Introduction:

Reconceptualizing Higher Education and Lifelong Learning

in the Era of the Synergistic Digital Economy

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Defining the "60-Year Curriculum"

Teenagers' serious thinking about a career begins by middle adolescence, gradually moving beyond visions of being a rock star or a professional athlete to develop realistic conceptions about their first occupational role (Porfeli & Lee, 2012). Looking ahead, the average lifespan of children born in 2020 is projected to be 90–100 years (Gratton & Scott, 2016), so many current students will need to work until their mid-70s to have enough savings for retirement or some other form of post-work life. In progressing through about 60 years of employment, they will face not only evolving jobs requiring expanding skillsets but also multiple careers as some occupations disappear and new roles appear in workplaces shaped by globalization, environmental crises, and artificial intelligence (Dede, 2018). As a result of these developments, society must prepare today's young people for six decades of career growth (e.g., moving from student teacher to lead teacher) and career change (e.g., moving from automobile welding supervisor to high school science teacher) followed by retirement. To fulfill their responsibilities, educators at every level are faced with the increasing challenge of developing young people's capacity for unceasing reinvention to face an uncertain and changing workplace and for taking on occupations that do not yet exist.

Dr. Gary Matlin at UC-Irvine coined the term the "60-Year Curriculum" (*60YC*) to refer to continuing education centered on lifelong learning about occupational changes and transitions (Branon, 2018). This book describes a *60YC* initiative sponsored by Harvard's Division of Continuing Education (DCE) and focused on a transformational evolution of higher education towards novel strategies to enable adults to add skills—via formal instruction, employment, and daily life—as their occupational and personal context evolves and shifts. On-the-job learning is familiar to most people; many of us learn to take on tasks that fall outside of our initial academic training. For example, as a professor in learning technologies I have had to reinvent my teaching and research every few years because of advances in digital technologies and globalization. Young adults today face challenges in finding stable jobs that provide benefits and upward mobility for their occupational role. Now, nations face challenges with continuing employability greater than at any prior time in history. I tell my students to prepare simultaneously for their first two careers, determining which is a better foundation as an initial job while building skills that enable shifting to new work-roles in a future neither they nor I can imagine.

The *60YC* is often described in occupational terms, but our initiative is based on a broader educational mission. As argued by Sizer and Sizer:

> High schools have long had three core tasks: to prepare young people for the world of work; to prepare them to use their minds well, to think deeply and in an informed way; and to prepare them to be thoughtful citizens and decent human beings. (1999, p. 10)

In the 21st century, work, civic participation, and family life rely heavily on the ability to collaborate, mentor, and network. Doing these activities well requires moral and ethical capacities that foster mutual benefits. In particular, low-cost videoconferencing and social media

have expanded the toolset and skillset required for sharing, co-creating, and negotiating with others, including people of different linguistic and cultural backgrounds whom one may never meet face-to-face (Fadel, Trilling, & Bialik, 2015). Thus, all three core tasks posited by Sizer and Sizer are important aspects of what educators must inculcate and evolve via the *60YC*.

Achieving the goals of the *60YC* requires rethinking the objectives of education. The importance of this shift was highlighted in a 2012 report by the US National Research Council (NRC), *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*, which posits that flexibility, creativity, initiative, innovation, intellectual openness, collaboration, leadership, and conflict resolution are essential for each person (2012). The report argued that cognitive, intrapersonal, and interpersonal dimensions of knowledge and skills are best developed in combination. Table 1.1 categorizes a broad range of knowledge and skills vital in the 21st century, grouped by these dimensions.

[Insert Table 1.1 here]

Some of these skills are seldom included in current educational objectives; others are under-emphasized; and still others have changed due to advances in digital technologies (e.g., filtering information has become more important than finding information). Moreover, and in contrast to industrial-style multiple choice and short-answer testing, achieving and assessing mastery now requires the ability to apply knowledge and skills in real-world contexts, demonstrating proficiency via effective, authentic performances. Accenture (2017) summarized and synthesized a variety of frameworks for 21st-century skills.

A report from the UK-based innovation foundation Nesta predicted the nature of work in developed countries in 2030 when the pupils currently starting elementary school begin their careers (Bakhshi, Downing, Osborne, & Schneider, 2017). Its forecast spans only the initial stage

of these students' employment, yet the report describes a future—a little more than a decade away—quite different from the present. Political, environmental, and economic instability are driving rapid, chaotic shifts in work and society. Given this rate of change, education's role must be long-term capacity building—enhancing students' interpersonal and intrapersonal skills for a lifetime of flexible adaptation and creative innovation—as well as providing short-term preparation so that they are college-or-career ready. The Nesta report stressed that current educational objectives overemphasize the acquisition of knowledge and underemphasize the mastery of generalizable skills for lifelong employability. Similar to the 2012 NRC report, the skills Nesta highlighted include fluency of ideas, social perceptiveness, systems evaluation, originality, and judgement and decision making. Nesta emphasized educators must raise aspirations for sophisticated educational outcomes and prepare all students—not only an elite few—to reach ambitious, individual proficiencies in these skills.

A recent Organization for Economic Co-operation and Development (OECD) report (2018) complemented the NRC and Nesta studies by emphasizing personal well-being, which goes beyond income, wealth, jobs, and earnings to stress equitable access to health, civic engagement, social connections, education, security, life satisfaction, and the environment. This OECD report described knowledge and skills people need for lifelong employability but adds an emphasis on attitudes and values, such as creating new value, reconciling tensions and dilemmas, and taking responsibility through personal agency. This formulation of what students need has less emphasis on cognitive factors and more on intrapersonal (including moral and ethical dimensions) and interpersonal capabilities. These align with Sizer and Sizer's goals for educational outcomes that produce thoughtful citizens and decent human beings.

