepreneurship, especially among successful and high-tech businesses, revolve around youth. Surveying a decade of *TechCrunch* award winners revealed that the average age of a founder of a tech company is 31, and the Inc. Magazine's 2015 fastest growing startup list presented an average founder age of only 29 (Azoulay et al., 2018). A 2017 article from *The New Yorker* describes this market as one that "discourage(s) a 'stale degree' and demand(s) a 'digital native' who's a 'culture fit' – sift(ing) for youth" (Friend, 2017, para. 4). This is widely believed, in part because of a cultural phenomenon drawn from buzzworthy quotes from young founders and accolades which seemingly reward youth. On the other hand, in non-tech fields such as hospitality or manufacturing, research points to an older, mid-career average age for founders. In fields such as engineering or biotechnology, the average founder age is 47 (Azoulay et al., 2018). University of Chicago economist David Galeson posits that "experimental geniuses" need more time for research, trial and error, and highly advanced degrees while "conceptual geniuses" may succeed earlier (Freedman, 2012).

In addition to entrepreneurs, senior leadership is also seeing a shift to younger individuals (Pressentin, 2017). As large swaths of Baby Boomers retire, organizations are seeking Millennials and Gen Zs to fill key leadership roles, including CEO positions. Both younger entrepreneurs and CEOs are more educated than their older counterparts, highly skilled, globally focused, and able to balance their use of technological and human skills. If CEOs are considered at the top of their profession, as are experts, the question of whether expertise is changing, too, is legitimate.

New Demands for Employee Skills in Profit Versus Nonprofit Organizations

The Institute for the Future (2011) has identified ten skills for the future workforce: sense-making, social-intelligence, novel and adaptive thinking, cross-cultural competency, computation thinking, new-media

literacy, transdisciplinary, design mindset, cognitive load management, and virtual collaboration. Additionally, advancements in artificial intelligence and robotics will require that employees be increasingly technologically savvy. Ongoing new advancements in technology continue to lead to drastic changes in the skills organizations need from employees (Pilenzo, 1989, p. 94). Before the internet age of the 2000s, employers did not expect employees to be digitally literate, creative everywhere and anytime, or excel in soft skills. They sought employees who mastered writing skills, communication, and teamwork. Today, some of the employability skills include soft skills such as a good work ethic, appropriate social behavior, reliability, and individuals with a good attitude (Indeed, 2020). Soft skills also include adaptability, communication, teamwork, decision making, time management, flexibility, problem-solving, and critical thinking (The Balance Careers, 2019). The five most important soft skills companies need the most in 2020 are creativity, persuasion, collaboration, adaptability, and emotional intelligence. Skills such as ethics, effective communication, time management, problem-solving skills, leadership, customer service, and decision making outweighed hard skills such as grant writing and marketing. According to a LinkedIn survey, creativity and persuasion were the top two needed soft skills in 2019 (Petrone, 2019). Furthermore, recruiters seek candidates with specific knowledge and hard skills. Hard skills are skills required to perform a job and are typically gained through formal education and training or from past work experience.

Both the for-profit and nonprofit sectors seem to follow these trends in needed skills. The differences in employability skills between for-profit and nonprofit organizations are shown in Table 9.2.

Although both for-profit and nonprofit organizations value employees who have hard and soft skills, nonprofits place less emphasis on hard skills such as grant writing, online marketing, and branding expertise (Rodriguez, n.d.). Indeed, in 2013, Hoefer, Watson, and Preble studied the preferred skills and educational degrees of executive directors (ED) and chief executive officers (CEO) in nonprofit human services. Their findings indicate that soft skills are rated higher than hard skills for EDs and CEOs (Indeed, 2020). In a 2019 global trend report, LinkedIn also found that 92% of companies surveyed believed that soft skills mattered

Table 9.2 Employability skills in for-profit and nonprofit organizations

For profit	Nonprofit
Hard skills (emphasis on software management, foreign languages, and operation of machinery)	Hard skills (emphasis on grant writing and direct service skills, such as teaching, counseling, and medical care)
Soft skills (communication, time management, problem-solving, and leadership are most desired)	More soft skills (i.e., fundraising and campaigning, communication and time management and desirable along with creativity, flexibility, and the ability to work with diverse groups)
Education and work experience	Leadership and ethics
People skills	Less emphasis on hard skills
Adaptability and time management	Budgeting

the same as, or more than, hard skills, with 80% believing that soft skills are important to a company's success.

