Revitalizing and Reshaping the Air Force Research Laboratory Workforce

Eric Chase
Toffler Associates, Inc.

01/10/2020
Final Report

REPORT DOCUMENTATION PAGE		*Form Approved* *OMB No. 0704-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Executive Services, Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.

1. REPORT DATE *(DD-MM-YYYY)* 19-08-2020	2. REPORT TYPE Final Performance	3. DATES COVERED *(From - To)* 01 Mar 2019 to 31 Dec 2019
4. TITLE AND SUBTITLE Revitalizing and Reshaping the Air Force Research Laboratory Workforce		**5a. CONTRACT NUMBER**
		5b. GRANT NUMBER FA9550-18-1-0155
		5c. PROGRAM ELEMENT NUMBER 61102F
6. AUTHOR(S) Eric Chase		**5d. PROJECT NUMBER**
		5e. TASK NUMBER
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Toffler Associates, Inc. 1775 Wiehle Ave Reston, VA 20190-5107 US		**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AF Office of Scientific Research 875 N. Randolph St. Room 3112 Arlington, VA 22203		**10. SPONSOR/MONITOR'S ACRONYM(S)** AFRL/AFOSR RTB2
		11. SPONSOR/MONITOR'S REPORT NUMBER(S) AFRL-AFOSR-VA-TR-2020-0143

12. DISTRIBUTION/AVAILABILITY STATEMENT
A DISTRIBUTION UNLIMITED: PB Public Release

13. SUPPLEMENTARY NOTES

14. ABSTRACT
To remain at the cutting edge and ensure the Air Force meets its strategic goals, AFRL must attract, develop, and retain the best and the brightest talent. The society from which its future workforce will be drawn is changing. The generations that will comprise the future AFRL researchers, program managers, scientists, and engineers are being shaped by a wide variety of economic, societal, technological, and geopolitical forces. The competencies, attributes, and values they bring to AFRL are not the same as those of earlier generations. This study explores the social and technological changes affecting the future human capital market and implications.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON PARRA, ENRIQUE
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	UU		19b. TELEPHONE NUMBER *(Include area code)* 703-696-8571

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

DISTRIBUTION A: Distribution approved for public release.

The Future of Work and Workforce Agility

Report by Toffler Associates

31 December 2019

This report was commissioned by the Air Force Research Laboratory and executed under contract FA9550-18-1-0155.

2

TABLE OF CONTENTS

3

1.0 SUMMARY

The Air Force wants to remain at the cutting edge of scientific research and development to meet U.S. national security needs for 2030 and beyond. To do this, the Air Force Research Lab (AFRL) must attract, develop, and retain the best and the brightest to build upon its successful legacy and ensure that the Air Force meets its strategic goals.

AFRL leadership understands that the society from which its future workforce will be drawn is changing. The generations that will comprise the future AFRL researchers, program managers, scientists, and engineers are being shaped by a wide variety of economic, societal, technological, and geopolitical forces. The competencies, attributes, and values they bring to AFRL are not the same as those of earlier generations.

Preparing for the future starts with first understanding what is creating it. Our analysis shows five drivers shaping the future of societies, organizations and individuals:

1. Geopolitical Powershifts
2. System Collaboration
3. Social Alterations
4. Wealth Creation
5. Technology Acceleration

These drivers outline shocks in identity, society, conflict, borderlessness, and development; they present fundamental shocks in how AFRL will interact with the workforce and how the workforce will interact with the organization.

This study is designed to explore the social and technological changes affecting the future human capital market and implications. Our analysis illustrates specific opportunities for AFRL to gain agility and resiliency through a focus on specific considerations.

KEY CONSIDERATIONS

- Find, engage and partner with foreign talent outside of the U.S.
- Increase engagement with—and foster exchanges between—foreign allies as well as multinational partnerships
- Enable 'revolving door' and short-term employment (1-12 months) to support specific tasks and projects with unique expertise
- Provide greater flexibility and incentives to transition between operational elements and the R&D enterprise with more frequency
- Enable both 'open' and 'closed' innovation with the right (and very different) talent, rules and supporting infrastructure

1

- Pursue cognitive diversity outside of traditional Science, Technology, Engineering, and Mathematics (STEM) communities to include business entrepreneurs and the liberal arts
- Break down barriers and over reliance on number of hierarchical layers and structures
- Consider metered funding approaches for small start-up projects and innovative ideas
- Value 'soft skill' leadership traits and human attributes such as communication, relationship- building, and persuasion
- Implement a knowledge management strategy throughout the organization to empower individual initiative and self-guided learning

2.0 INTRODUCTION

Revitalizing AFRL workforce agility is urgent; it is a priority that must be satisfied if AFRL leaders are to achieve any transformation or modernization goals of the Air Force. Regardless of advances in technology supporting AFRL operations or capabilities to meet the threat, AFRL needs talented people to achieve the Air Force's mission.