Moving Beyond Preparation for One's First Job

Society must help workers who have exhausted their resources for formal education and are faced with ongoing occupational change (Rodrik, 2017). However, the above reports are focused primarily on preparing students at the start of their working lives, getting them ready for their first career, and building transferable skills for future career growth and career change. For that reason, the *60YC* initiative centers on the least understood aspect of the lifelong learning and employability challenge: What are the organizational and societal mechanisms by which people can upskill later in their lives when they do not have the time or resources for a full-time academic experience that results in a degree or certificate? Creating these mechanisms requires developing novel services for adults who are learning while working—the focus of this book—and then applying insights from the new organizations delivering those services to the related tasks of improving preparation for initial jobs and of having a satisfying life after retirement.

Because the digitalization of the economy is unprecedented historically, an uncertainty not addressed in these reports is the extent to which advances in technology will create as many jobs as they eliminate (Frey & Osborne, 2013). If not, then new challenges will arise in ensuring that people who are structurally unemployed have adequate incomes and meaningful opportunities outside of paid work.

Adult learners need educational opportunities and stackable credentials not limited to formal degrees and certifications. Thus far, attempts to address learning post-matriculation have centered on what individual institutions might do. For example, in 2015 Stanford developed an aspirational vision called “Open Loop University” (Stanford2025, n.d.), and Georgia Tech has released its report *Deliberate Innovation, Lifetime Education* (Georgia Tech Commission on Creating the Next in Education, 2018). The hallmarks of these and similar models center on providing a lifelong commitment to alumni that includes periodic opportunities to upskill

through services offered by the institution: micro-credentials, mini-mester classes, and credit for accomplishments in life; personalized advising and coaching as new challenges and opportunities emerge; and blended-learning experiences with distributed worldwide availability. Some of these services will require partnerships and collaborations with organizations outside of academia that have complementary strengths and missions (e.g., mentoring the transition to a new job or occupation).

Further, the educational emphasis in college shifts to acquisition of competencies (skills, knowledge, and abilities) rather than disciplinary topics and knowledge communication—the student's goal is to develop a suite of skills and strategic attitudes to make a difference in the world rather than just attaining formal academic certification to meet the immediate requirements of a particular occupational role. Beyond these models of how universities might help, partnerships with employers are important in recognizing the value and complementarity of situated workplace learning and acculturation.

Models like these are a useful step forward but are not sufficient because they focus on a single institution's ability to serve its alumni rather than on meeting the more general need to equip and help all adults from any background at any stage of their lives. For this reason, DCE's *60YC* is exploring models in which a coalition of extension schools might accomplish this broader task by working together to extend their mission, moving beyond episodic "continuing education" to iterative, cyclical, continuous adult learning. Another organizational model could be regional higher education coalitions parallel to Western Governors University in their cross-institutional cooperation. Useful insights about institutional partnerships and coalitions can come from fields like medicine that provide approaches for continuous recertification, as well as from sectors like the military that have well-developed approaches for employee career growth and

career change. That said, expanding the mission of current institutions designed for different educational purposes is unlikely to provide the full range of services necessary for continuous lifelong learning. This book sketches strategies and models that could provide a novel comprehensive solution, including models from non-profits and workforce development boards.

Frameworks for Adult Learning and Education

Thompson (2009) provided a brief history of research and theory on adult learning and cognition. Relevant to occupational learning, Knowles (1970) identified andragogy (instructional strategies for aiding the learning of adults, as opposed to children) as including five basic assumptions:

1. Adults are more independent and self-directed than children.
2. As adults mature, their life experience grows as a resource on which to base new learning.
3. Adults' motivation for learning is largely focused on life tasks, issues, and challenges.
4. For adults, learning just-in-time is valued more than learning just-in-case.
5. For adults, learning is problem-centered rather than content-centered.

Cross (1981) applied these principles to the design of adult learning experiences. Brookfield (1986) and Mezirow (1991) emphasized the self-directed nature of adult learning and the importance of critical awareness.

Bryson defined adult education as "all activities with an educational purpose that are carried on by people in the ordinary business of life" (1936, pp. 3–4). In contrast to informal learning from life, Cremin (1970) defined education as an intentional and organized activity to transmit or acquire knowledge, skills, and attitudes. Recent work in the learning sciences has emphasized the importance of context and culture (National Academies of Science, Engineering, and Medicine, 2018), which shape learning from life as well as through education. Marsick and

Watkins defined informal and incidental learning as “learning outside of formally structured, institutionally sponsored, classroom-based activities” (1990, pp. 6–7) and asserted that responding to non-routine circumstances outside of standard procedures exposes erroneous tacit assumptions and leads to learning through reflection on what was expected versus what actually happened. In this process, they differentiated between informal workplace learning, which may be planned and intentional, versus incidental workplace learning, which is “a byproduct of some other activity, such as task accomplishment, interpersonal interaction, sensing the organizational culture, or trial-and-error experimentation” (pp. 6–7).