The findings of Campbell & Company, an organization dedicated to helping nonprofits, challenge those of Hoefer, Watson, and Preble (2013). In December 2017, while the company claimed that hard skills such as campaigning, fundraising experience, and strategic and financial planning were in demand for the positions of chief development officers (CDO) and chief executive officers (CEO) in 2018, they considered emotional intelligence and empathy essential skills to create the right conditions for creativity and innovation (McFeely, 2017).

When corrected for the size of organizations, only one hard skill is tied with the desired characteristic of decision making: budgeting (Petrone, 2019). As more nonprofits continue to see an increase in corporate to nonprofit crossovers (C&C, 2019), emotional intelligence will not outweigh heavy fundraising experience (C&C, 2019). Such findings further confirmed the importance of soft skills such as communication, relationship development, management, leadership development, and integrity (Hoefer et al., 2013). This means that candidates who are "flexible, innovative, and [enjoy] meaningful work" (Rodriguez, n.d.) are highly sought after in the nonprofit sector. Surveys have also shown that the "Millennial advantage" can be extremely beneficial for nonprofit organizations. As shown in Fig. 9.1, behavioral skills such as flexibility, agility, ability to prioritize, working well with others and communication are the most

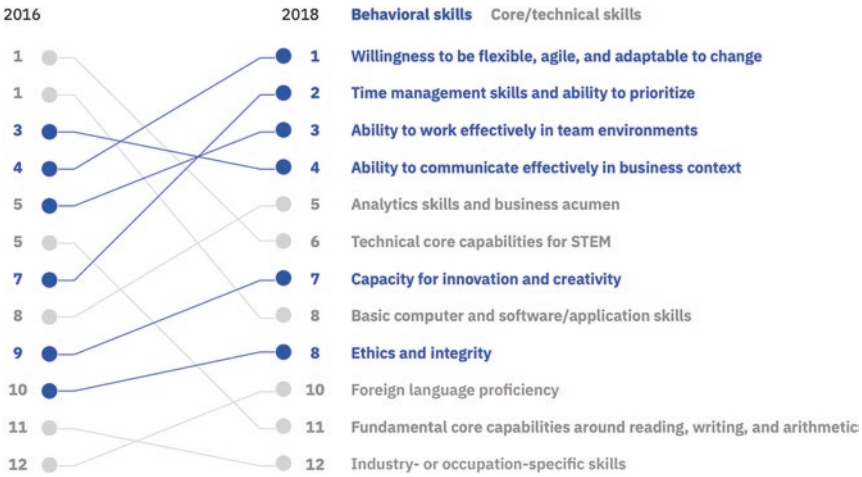

Fig. 9.1 Behavioral skills as most critical for today's workforce members. (Source: 2016 IBM Institute for Business Value Global Skills Survey; 2018 IBM Institute for Business Value Global Country Survey. (Used with permission))

critical for members of the workforce (LaPrade, Mertens, Moore, & Wright, 2019).

In today's competitive market, both for-profit and nonprofit organizations must find people who can make their company stand out. Candidates for employment should expect to "wear a lot of hats instead of doing the same tasks day-after-day" (Anderson, 2020).Overall, hard skills may remain essential in both the for-profit and nonprofit sectors, but there is strong evidence to support an upward trend in soft skills as 92% of employers deemed soft skills as growing in importance (CareerBuilder, 2019). Additionally, the ability to be trained is critical, as CareerBuilder found in 2019. Fifty-nine percent of the employers surveyed were willing to hire underqualified candidates that showed potential.