AFRL must be able to attract the right talent and deploy the appropriate skills to meet the needs of a rapidly changing United States Air Force (USAF). However, the workforce that AFRL needs today will not be the workforce of tomorrow. Moreover, those who want to work at AFRL today may not be those who want to work there tomorrow.

The future of work and workforce agility is uncertain, but not unknowable. A thorough study of the human capital market and the addressable market for AFRL, combined with a strategy to capitalize within that market, will position AFRL to take advantage of the opportunities and mitigate the challenges associated with this transformational imperative.

Important changes in the environment that directly impact the workforces of all organizations, including those of AFRL, are accelerating. The explosion of information technology, data analytics, artificial intelligence, and other changes will shift what employees do and how they work.

Familiar management models and competencies for managing human capital will be insufficient for and, in some cases, inimical to success. The competition for talent is fierce and growing. AFRL faces particular challenges attracting and retaining the best people given government's unique constraints.

To get to where AFRL needs to be in 2030 and beyond, Major General William T. Cooley has outlined five changes that will be necessary to overcome barriers that are hindering efficiency and success.

1. **Workforce Agility** – a workforce capable of meeting rapidly changing USAF needs, accomplishing jobs in diverse areas with complex missions.

2. **Internal Collaborations** – the ability to combine an intricate web of diverse expertise and technical specialties.

2

3. **Technology Transition** – the ability to bridge the "valley of death," creating and integrating new warfighter capabilities quicker.

4. **Enterprise Business Practices** – the ability to share information in a common IT environment, such that it is readily available for modern analytical methods.

5. **Interlocked Partnerships** – the ability to leverage other organizations' science and technology investments, preserving AFRL resources for where it has comparative advantages.

Among these, getting workforce agility "right" is the most critical; people are the heart and soul of every organization, and hiring decisions can impact an organization for decades. Furthermore, having the right workforce is fundamental to accomplishing the other four imperatives. This project will provide the data and insights necessary to ensure that AFRL will "get the future workforce right."

3.0 METHODS, ASSUMPTIONS, AND PROCEDURES

To execute this task, Toffler Associates took a three-phased approach:

Phase 1: Understand the forces driving change in the human capital market

- Synthesized 30+ internal and external interviews, AFRL strategic planning documents from 2015-present, DoD plans and guidance, industry trends and reports, academic literature, and R&D spending profiles / estimates
- Identified five drivers that will influence the human capital market through 2030

Phase 2: Define how those drivers will impact the talent pool AFRL requires

- Distilled six fundamental future "shocks" that will disrupt current AFRL business practices and organizing constructs

Phase 3: Identify considerations for supporting AFRL workforce agility topics and pilots

- Conducted implementation deep dives on topics of specific interest to AFRL through a combination of secondary research and one-on-one interviews
- Identified leading practices and developed implementation considerations for AFRL.

4.0 RESULTS AND DISCUSSION

4.1 DRIVERS ARE A LENS TO UNDERSTAND FUTURE DISRUPTIONS

AFRL will operate in a world with different challenges, technologies, and opportunities.

3

AFRL cannot make decisions that only address the needs of today; rather, AFRL should seek opportunities to increase strategic agility and resiliency across the many disruptions and *"shocks"* created by the convergences of the drivers.

Toffler Associates' research for AFRL produced five drivers of change shaping the future. While each driver can be defined and explained as a single entity, it is imperative we understand the resulting convergences of these drivers that create change – in the form of "shocks" – and create opportunities for the emergence of new technologies, concepts, frameworks, and approaches to resiliency for AFRL and the broader defense research enterprise.