Informal and incidental learning draws on various frameworks: Dewey’s (1938) reflective thought, Lewin’s (1947) action research, Polanyi’s (1967) tacit knowledge, and Argyris and Schon’s (1978) action science, a systematic process for learning from experimentation in groups and organizations. Marsick and Watkins (1990) identified conditions that might delimit or enhance informal and incidental learning. Delimiters include the ways that understanding is framed and reframed (Polanyi, 1967) and the capacity to engage in goal-directed behavior in everyday work (Inkster, 1987). Consistent with the 21st-century skills described earlier, enhancers include creativity, proactivity, and critical reflectivity. Situated cognition and learning by doing in workplace settings are also important forms of informal learning (National Academy of Sciences, Engineering, and Medicine, 2018), as are deliberate and focused actions by adult learners.

As adult education has evolved over time, its use of these learning principles has become more pervasive. Fostering career growth and career change via the *60YC* will require research to deepen our understanding of adult learning, as well as applications of personalized learning to

this distinct set of students. The process of *learning engineering* will support the development of new models and refined approaches for adults (Dede, 2019).

The History of Institutions Fostering Adult Learning in America

Understanding the approaches organizations have historically used to promote adult learning and education in the United States is important as a context for developing future-oriented strategies. This section briefly summarizes this evolution and the many types of institutions and media involved, and it then draws implications for the *60YC*.

In the Colonial Period, adults primarily drew on sources of informal learning, such as coffeehouses and taverns. Public lectures were another source of information, but the required fees limited access to the leisured, business, and professional classes (Stubblefield & Keane, 1994). In contrast, public libraries provided more open means of learning. In 1727, Benjamin Franklin founded a learned society, a mutual-improvement club whose members aided each other's learning; some of these groups incorporated multiple disciplines and fields, such as the American Philosophical Society. Evening schools offered basic courses in reading, writing, and arithmetic, as well as more advanced offerings in classic and modern languages or in business and technical subjects (Seybolt, 1925). Apprenticeships were the basis of most workplace learning; the mutual obligations of mentor and apprentice were specified in contracts of indenture, typically for seven years (Towner, 1966).

By the early 1800s, social reformers saw adult education as a means of providing access to learning for everyone, including marginalized populations like women, ethnic groups, and the poor (Wecter, 1937). Agricultural societies worked to modernize the practices of farming (Rossiter, 1975), and evening schools helped to educate immigrants who worked all day in factories and shops. Knowledge that served a useful economic purpose was promoted by

industrialists; this included a particular emphasis on science, engineering, and technology communicated through mechanics' institutes (Bates, 1965). Newspapers flourished and complemented the rapid expansion of libraries as published sources of information (Bode, 1960).

During this period, lyceums emerged as a popular form of adult education. Their emphasis was on the sciences and useful knowledge, the development of libraries and museums, and the encouragement of temperance and morality; politics and religions were excluded as topics (Noffsinger, 1926). A competitor to lyceums as an organized movement was the rise of professional lecturing, which developed national educational associations in fields such as geology, dentistry, and civil engineering (Scott, 1980).

Between the Civil War and World War I, adult education flourished (Knowles, 1977). The Morrill Act of 1862 created Land Grant colleges (Andrews, 1918). As a complement to lyceums and lectures, chautauquas emerged: weeks-long summer institutes devoted to learning (Morrison, 1974). These events organized into circuits on which a traveling chautauqua might visit about 30 towns over the course of a summer. Perhaps in response to these non-academic methods of adult education, universities developed *extension* activities that focused on subjects such as mechanics, farming, and teaching (Van Hise, 1915). Magazines joined books and newspapers as media for informal learning (Tebble, 1974). World's Fairs provided a complement to museums.

The development and implementation of the first correspondence courses were credited to Sir Isaac Pitman of England, the inventor of shorthand. In 1840, he used the postal service in England to reach learners at a distance. A more formal version of the early-American correspondence course was created by Anna Ticknor of Boston in 1873. In order to increase educational opportunities for women, she originated the Society to Encourage Studies at Home.

The society provided courses of study for women of all social classes and served over 10,000 women over its 24 year lifespan (Nasseh, 1997; Stevens-Long & Crowell, 2002).

Advances in industrialization and a move away from agricultural labor led to an increasing focus on preparation for work, both for career growth and for career change (Gutman, 1976). Technics and the useful arts linked science and economic development (Daniels, 1971). Businesses pushed for vocational education, trade schools, and in-plant apprenticeships. Taylor's "scientific management" promoted training for workers to act like machines (Neumann, 1979), while corporate "industrial welfare" programs taught safety and sanitation. Workers sometimes pushed back against this top-down training, creating their own educational systems like the Grange, the Farmers' Alliance, and the Knights of Labor (McLaurin, 1978). On America's entry into World War I, the military developed methods of mass training and classification by aptitude, including the origination of intelligence testing (Gould, 1981).

In the period between the two world wars, the Carnegie Corporation of New York professionalized adult education through forming the American Association for Adult Education (AAAE). Annual conferences and the *Journal of Adult Education* brought rigor and research to the field. That said, the AAAE focused on the professionalization of adults more than on providing access to career growth and change to marginalized populations (Lagemann, 1987). In parallel and with a similarly elitist perspective, the National University Extension Association helped to professionalize those offerings (Rohfeld, 1990). Government programs associated with the New Deal reached more of a general adult audience (Maskin, 1973).

Commissioned by the American Association of Museums, the research of Edward S. Robinson aided with the design of exhibits to maximize learning (Alexander, 1979). *Life* magazine invented the picture essay, and movie theatre audiences enjoyed newsreels (Marquis,

1986). Radio broadened the range of educative media and reached national audiences, supplanting the newspaper as the preferred source of news (Perrett, 1985). Despite the rapid rise of radio technology, distance education courses were rarely if ever offered for credit in higher education. The education community, along with society as a whole, regarded legitimate education as only possible in conventional locales such as classrooms (Funk, 1998).