While the labor force is becoming more educated, we are also seeing a decline in the value of education attained. A 2019 study from economists at UCLA and the Pontificia Universidad Católica de Chile claims that the average income of high school graduates has declined 12% during the past 40 years and that the value of a high school degree has declined along

with a loss of manufacturing jobs and an increase in low-wage service jobs (Fuentes & Leamer, 2019). Some sectors such as technology have seen education devalue rapidly in the years after graduation (Charette, 2013) and the speed at which professional skills become obsolete is increasing. The half-life of professional skills was once estimated at 10 to 15 years, meaning that the value of those skills would decline by half—or half the knowledge associated with the skills would become irrelevant—in a decade or so. Today, the half-life of a learned skill is estimated to be five years and even shorter for technical skills, meaning that a skill learned today will be about half as valuable in just five years or less (LaPrade et al., 2019). The knowledge half-life of software engineers is even shorter, with an estimated three years (Friend, 2017). This very short knowledge life change may impact how we define the knowledge component of human expertise, especially in the tech field.

The impact of the demographic changes and the half-life knowledge findings on the construct of expertise is three-fold: First, employee experience may not be as valuable as it was a few decades ago. As aforementioned, entrepreneurs and those employed in tech-related fields are much younger than in previous generations. What seems to be valuable to tech companies are specific skills and the desire to grow as an employee, not the "10,000 hours" of experience rule that has defined expertise (Ericsson, Krampe, & Tesch-Römer, 1993). Second, education is seen as a more negotiable qualification for some jobs. Rather, organizations value employees who are creative, adaptable to swift changes, and who are able to learn quickly. This may impact the knowledge dimension of expertise. Finally, the pace at which tech companies evolve organically excludes those with accrued knowledge in one specific domain. Also, because products and services encompass more than one domain, employers seek individuals who are curious about various subjects. Gen Z employees respond well to this requirement as they want to gather a variety of different skill sets rather than declaring a single subject (Gomez et al., 2020). This represents a significant shift for the definition of human expertise, especially for the longstanding belief that it is domain-specific.

1990 to 2025: A Changing Definition of Expertise

The changes in workforce demographics, the increasing use of technology, and the subsequent changes in the employee skills organizations need to remain competitive have influenced how expertise has been perceived and defined over the past three decades. Table 9.3 presents some changes in how expertise has been defined since the 1990s.

Artificial Intelligence and Employee Expertise

In this chapter, I have defined the construct of expertise as a combination of knowledge, experience, problem-solving skills, and behaviors. Artificial intelligence is defined as an intelligence demonstrated by machines, unlike the natural intelligence of humans. As artificial intelligence continues to change the nature of work, the question of whether or not the capabilities of AI will surpass that of humans and negate the need for human expertise becomes relevant. This section compares each dimension of expertise to artificial intelligence.

Table 9.3 Changes in expertise

	1990s	2020–2025
Knowledge	Depth Developed slowly Long half-life ~ 10 years	Depth and breadth of knowledge Constant upskill Short half-life ~ 3 years
Level of education	Bachelor's degrees: 17.2% Advanced degrees: 9.3%	Bachelor's degrees: 24.2% Advanced degrees: 14.7% (expected increase to 22% in 2026)
Number of jobs	1 or 2	4 to 5
Type of role and skills	Single discipline Functional skills	Multidisciplinary Hybrid functional skills
Organizational structure	Hierarchical	Flattened, with a focus on cross-functional teams and networks

Knowledge

Humans possess many types of knowledge: implicit, explicit, formal, informal, deep and shallow knowledge, along with the ability to multitask (Swanson & Holton, 2009). The algorithms necessary for AI analyze human-generated datasets and have the capability to retain unbiased knowledge in high volumes (SAS, 2020), but it is only through data. Although AI may outperform human knowledge in capacity and processing speed, at its core, AI systems are reliant on humans for knowledge through the input of data.