The key to understanding the future goes beyond individual workforce challenges or present needs in the future operational environment. AFRL must understand not only where it operates today, but also where it will operate in the future. This includes understanding future customers, adversaries, employees, other stakeholders, **and** what world they will be living in.

4.1.1 **Geopolitical Powershifts refers to the transfer or diffusion of power from traditional entities to new interconnected systems that transcend traditional boundaries and frameworks.** The changes in power dynamics are inciting new opportunities for some, while presenting challenges and causing redefinition for others. Those that have historically been in places of power need to consider new ways to engage their ecosystems as new entrants cause disruption.

- Roles: Traditional definitions and spheres of influence are changing. There are no longer clear jurisdictions between the public, private, and academic sectors. Private sector companies are providing services traditionally provided by public sector entities, disrupting past role and responsibility delineations.
- Borderlessness: Ideas and people are moving in an increasingly fluid nature across countries, organizations, and industries. Global talent is increasingly dispersed, information is more widely available, and technical 'know-how' is proliferating rapidly.
- Citizens of the World: The confluence of increased individual mobility and employment flexibility is shifting norms around identity and personal expectations. Rather than relocating for employment opportunity, people will increasingly move to seek new experiences and communities that align with their individual value systems and desires.
- Supporting findings:
  - Massive corporate partnerships (e.g., Amazon, Berkshire, JP Morgan Chase) create opportunities to enter, shape, or disrupt the market, like healthcare.[1]
  - 51% of "Billion Dollar Startups" were founded by immigrants. 70% of management positions in these firms were occupied by immigrants.[2]

- The US Bureau of Labor Statistics projects STEM occupations to grow by about 8.9% from 2014 to 2024, compared to 6.4% growth for non-STEM occupations. Most of those jobs will be in computing-related disciplines – about 55%.[3]

4.1.2 System Collaboration refers to two or more components (people, organizations, or things) jointly cooperating to execute a shared purpose. Models, structures, and definitions that once provided order are colliding, causing confusion and conflict. Society is addressing these tensions with rising levels of specification. Yet, for these specialized solutions to be successful, they must be networked into a larger ecosystem.

- Resources: In this increasingly competitive landscape, businesses must find a way to increase their value to their stakeholders, customers, and employees. Creative and innovative resource management (e.g., sharing talent, space, and information) with the right infrastructure, business models, and operating concepts will enable continuous workforce agility.
- Structure: Familiar social orders and traditional business models are breaking down and being replaced. Work, family, and community are blending, bending, and blurring conventional boundaries. Conventional organizational structures and constructs are at the tipping point as well. These models must also adapt to keep up with the accelerating rate of change.
- Alignment: In an increasingly volatile world, in which more solutions are being developed to serve niche markets, there is an increased need to gain alignment across stakeholders, customers, employees, and partners. This need for alignment transcends that of the organization alone; individuals must also find alignment with their organization in their work, individual values, expectations, and preferences.
- Supporting findings:
  - 58% surveyed self-describe coworking spaces as communities.[4]
  - 43% of the US workforce will be freelancers in 2020.[5]
  - Strategic partnerships are increasingly becoming a vital element of businesses' corporate growth strategies with executives setting aside 20% of their assets or more to developing and maintaining partnerships.[6]
  - "The government uses, it does not build. It specs…what's needed must be in context of the system being built." – VP, Defense Company

4.1.3 Social Alterations refers to increasingly diverse generations, longer lifespans, and changing attitudes, expectations and priorities will redefine value systems. Perceptions, values, and attitudes drive investor, customer, and employee behavior; therefore, these are non-negotiable forces that will directly influence an organization's engagement with their stakeholders.

- Ownership: Fueled by the technology and infrastructure enabling the shared economy, individuals expect to customize experience and tailor outcomes to their

5

specific preferences. This 'mass customization' effect is also seen in the workplace, where individuals are increasingly seeking employers that offer customizable experiences that value flexibility and promote an entrepreneurial spirit.