Corporations blended emerging media into their training, establishing formal schools such as the Westinghouse Technical Night School and the General Motors Institute of Technology (Stubblefield & Keane, 1994). The US entry into World War II brought coordinated efforts to train not only military personnel but also civilian workers (Grace, 1948). Post-war, the GI bill brought many former military personnel into higher education.

The past seven decades have brought expansion for many of the adult educational mechanisms and organizations described above. Community colleges provided educational and certification options that were less time consuming and expensive than four year colleges. Workplace education programs sponsored by large corporations for their employees became the norm (Eurich, 1985), and unions responded with educational initiatives of their own (Aronowitz, 1990). IBM (2005) established a model for blending formal and informal learning with its On Demand learning system. Professional associations, such as the American Bar Association and the American Medical Association, became core licensing bodies for people who wanted to practice those professions.

In the decades after World War II, television became a powerful vehicle for adult education (Chafe, 1991). Tele-courses (Verduin & Clark, 1991), which developed in the 1970s, showed promise for minimizing some of these problems. The development of videotape allowed educators to customize the same content for different learning environments. This medium also

allowed increased flexibility; course content could be stored, delivered, and repeated at will. However, despite their advantages, the cost and complexity of producing tele-courses made them impractical for teaching large numbers of students.

The British Open University began in 1969 through video broadcasting its weekly courses on the BBC. Over time and with the advent of new technologies, the British Open University's model of distance learning evolved into a student-centered delivery system and administrative structure separate from a campus setting. More economically practical than tele-courses, this system envisioned each student as "a node in the network" (Granger, 1990, p. 189) that provided individualized instruction in a virtual classroom. The students had access to a virtual library—customizable based on their particular learning style—and to collaborative tools that encouraged discourse and critical thinking (Prewitt, 1998). By encouraging a community of learners without admission requirements, this model enabled outreach to adults facing career growth and career change.

During the 1990s, government policy and investment led to workforce innovation boards, public funding for workforce development, and public employability offices. Also, widespread usage of the Internet transformed the nature of distance education. In particular, with the development of the World Wide Web (WWW) as a means of representing and accessing information, Internet use expanded exponentially. By 2000, the number of webpages rose to at least one billion (Maddux, 2001). With its capability to facilitate communication between people in various geographic locations and to disseminate information quickly and relatively inexpensively, the Internet appeared well-matched for distance education of adults. However, change has been very slow in both face-to-face and distance-based educational practice (Cuban, 2013), with a perennial emphasis on presentational instruction and content coverage despite

research-based findings emphasizing active learning and skill development (Clark & Mayer, 2016; National Academies of Science, Engineering, and Medicine, 2018). In informal learning, however, social media (such as YouTube videos) have transformed how adults gain and interpret information (Dede, 2016).

In online learning, although massively open online courses (MOOCs) were hailed as a breakthrough, their instructional practices have remained entrenched in outdated models of teaching (Dede, 2013). In particular, methods for personalization such as individualizing a student's path to content mastery—through adaptive learning or competency-based education—have typically not been utilized (Dede, Ho, & Mitros, 2016). Similarly, more efficient and effective learning as a result of faster and more in-depth diagnosis of student needs or course trouble-spots has languished, including assessment of skills such as systems thinking, collaboration, and problem solving in the context of deep, authentic, subject-area knowledge assessments.

In summary, over the past few centuries, beyond participants' desire for self-improvement, adult education has been influenced by those who sought to shape individuals and society as well as by the sequential emergence of various media that could support learning (Stubblefield & Keane, 1994). Almost every conceivable combination of the dimensions of adult education have been tried—formal, informal, and incidental; community-based and classroom-based; top-down from employers and government and bottom-up from workers and individuals; isolated, collaborative/peer-based, and massive numbers of participants—all with an ever-evolving array of media. While the future may bring new capabilities such as immersion in designed experiences that simulate career growth and career change (Dede, Grotzer, Kamarainen, & Metcalf, 2017), the rich knowledge from the past about participants, instructional

designs, and organizational structures should inform emerging models for the *60YC*. These models must address lifetime (as opposed to life-stage) learning and lifetime (versus career-stage) employability, incorporating strategic, long-term investments as well as tactical preparation. As discussed earlier, the *60YC* also must extend beyond people's work to include their personal wellbeing and social contribution.

The Challenges of Maintaining Workforce Value and Lifetime Employability

This section draws on studies and current reports from many organizations, so that a variety of viewpoints is represented. All these analyses present a consistent message about the core issues and ways that stakeholders should act in response. No term acceptable to all stakeholders has emerged from these studies; this chapter uses the phrase "synergistic digital economy" to reflect the interweaving and mutual empowerment of physical and biological technologies by advances in digital technologies.

Recently, the chair of the World Economic Forum posited that civilization is entering a historically-unprecedented, transformational economic change. As Schwab explains in *The Fourth Industrial Revolution: What it Means, How to Respond*:

> [The Fourth Industrial Revolution] is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. . . . When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance. . . . The possibilities of billions of people connected by mobile devices, with unprecedented processing power, storage capacity, and access to knowledge, are

> unlimited. And these possibilities will be multiplied by emerging technology breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing. (2016, p. 1)

Schwab indicates that, in this new economic system, human talent will become the most important factor in production, outweighing historically central factors such as financial capital and technological infrastructure. He sees inequality as the greatest concern of the coming decades, with jobs segregated into low-skill/low-wage and high-skill/high-wage occupations, losing many jobs in the middle class.