Experience

Humans and AI gain experience in different ways. Human experience is gathered over time, throughout a person's life. It is dependent on the type, the quality, and the quantity of events experienced by an individual. According to Swanson and Holton (2009), "When specifically related to the development of human expertise, experience is an interactive component that is heavily dependent upon the type and quality, as well as the quantity, of the events experienced by the individual" (2009, p. 263). In contrast, AI gathers experience through the analysis of vast amounts of data (SAS, 2020) and is dependent on the analysis of input of human-generated data.

Problem-Solving

The ability to solve problems has been identified as a key component of human expertise (Swanson & Holton, 2009). Wertheimer (as cited in Swanson & Holton, 2009) believes that experts must have a real understanding of the environment in which the problem is framed to develop insightful solutions. Additionally, problems may require a variety of skills and approaches, which human experts possess, such as deliberative reasoning, expertise-based intuition, creativity and innovation (Salas, Rosen, & DiazGranados, 2010). In comparison, AI analyzes vast amounts of

human-generated data to see relationships and recognize patterns in those data. The analysis of data allows AI to derive meaning and extract insights, which can be used to make decisions (SAS, 2020). While AI is capable of making decisions based on data, it still requires an initial human inquiry to set up the system and ask the right questions. Therefore, it is likely to just confirm its solution or finding. Therefore, one major limitation of AI lies in the way it makes decisions. Its intuitive ability is only as good as the dataset available for that system. Also, AI systems are largely focused on a single task. The relevant dataset is highly specific and the sole driving influence for solutions proposed by AI (SAS, 2020).

Behaviors

In 1999, Swanson and Holton defined expertise as "human behaviors, acquired through study and experience within a specialized domain" that have effective results and optimal efficiency (p. 26). Two decades later, the definition evolved to include behavioral traits, as Germain's (2006) Generalized Expertise Measure (GEM) suggests. Germain defines expertise as a combination of knowledge, problem-solving skills, years of experience, and behavioral traits. Human experts have the ability to rely on intuition to help fill gaps in information while making decisions (Anderson & Rainie, 2018). Experts can also draw analogies to experiences in different areas to assist their decision-making process, while also bringing the human element to decisions, which require soft skills and emotion. Although AI systems can mimic human behavior, they are still far from thinking and behaving like humans (Rutschman, 2019). Table 9.4 compares the main variables of artificial intelligence and human expertise. Although they are beyond what defines expertise, accuracy and speed/processing are included in the table as their contrast is stark and helps in further understanding how AI and human expertise might be complementary.

Scholars are in agreement with the idea that the best use of artificial intelligence and human expertise lies in collaboration. Human expertise and AI are complementary, not substitutes (Evans-Greenwood, Lewis, & Guszcza, 2017). AI's strengths in speed, scalability, and quantitative

Table 9.4 Comparison of artificial intelligence and human expertise

	Artificial intelligence	Human expertise
Knowledge	Variety of learning through algorithms' analysis of vast human-generated datasets Retention in high volumes Focused on a single task Unbiased	Deep learning through experience and education Vast amounts of domain-specific knowledge Many types of knowledge Possess sensory information
Experience	Dependent on the analysis of input human-generated data	Gathered over time Dependent on type, quality, and quantity of events experienced by an individual
Problem-Solving	Requires human inquiry to set up the system and ask the right questions Sees relationships and patterns through data Analysis of data allows AI to extract insights and make decisions	Understands the problem and the environment in which the problem was framed May use deliberate reasoning, expertise-based intuition, creativity, and/or innovation to solve problems and make decisions
Behavior	Far from thinking and behaving like a human	Soft skills, emotion, empathy
Accuracy	Increases accuracy with frequency of use and amount of data	Variable
Speed/ Processing	Extremely fast processing capability Less ability to process nuance and ambiguity	Superior processing for multitasking Potential for fatigue

capabilities can enhance human expertise when solving problems in their roles as leaders (Wilson & Daugherty, 2018). Both are essential for superior organizational performance. Humans may define problems, machines may help find solutions, and humans may verify the acceptability of those solutions (Evans-Greenwood et al., 2017). Jesuthasan (2017) surmises that humans will still play an integral role in work, with more mundane aspects of work being relegated to machines, while the non-routine components of work may be managed and conducted by people. Studies by Schwartz, Collins, Stockton, Wagner, and Walsh (2017), Andra's (2017), and Jesuthasan's (2017) research support the claim that, while an "old