- Purpose: In an increasingly globalized society, organizations that cultivate a shared purpose amongst their employees will see the greatest return on their talent investment. As the sphere of organizational influence continues to expand, companies must work beyond stating mission and business objectives. They must actively engage and encourage employees to live out social and societal values.
- Behavior: Organizations must design dynamic structures that leverage the strengths of generational differences and can respond to varying values and needs throughout the employee lifecycle.
- Supporting findings:
  - Makers fuel business with some $29 billion poured into the world economy each year.[7]
  - 45% of workers who worked directly on a product making a social or environmental impact reported being very satisfied with their jobs, compared to 29% of those who do not do such work.[8]
  - More than 70% of high-retention-risk employees say they'll have to leave their organization to advance their career. [9]

4.1.4 Wealth Creation refers to how the very nature of how individuals generate, capture, earn, and perceive value is changing. As the structure and pace of work changes, models of wealth creation must adapt as well. Employees seek and value new types of rewards, requiring employers to reconsider and redefine the ways that they attract and retain top talent.

- Learning: Hierarchical development and progression will be abandoned in favor of flexible, on-demand, and experiential learning opportunities. Traditional training classes will be replaced with rotational programs that provide learning in real-time, in-context, and deliver immediate results.
- Compensation: Younger employees and future generations will increasingly seek out different forms of value beyond monetary compensation. These may include experiential flexibility, intellectual stimulation, and leadership opportunities, as well as company culture and the work environment.
- Connection: Employees value the networks and relationships created through the workplace. This desire expands beyond connecting with individuals with similar functional skillsets or backgrounds. Employees perceive value when provided the opportunity to develop networks and engage in cross-department, cross-disciplinary collaboration that transcends organizational structures.
- Supporting findings:
  - Employers find rotational programs not only attract millennials but develop them into long-term employees that contribute with more depth.[10]

6

- 62% of Gen Z would rather customize their own career plan than have the organization lay one out for them.[11]
- In the experiment, of workers who took breaks alone vs workers who took breaks with their coworkers, those who took 15 minutes to chat and socialize with coworkers showed a 20% increase in performance.[12]

4.1.5 **Technology Accelerations refers to accelerating technological advances and the maturation of human-machine teaming will disrupt current business models, operational concepts, and organizing constructs.** As the structure and pace of work changes, employers must reconsider how they develop and engage workers and how they incentivize and facilitate innovation.

- Human Attributes: With the increasing influence of AI and automation, old jobs will go away and new jobs will be created. The value of the human attributes such as empathy, creativity, and communications will become increasingly important to the operationalizing successful technologies. Soft skills like relationship building, communication, persuasion, networking, and ethics will be highly valued in a highly technical world.
- The New Team: Automation must be viewed as a 'near-peer collaborator' not as a 'near-peer competitor.' A key factor for future success isn't just tech-fluency, but the realization of the human-machine team. The accelerating rate of innovation and AI will guide interaction with and the use of sophisticated technology that requires specialized worker knowledge – resulting in the ability for tech-comfortable but not necessarily tech-savvy employees to perform high-tech tasks very effectively.
- Acceleration: The transition to a Knowledge Age will dramatically increase rates of change as access to technology decreases cost and entry barriers. While the accelerated adoption of today's emergent technologies will undoubtedly drive innovation, these increasingly compressed technology adoption cycles will require a properly-equipped workforce that can adapt and keep up with the pace of acceleration.
- Supporting findings:
  - Respondents to a Pew Research Center survey report that interpersonal skills, critical thinking, and good writing and communications skills are the most important skills for doing their jobs.[13]
  - By one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist.[14]
  - Some of the mismatching is locational: where there is demand for work, there may not be available and qualified workers to be found. This geographic mismatch can be seen across regions within countries, and between countries.[15]

4.2   SHOCKS RESULT FROM THE CONVERGENCE OF FUTURE DRIVERS

Convergences of the drivers will challenge organizations in every industry.

As AFRL and the Air Force consider their futures, there are six shocks that will present challenges to organizational capabilities, capacity, and ultimately the resiliency of the Air Force itself.

These shocks vary widely in terms of their features and components, but they serve to highlight the complexity of the future, underscoring the importance of resiliency and agility in AFRL.

4.2.1   Brain Drain – The Talent Exportation Effect. The majority of the world's top talent will not reside in the U.S. by 2030. K-12 academic performance in STEM continues to slip in global rankings. International students pursue American graduate degrees only to leave the country for opportunities outside the U.S. where the rate of R&D spending is increasing.

If the US is no longer creating "the best and brightest," how will AFRL source its talent? Should it look at international talent pools or take a bigger role in talent development?