In its 2019 report *Leading through the Fourth Industrial Revolution: Putting People at the Centre*, the World Economic Forum uses manufacturing as an illustration of the importance of talent and the challenge of inequality. Manufacturing is currently 16% of the world's economy and employs nearly one quarter of the world's workers (2019c, p. 6). The report describes how an emerging economic transformation is disrupting long-established business models, creating shifts in production-value chains, digitizing almost every manufacturing process, and fostering demand for customized products. Trends in the concentration of product demand and labor supply across geographies, as well as the localization and consolidation of production supply chains, are accelerating shifts in the nature of work and occupations. All this is driving a rise in protectionism and populism, as many see their financial security threatened or lost. For better or for worse, these pervasive economic factors are driving an inevitable, world-wide, long-term rise in career growth and career change.

Autor (2019) contrasts the work of the past and the work of the future from an economics perspective. The International Labour Organization's Global Commission on the Future of Work

(2019) calls for a human-centered agenda for the future of work, with increasing investments in people's capabilities, in the institutions of work (universal labor guarantees, time sovereignty, collective representation of workers and employers, harnessing of technology for meaningful work), and in decent and sustainable work. Without investments in increasing human capabilities, the gulf between the affluent and the poor will persist and perhaps widen.

In its 2019 report *Dialogue Series on New Economic and Social Frontiers: Shaping the New Economy in the Fourth Industrial Revolution*, the World Economic Forum describes how other sectors of the world economy beyond manufacturing are also contributing to occupational instability, insecurity, and inequality:

> Although many advanced economies have reaped enormous benefits from technological advances, they have also experienced a hollowing out of the middle class; growing market concentration within many sectors; a "great decoupling" between productivity growth and the evolution of wages; and concerns about algorithm bias solidifying patterns of exclusion. Largely because of increasing polarization and reduced social mobility, perceptions within these economies around the opportunities and risks are diverging. . . . Part of this insecurity comes from the very real experience of shifts in labour markets already underway; and it is compounded by growing uncertainty about what the future will look like, with the only area of consensus being that the biggest part of the transformation is still ahead of us. (2019a, p. 1)

These concerns are echoed in the World Economic Forum's *Global Risks Report 2019*, which warns about the psychological stresses people are facing worldwide due to lack of control in the face of uncertainty given complex social, technological, and work-related transformations.

The report notes that declining psychological and social well-being is not only a risk in itself but also adds to other risks related to social cohesion and politics (2019b, p. 7).

The World Economic Forum's *Leading Through the Fourth Industrial Revolution: Putting People at the Centre* report described earlier identifies the primary societal and leadership challenge as enabling workers; although technology is an important differentiator for organizations, people are seen as the most important source of competitive strength (2019c). In their book, *Human+Machine: Reimagining Work in the Age of AI*, Daugherty and Wilson (2018) indicate that organizations are quickly realizing that humans are necessary to leverage the full potential of intelligence technologies. Accenture (2018) estimates that, if workforce enablement does not catch up with the rate of technological progress, G20 economies could lose up to $11.5 trillion in cumulative GDP growth over the next 10 years. This is equivalent to more than an entire percentage point from the average growth rate every year during this period.

The World Economic Forum's report *Strategies for the New Economy: Skills as the Currency of the Labour Market* describes the types of leadership actions needed to meet these challenges, centering on three types of initiatives: skills-building strategies in the learning ecosystem; labor market strategies to identify necessary skills and provide mechanisms for certifying these as warrants of employability; and enabling strategies, such as encouraging lifelong learning and aligning skills taxonomies (2019d, p. 8). Summarizing these strategies is beyond the scope of this chapter, but the cases offer models valuable in actualizing the *60YC*. The research of Deming and Kahn (2018) addresses several of these strategies, examining skill requirements across firms and labor markets, and Deming (2017) highlights the growing importance of social skills in the labor market. Resolving difficulties in measuring social skills

and understanding effective ways to help people learn these are central to achieving the leadership actions recommended by the World Economic Forum.

Like learning ecosystem strategies and labor market strategies, educational technologies are another avenue to address the challenges raised by the synergistic digital economy. An inquiry into the "skills gap" at the 2018 Stanford Shaping the Workforce of the Future design series highlighted that there was a significant opportunity for workforce educational technologies to help close a translation gap between workers and how their skills apply to the future of work. As a follow-up from the series, the organizers developed a web-based application that leverages principles from the learning sciences to prompt the process of analogical reasoning so that users might transfer their skills to new and different types of work. This tool ingests existing data about a user from their LinkedIn profile, resume, and other text-based sources and visualizes them as the competencies needed for the future of work. Early studies in partnership with the Los Angeles Chamber of Commerce revealed participants exposed to their skill-visualization map were three times more likely to be recommended by the chamber for an internship with one of their partner organizations such as Snap, LinkedIn, Google, and Microsoft and self-reported having 356% more skills (Forshaw, Rosas, & Maples, 2019).