rule" may be that "machines and artificial intelligence are taking over jobs" and replacing people, most companies (up to 77% of them) would either retrain people to use technology or redesign jobs to better utilize human skills. As such, Schwartz et al. (2017) suggest a "new rule" where jobs and tasks are being redesigned to use more essential human skills and are augmented by technology. These human characteristics of work include a variety of skills and abilities, such as problem-solving, decision making, communication, and empathy (Schwartz et al., 2017).

Furthermore, Jesuthasan (2017) contends that traditional jobs will be "deconstructed" into component tasks and competencies, which may or may not be performed as distinct jobs. He notes that talent platforms, such as Upwork, which connects specialized professionals/freelancers with businesses, unlike traditional staffing agencies, will alter the relationship between organizations and workers, including those with expertise. Seeking workers such as contractors, freelancers, outsourced employees, and contingent workers, in addition to machines or artificial intelligence, will enable organizations to be more adaptable as it pertains to cost, risk, speed, and capability.

Rather than hiring consultants who are often experts in a specific domain, organizations may seek a web of on-demand specialists who don't necessarily have the four pillars of expertise (knowledge, problem-solving skills, experience, and behavioral traits (Germain, 2006)). Freelancers, for instance, may develop a tailored digital solution for an organization, one that only requires a specific talent. The years of experience and the level of education become secondary to the ability to solve a problem for a client (problem-solving) and to communicate effectively (behavioral trait).

This chapter has drawn attention to how the changing employee demographics and the increasing use of technology and AI are changing the skills sought by employers and the traditional expertise-related dimensions. First, I suggested a shift in the importance of employee experience. As suggested earlier, entrepreneurs and those employed in tech-related fields are much younger than in previous generations. What seems to be important to tech companies are specific skills and the desire to grow as an employee, not the 10,000 hours of practice rule that has traditionally

defined expertise (Ericsson et al., 1993). Second, it appears that education is a more negotiable qualification for some jobs, especially in tech fields where knowledge has a life of about three to five years, after which it becomes obsolete. The pace at which tech companies evolve organically excludes those with accrued knowledge in one specific domain. Additionally, organizations value employees who are creative, adaptable to swift changes, and who are able to learn quickly, rather than being in the form of a formal degree, that learning may occur via internal networks, certifications, Massive Open Online Courses (MOOCs), or other short-term training programs. Third, because consumer products and services tend to encompass more than one domain, employers seek individuals who are curious about various subjects and who value multidisciplinary knowledge. Gen Z employees respond well to this requirement as they want to gather a variety of different skill sets rather than embracing one specialization (Gomez et al., 2020). This multidisciplinary approach contrasts with the traditional domain-specificity and narrow focus of expertise (Swanson & Holton, 2009).

The past decades have been marked by significant investments in technical skills. Data science and machine learning have saturated almost every industry. It is expected that the application of intelligent automation will continue to have a deep and urgent impact on skills requirements. As LaPrade et al. (2019) suggest, executives' views regarding the priority of critical skills have taken a turn from digital and technical to behavioral. Navigating this new landscape requires individuals who can communicate effectively, apply problem-solving and critical-thinking skills to drive innovation using new technologies, and draw and act on insights from large amounts of data. It also calls for creativity and empathy, an ability to change course quickly, and a propensity to seek out personal growth. Going a step further, Ginni Rometty, President and CEO of IBM, predicts that AI will change 100% of jobs in the next five to ten years (Ioane, 2019) and 67% of executives expect that advancements in automation technology will require roles and skills that do not even exist today (LaPrade et al., 2019). If their predictions hold, it is unclear how the definition of human expertise will shift. Perhaps organizations will call on on-demand industry expertise networks rather than

on individual experts. And these networks might only include tech-savvy, diverse, communicative, and creative individuals whose knowledge is multidisciplinary.

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