Supporting findings:

- Data from international math and science assessments indicate that U.S. students continue to rank in the middle of the pack and behind other advanced industrial nations.[16]
- Economic projections point to a need for approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade if the country is to retain its historical preeminence in science and technology.[17]
- R&D expenditure in North America (particularly the United States), as a ratio of total global spending, is approximately 28%, down from about 40% fifteen years ago. East Asia (particularly China) has increased its global share to about 40%.[18]

- "In science and technology fields, and some of the social sciences, many doctoral students aspire to corporate or government jobs, and many get those jobs, yet these disciplines also are seeing fewer people earn PhDs with a firm commitment for employment or postdoc. (Postdocs are much more common in the physical and life sciences than in the humanities and social sciences, although they are becoming more common in those fields as well.)" [19]

4.2.2   A Clear(ed) Paradox – Protecting IP and Military Secrets in a Knowledge Economy. Open innovation cycles inspiring new ideas are of greater value to a nation's technological output than protecting intellectual property (IP) and classified technology. While protecting exquisite military / applied technology remains vital, robust open innovation ecosystems that span the globe will be even more so.

8

How will AFRL thrive in an increasingly "open" environment?

Supporting findings:

- Increasing reliance on external innovation is accentuated by trends of decreasing in-house R&D investment. The diffusion of online platforms, increased access to externally-sourced information, and growth of technology intermediaries has decreased transaction costs.[20]

- The rising speed of the innovation cycle has led product development to outpace patent offices and accelerate technology obsolescence. In today's technology industry it is not uncommon to have patent granting times greater than the market life expectancy of the underlying product.[21]

- "The company of the future will be confronted with new realities due to sweeping changes in the management, creation, use, and protection of intellectual property: Rapid innovation cycles mean that companies will act at a much faster pace than patent offices, leading to a subsequent speed gap and the creation of new protective mechanisms."[22]

- "Publication is the currency of this business." – VP, Defense Company

4.2.3 "Transdisciplinarity" – The Future of STEM and the Liberal Arts. R&D organizations utilize "transdisciplinarity" to integrate functional expertise with 'big-picture' conceptual reasoning. The increasing involvement of a liberal arts workforce disrupts the previous model of scientific silos. Projects are organized to foster interaction between technical and conceptual thinking on all levels.

How will a more cognitively diverse workforce change AFRL's cultural norms, models, and behaviors? Is it prepared to change?

Supporting findings:

- Decreased barriers to entry for technical skills (e.g., coding camps) and the diversity of educational backgrounds accents the false-dichotomy between STEM and Liberal Arts. Tech firms are increasingly valuing how you think more than hard skills in their workforce.[23]

- Industry has recognized the value of interdisciplinary thinking. Between 2010 and 2013, the growth of liberal arts majors entering the technology industry from undergrad outpaced that of computer science and engineering majors by 10%. Internet or software companies are especially popular—38% of all recent liberal arts grads in tech currently work in this space.[24]

- "Soft" skills such as relationship-building, communication, and persuasion are more essential than ever in project-based workspace. Appropriate frameworks designed to foster these capabilities also allow for the diffusion of knowledge institution-wide.[25]

9

- "STEM students can care about human beings, just as English majors can investigate things scientifically. We should be careful not to let interdisciplinary jockeying make us cling to what we know best. Everything looks like a nail when you have a hammer, as the saying goes."[26] -Harvard Business Review

- "In STEM and other fields, employers are putting more emphasis on professional skills... what they complain about is students don't know how to write, give presentations…"- University Vice Provost

4.2.4 Accredited Credibility – The "New Scientist" in an Era of Micro-Accreditations and Individual Brands. Most high-skilled job descriptions include a requirement to gain "micro-accreditation" in their field of specialization. Academic programs are designing research degrees to be more versatile—students can opt for more practicum coursework and dissertations double as work portfolios geared toward private sector employers. The new top candidates in science and engineering are generalists with agile mindsets.

How will this impact the type of employees that AFLR needs? Will requirements need to change?