Shifts in Workforce Skills

The World Economic Forum's The *Future of Jobs Report 2018* report describes a new human-machine frontier within existing tasks:

> Companies expect a significant shift on the frontier between humans and machines when it comes to existing work tasks between 2018 and 2022. In 2018, an average of 71% of total task hours across the 12 industries covered in the report are performed by humans, compared to 29% by machines. By 2022 this average is expected to have

> shifted to 58% task hours performed by humans and 42% by machines. In 2018, in terms of total working hours, no work task was yet estimated to be predominantly performed by a machine or an algorithm. By 2022, this picture is projected to have somewhat changed, with machines and algorithms on average increasing their contribution to specific tasks by 57%. For example, by 2022, 62% of organization's information and data processing and information search and transmission tasks will be performed by machines compared to 46% today. Even those work tasks that have thus far remained overwhelmingly human—communicating and interacting (23%); coordinating, developing, managing and advising (20%); as well as reasoning and decision making (18%)—will begin to be automated (30%, 29%, and 27% respectively). Relative to their starting point today, the expansion of machines' share of work task performance is particularly marked in the reasoning and decision-making, administering, and looking for and receiving job-related information tasks. (2018, p. viii)

Similar conclusions about the challenge of technology-driven career growth and career change are reached in reports from the Organization for Economic Cooperation and Development (2019)—*Trends Shaping Education, 2019*—and the Southern Regional Education Board (2019)—*Unprepared and Unaware: Upskilling the Workforce for a Decade of Uncertainty*.

The Brookings report *Automation and Artificial Intelligence: How Machines are Affecting People and Places* indicates that almost no occupations will be unaffected by AI, and about one quarter of US jobs will face high exposure to automation in the coming decades (Muro, Maxim, & Whiton, 2019). In response, the authors recommend five major public policy agendas; the two closely related to this chapter are to promote a constant learning mindset and to

create a universal adjustment benefit to support all displaced workers. The latter could be actualized through federal initiatives such as employability insurance, which could serve as a potential funding source for the *60YC*. Acemoglu and Restrepo (2018) note that AI focused on automation reduces employment, but AI focused on new tasks where labor can be productively employed may increase jobs and develop new types of meaningful work. Further, all types of occupations must be fully available to the diverse groups who are marginalized in our current economy.

The Brookings report also notes that a cultural shift must take place in business practices for hiring:

> As the market for accelerated learning continues to expand, companies will need to be able to effectively evaluate which skills workers have mastered. Therefore, state and local governments, in partnership with industry associations, business services groups, and other employer intermediaries, should develop and push wide acceptance of skill-based hiring. This would stand in contrast to current standard hiring practices, which designate a high school diploma or university degree as the primary, and often sole, credential. Skill-based hiring efforts could in turn be leveraged to facilitate "stackable credentials" by laying out which skills and certifications can be combined into the equivalent of a degree. (Muro, Maxim, & Whiton, 2019, p. 53)

On the demand side, skill-based learning will be a difficult shift to accomplish, just as it is on the supply side where educators have long-standing, entrenched practices related to what degrees represent and how they are acquired.

New types of credentials and novel mechanisms for obtaining them are essential for most adults facing career change because they do not have the resources to complete the extensive

formal education associated with degrees and certifications. Goldin and Katz present a historical analysis of the co-evolution of educational attainment and the wage structure in the United States through the twentieth century in their book *The Race between Education and Technology* (2010). Recent publications that discuss this challenge of meaningful work and fair wages and present promising approaches to credentialing include the American Enterprise Institute report, *Non-Degree Credentials, Work-based Learning, and the American Working Class* (Columbus, 2019); the International Council for Open and Distance Education report, *The Present and Future of Alternative Digital Credentials* (ICDE Working Group, 2019); and Northeastern University's analysis, *Educational Credentials Come of Age*, a survey on the use and value of educational credentials in hiring (Gallagher, 2018). A crucial issue in this is applying artificial intelligence to create a division of labor in which mid-range and lower-range jobs are worthwhile and respected as opposed to making people the eyes and hands of machines that govern their behavior (International Labor Organization, 2019; Acemoglu & Restrepo, 2018).

The World Bank (2019, p. 9) makes similar recommendations on what governments can do to ameliorate problems caused by the changing nature of work. Its *World Development Report* argues for investing in human capital, particularly early childhood education, to develop higher order cognitive and sociobehavioral skills in addition to the standard foundational skills taught through current curricula. Also, a solid, guaranteed social-minimum-income and strengthened social-insurance are seen as key in helping the labor market meet the challenges of increasing work in the informal economy, which often offers no protections. Further, the World Bank recommends creating the necessary public funding for these measures through property taxes in large cities, excise taxes on goods such as sugar or tobacco, and carbon taxes.

The World Economic Forum report *Towards a Reskilling Revolution: Industry-Led Action for the Future of Work* argues that business and government have strong economic reasons for making these shifts in labor market and business practices:

> Drawing from average reskilling costs, we find that the 1.37 million workers who are projected to be displaced fully out of their roles in the next decade according to the US Bureau of Labor Statistics, may be reskilled to new viable (similar skillset) and desirable (higher wages) growing roles at a cost of US$34 billion. On average this would entail US$24,800 per displaced worker. . . . In the US alone, with an overall investment of US$4.7 billion, the private sector could reskill 25% of all workers in disrupted jobs with a positive cost-benefit balance . . . if industry-led collaboration could reduce reskilling costs and times by 30%, nearly half of the disrupted workforce could be reskilled by employers with a positive cost-benefit balance. . . . With the set of assumptions applied and with an investment of US$19.9 billion, the US government could reskill 77% of workers expected to be displaced by technology into growing jobs while generating a positive return in the form of taxes and lower welfare payments. (2019e, p. vii)

This shows a strong economic case can be made for funding the *60YC*.

How big a skill shift will be necessary in career growth and career change? Some of what will occur is shifts in the division of labor between person and machine; the Brookings report discussed above details what those changes may be. Also, people may change to new careers that do not now exist. Beyond supply-side analyses of which current jobs will be eliminated or de-skilled and which new roles employers will need, the demand-side creation of new occupations by entrepreneurial young people is important to consider. The 2017 report from Accenture, *New*

Skills Now: Inclusion in the Digital Economy, analyzes the core skills important for workplace success in the coming decades and presents six personas that illustrate what skills are needed to enter particular careers, such as functional-test engineer or aged-care worker. Two reports from Cognizant (2017; 2018), *21 Jobs of the Future* and *21 More Jobs of the Future*, sketch some interesting hypothetical possibilities for new occupations. These include personal memory curator, man-machine teaming manager, genomic portfolio director, augmented reality journey builder, and tidewater architect. An interesting exercise for the reader is to imagine how much the content, process, and personnel of current higher education and adult learning organizations would need to shift to enable helping students master these new roles.

Overall, this book discusses the roles that higher education can play in the organizational and societal mechanisms by which people can upskill later in their lives when they do not have the time or resources for a full-time academic experience that results in a degree or certificate. Creating this transformational evolution of higher education requires developing novel services for adults learning while working—through formal instruction—or informally in daily life, and then applying insights from the new organizations delivering those services—within and outside of higher education—to the related tasks of improving preparation for initial jobs and of having a satisfying life after retirement.

Overview of the Chapters in this Volume

The book begins with a foreword by Huntington Lambert, Dean of Harvard's Division of Continuing Education. Next is this introductory chapter introducing terms and conceptual frameworks as well as providing a brief summary of the contents of each chapter, grouped into two types of discussions. *Challenges and Opportunities for Stakeholders* are delineated in chapters by Scott, Servoz, and Brewer. *Current Models and Strategies* are provided by Harmon

and Baker, Mishra and Smith, Wingard and Farrugia, Honan, and Lambert and Leitner. The book concludes with a chapter by Richards summarizing cross-cutting themes from the chapters and delineating important next steps in research and practice for the evolution of *60YC*.

Challenges and Opportunities for Stakeholders

Scott's chapter, "Education, Age, and the Machine," describes how the combined influences of technological change and longevity are likely to transform the educational system. What we learn, when and how we learn it, and who we learn it from all will change. The good news for the educational system is that the continued growth it has benefited from over the last 100 years looks set to continue, as these forces should raise the return on education. The more challenging news is that this expansion will manifest itself as a shift into new areas that are currently poorly served: adult education, intergenerationally mixed courses, skills- and employment-based learning, and shorter cumulative programs.

Servoz's chapter, "Are We Ready for the Jobs that the Digital Economy Will Offer to Us?" indicates that previous historical waves of automation have been overwhelmingly positive for the economy and society. However, artificial intelligence (AI), as the latest manifestation of the digitalization transformation, is in a different league, with the potential to amplify major socio-economic changes and be much more disruptive. What do recent developments in digitalization, AI, and robotization foreshadow for the economy, businesses, and jobs? Should we be worried or excited? Where will jobs be destroyed or new ones created? How do education systems, businesses, governments, and social partners need to adapt to successfully manage the forthcoming transitions?

Brewer's chapter, "Employing the 60-Year Curriculum as a Strategic Approach," discusses how, until recently, employers controlled the career paths of individuals. Today, career

paths are in the hands of the individual. People are faced with sponsoring their own learning and all that this entails—time, distance, costs, and outcomes. Steering a pathway through this uncertain and high-investment terrain is nigh impossible without some guidance. It is critical for educational institutions to understand how strategic- and student-centric foci can support their efforts to achieve educational objectives and learning outcomes for students and educators alike. There is no doubt that a transdisciplinary approach will be one of the factors that will be necessary to bring the dynamism of the *60YC* to fulfill its value proposition. Student transition into a *60YC* context is an important aspect in terms of curriculum design by linking content, delivery, and assessment with each prospective student's previous learning. Designing a curriculum *with* rather than *for* adults necessitates a democratic, active, and stratified environment that facilitates learning. Engaging external stakeholders to participate in curriculum design allows educational institutions to harvest and harness information from the most suitable sources and will lead to developing new ideas that return value to students and, subsequently, to the institution.

Current Models and Strategies

Harmon and Baker's chapter, "Creating the Next in Higher Education at Georgia Tech," delineates that trying to envision the best possible future is always challenging, but putting in place a process and set of actions that might enable that future is even more challenging. This chapter provides a description of and context for Georgia Tech's efforts to envision and create its educational future. It identifies factors we think are driving change in higher education and how this institution is responding to them. It identifies activities already in process at Georgia Tech and describes actions yet to be determined and/or defined to help reach that future. This work is based upon the efforts of a group of faculty, staff, and students who engaged in a multi-year

effort, called the Commission on Creating the Next in Education, resulting in the publication of a guiding report titled “Deliberate Innovation, Lifetime Education.” With this report, Georgia Tech is striving to provide options that will enable the university to succeed in the future and not suggesting that these are the only steps one should take. We firmly believe that higher education in the future must be different than it is now in several meaningful dimensions in order to fulfill our social contract.