Supporting findings:

- Across sectors, the "employability" of top job market candidates is shifting from specific knowledge to the ability to learn new skills. Google, Apple, and other giants leading the private sector select for "learning animals" over technical proficiency.[27]

- "Microcredentials"—fast-paced, subject specific, cost-effective certifications—are increasingly used to engage deeper learning, and foster expertise and adaptability in roles that face dynamic challenges. They also nurture capacity for new skills; a survey found that 97% of respondents in a trial of microcredentials for educators said they wanted to pursue another.[28 & 29]

- Given the rapidly accelerating challenges of previously traditional roles, scoping problems in new ways requires knowledge outside the purview of traditional education. These required skills may look radically different at the outset of a student's education in comparison to the end.[30]

- On average, approximately half the knowledge learned in the first year of a technical four-year degree is obsolete by graduation. One estimate claims that 85% of jobs in 2030 haven't been created yet. This acceleration requires proactive thinking in the present to prepare for the future; employers must build capacity to develop new skills and search for life-long learners.[31]

- "The days of working for same company are pretty much gone…[you] must prepare students for lifelong learning." - University Vice Provost

4.2.5 **Gig Science – The Freelance Effect.** The majority of talent an organization recruits and needs access to will not seek permanent or long-term employment, but rather short term assignments that last from a few months to a year with the freedom to continually "roll in" and "roll out."

If talent is looking for short term assignments, how quickly can AFRL onboard and stand up teams?

Supporting findings:

- Freelance employment (which made up a mere 6% of employed workers in 1989) is expected to represent 43% of the workforce by 2020, with some analysts estimating that figure to rise to 80% of the global talent pool by 2030.[32]

- 20% to 30% of the working-age population in the United States and the EU-15, or up to 162 million individuals, engage in independent work.[33]

- Government offices already have a long history with freelance style work through contracted employees, with estimates of more than 40% of the federal workforce—about 3.7 million people being under contract.[34]

- "Two-thirds of freelancers started freelancing more by choice rather than by necessity and they are generally much happier with their work than traditional employees. What's more, 50% of freelancers say there is no amount of money that you could pay to convince them to work as an employee." -Stephane Kasriel, CEO, UpWork

4.2.6 **Rules of Engagement – New Expectations for Talent Engagement.** Talent engagement is not one size fits all. Employees expect employers to truly their individual needs, motivators, and career ambitions, and to provide the space to develop a customized career trajectory. Work environments should be flexible to accommodate different arrangements and offer the promise of reward from hard work.

How can AFRL provide personalized employee experiences? How do needs change between civilian and enlisted audiences?

Supporting findings:

- By 2025, Gen Z will represent over a quarter of the workforce.[35] Gen Z has an increasing expectation and desire to personalize their career journey; 62% of Gen Z would prefer to customize their career plan than have the organization lay it out for them.[36]

- Merit-based career advancement is important. More than 70% of high-retention-risk employees say they'll have to leave their organization to advance their career.[37]

11

- Workers demand increasing amounts of flexibility, as evidenced by the rise of telecommuting, co-working spaces, globalization and the rise of new technology and communication tools.[38]

- "From the moment you accept we engage you…its culture, culture, culture around here. This focus on onboarding is so critical. Also, we also have improved our close rates by giving an offer by end of (the interview) day."- CEO, Healthcare Start-Up

- "Employee engagement is really about individual appreciation. That doesn't just mean rewarding individuals. It means appreciating employees for exactly who they are, not who you want them to be."[39] - Cha Tekeli, Forbes

4.3 PILOTING NEW METHODS FOR WORKFORCE AGILITY

Testing new ways to engage future talent will be critical to its long-term mission performance. This includes considering new ways of identifying, onboarding, and developing talent. More specifically, this could manifest through the use of external recruiters, development of a micro-accreditation program, the use of K-12 STEM programs to support talent pipeline efforts. Additional detail on each of these areas can be found in Appendix A.

To help identify and recruit potential employees, external recruiters or executive search firms can be used to augment efforts and provide access to new prospective employee groups. These firms augment existing AFRL recruiting efforts. Working with external recruiters or executive search firms requires an understanding of hiring needs and specific position requirements, scope of impact on current AFRL hiring processes, identifying the right external recruiter or executive search partner, and negotiating agreements that ensures judicious use of government funds. In all cases, AFRL retains sole hiring and decision authority.

To increase the agility of the current workforce, AFRL must understand how the corporate learning landscape is changing in response to societal evolutions, organizational demands, and individual needs. The emphasis on degrees is shifting and there is increased value placed on skills obtained and the ability to quickly learn and apply new skills. New learning options, such as micro-accreditation programs, can help AFRL employees continuously evolve and learn new skills.