Mishra and Smith’s chapter, “Known for Whom We Include: Designing Models for Lifelong Education at Arizona State University,” indicates that the development and implementation of a 60-Year Curriculum requires a broad conceptualization of university design grounded in a deep understanding of the learners we are trying to reach. We need to expand our view from those we have traditionally served to others who may have significantly different lived experiences and educational needs. In particular, we need to focus on the variable, fluid, and evolving nature of learner narrative-identities over a student’s lifespan and meet all students where they are in terms of their current and aspirational identity development. In this chapter, we provide examples of (and initial learnings from) some key initiatives currently underway at Arizona State University (ASU) that align with the 60-Year Curriculum. An important aspect of ASU’s work has been developing new pathways to learners in addition to the standard direct-to-learner model. These include the education-to-business model, in which ASU delivers a learning experience in partnership with an employer. We argue that, in response to the upskilling needs of adult learners, universities will re-imagine how they engage learners at scale (such as partnerships with community-based organizations).

Wingard and Farrugia’s chapter, “Market-Driven Education: The Imperative for Responsive Design and Application,” describes how the higher education sector faces the

imminent challenge of how to prepare students with the applicable skills and abilities necessary to secure a job after graduation and to adapt continuously to ever-changing workplace demands throughout their careers. Currently, higher education falls short of expectations in producing market-ready, employable graduates; inadequate employer engagement is the principle culprit for this failure. This chapter describes the existing gap between higher education and employers and discusses the relative implications of this disconnect for workers and employers alike. The chapter delineates a framework of higher education-employer engagement, and its connection to employability, and applies this framework to the case of the Columbia University School of Professional Studies—focusing on how the school approaches employer engagement throughout its academic and co-curricular activities in service of maximizing the employability of its graduates.

Honan's chapter, "The Role and Potential of University-Based Executive Education and Professional Development Programs in the 60-Year Curriculum: A Case Example of an Intensive Residential Program for Higher Education Leaders," examines an example of a long-standing, university-based program designed for senior-level leaders of colleges and universities. Through a detailed description of key design features of this program, the chapter attempts to illustrate some of the key challenges and opportunities associated with effectively meeting the learning needs of individuals who are in the latter stages of the 60-Year Curriculum continuum. The chapter concludes with a discussion of the roles that university-based executive education programs could play for this audience in the coming years. Among the challenges discussed is the need for empirical evidence to document the efficacy of these types of programs; that might support continued investments in this type of learning experience.

Lambert and Leitner's chapter, "Implementing *60YC* Learning at the Harvard Division of Continuing Education," explains that the mission of Harvard's Division of Continuing Education (HDCE) is to provide open access to high-quality affordable courses, certificates, and degrees for adult learners. Implementing the 60-Year Curriculum at HDCE has been, and will continue to be, a work in progress with both successful innovations and missteps. Thus far, it has involved successive strategic planning exercises to guide an evolution from a lecture-oriented pedagogical model with administration-centric services to supporting multiple online and hybrid pedagogical models with learner- and faculty-centric services. The technical infrastructure is changing from modifications of existing management information systems and a suite of in-house applications to a relationship-management infrastructure and open source and commercial applications. The on-going *60YC* planning and development efforts involve shared work by learning engineers, IT developers, and administrators. HDCE's 60YC infrastructure allows them to conduct experiments to test learning experiences, new infrastructure tools, and administrative processes in response to evidence of learner success, faculty satisfaction, and operational efficiency.

Following these two sections on *Challenges and Opportunities for Stakeholders* and *Current Models and Strategies*, a concluding chapter by Richards consolidates themes from all chapters, assesses the current state of *60YC* implementations, and proposes dimensions for research. Preparing for job changes and upskilling, and for successive shifts in careers, creates entirely different demands on learners, instructors, career counselors, employers, and all other stakeholders in building and sustaining adult capacity. As we have seen, the 60-Year Curriculum, driven by the synergistic digital economy, extends the two- to eight-year university experience and other traditional forms of education and training to learning throughout a lifetime. The chapter identifies two dimensions for future research. First, students as consultants-entrepreneurs

must accept responsibility for their own learning. They must learn to collaborate, to lead and follow, to be agile and resilient, and to learn how to continue learning. How are the transferable intrapersonal, interpersonal, and cognitive competencies that make this possible integrated into the instructional methods of the university? Second, the evolving relationship between the student and the university begins with first contact and extends through 60 years. How will universities adapt infrastructure and administrative processes to support this relationship?

The book ends with acknowledgements and the biographies of the authors.

Conclusion

Much remains to be understood about how the *60YC* might become the future of higher education and adult learning. Whatever models emerge, they must include strategies that help those now involved in adult learning—both providers and students—to transformatively change their behaviors. Porfeli and Vondracek (2009) emphasize that individual development is shaped both by organismic factors (biological predispositions and Piagetian developmental-psychological constructions) and by contextual factors (human history and social institutions). Bronfenbrunner's ecological model (1979) posits that social contexts are hierarchically linked to each other (i.e., developmental systems theory). Kegan and Lahey (2009) describe how these factors combine to make many adults immune to change.

In my opinion, the biggest barrier we face in this process of reinventing our current methods, models, and organizations for these activities is *un*learning. We have to let go of deeply-held, emotionally-valued identities in service of transformational change to a different, more effective set of behaviors. This is both individual (an instructor transforming practices from presentation and assimilation to active, collaborative learning by students) and institutional (a higher education institution transforming from degrees certified by seat time and standardized

tests to credentials certified by proficiency or competency-based measures). Unlearning requires not only novel intellectual insights and approaches but also individual and collective emotional and social support for shifting our identities—not necessarily in terms of fundamental character and capabilities but in terms of how those are expressed as our context shifts over time. I hope higher education will increase its focus on the aspirational vision of the *60YC* as an important step towards providing a pathway to a secure and satisfying future for our students.

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