To develop the workforce of the future, AFRL can focus its investment and engagement in the Air Force STEM program. This includes an opportunity to create interest in general STEM careers, help develop future workforce skills, and begin to build relationships with future Air Force employees. This requires a STEM program that builds upon leading practices and a focused effort on shepherding students into the Air Force recruitment channels.

12

Critical to all of these areas is a defined understanding of AFRL's current and future objectives and vision. This will help inform and guide future workforce planning efforts, investment decisions, and partnership opportunities. AFRL can use this information to determine what positions are required, how to identify and hire that talent, determine the learning methods required to re- or upskill the existing workforce, and cultivate future STEM talent that will constitute the workforce in 2030 and beyond.

5.0   CONCLUSIONS

These shocks have direct implications to AFRL and it must consider the following recommended changes to remain competitive in the talent market:

- o Find, engage, and partner with foreign talent where an increasing proportion of: (i) the STEM human capital market resides; and (ii) game-changing innovation occurs.
- o Increase engagement with—and foster exchanges between—foreign allies as well as international partnerships to access rapidly expanding R&D investments occurring outside the U.S.
- o Reform the personnel management system to allow "revolving door" and temporary short-term employment (i.e., weeks and months) supporting specific task and project outcomes. Design incentives to capture the benefits of the gig economy.
- o Allow flexibility and seamless transitions between operational elements and the R&D enterprise.
- o Move away from the "gray" model where neither open innovation nor the protection of classified technology works particularly well; clearly delineate between the open and the closed ("black and white") by enabling those two broad functions with the right (and very different) talent, rules, and supporting infrastructure.
- o Pursue cognitive diversity outside of the traditional STEM communities. Find those with the ability to imagine and identify opportunities where others may see problems and obstacles. Integrating individuals with diverse backgrounds allows for the marriage of technical expertise with a broader conceptual understanding of the bigger picture.
- o Break down the reliance on hierarchy and reduce number of layers between organizations.
- o Consider a metered funding / start-up approach to quickly test new ideas and evaluate whether additional investment is warranted.
- o Implement a knowledge management strategy throughout the organization to broaden awareness of best practices.
- o Value "soft skill" leadership and human attributes such as communication, relationship building, and persuasion.

13

6.0 REFERENCES

1. Wingfield, Nick, et al. "Amazon, Berkshire Hathaway and JPMorgan Team Up to Try to Disrupt Health Care." *The New York Times*, The New York Times, 30 Jan. 2018, www.nytimes.com/2018/01/30/technology/amazon-berkshire-hathaway-jpmorgan-health-care.html.

2. Brueck, Hilary. "Immigrants Are Driving More Billion-Dollar Startups, Study Finds." *Fortune*, Fortune, 18 Mar. 2016, fortune.com/2016/03/18/billion-dollar-startup-founders-immigrants-study-nfap.

3. Fayer, Stella, et al. *STEM Occupations: Past, Present, And Future*. U.S. Bureau of Labor Statistics, Jan. 2017, www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf.

4. AT&T Business. "Sponsored: Remote Work Is Reaching Unprecedented Levels of Popularity, and That's a Good Thing." *Quartz*, Quartz, 2 Mar. 2018, qz.com/1161017/remote-work-is-reaching-unprecedented-levels-of-popularity-and-thats-a-good-thing/%C2%A0.

5. Ferguson, Niall. "In Praise of Hierarchy." *The Wall Street Journal*, Dow Jones & Company, 5 Jan. 2018, www.wsj.com/articles/in-praise-of-hierarchy-1515175338.

6. Jansen, Hasse. "94 Mind-Blowing Strategy Execution Stats." *Boardview*, 5 Oct. 2016, boardview.io/blog/strategy-execution-stats/.

7. Fallows, James. "Why the Maker Movement Matters: Part 1, the Tools Revolution." *The Atlantic*, Atlantic Media Company, 6 June 2016, www.theatlantic.com/business/archive/2016/06/why-the-maker-movement-matters-part-1-the-tools-revolution/485720/.

8. Dailey, Whitney. "Three-Quarters of Millennials Would Take a Pay Cut to Work for a Socially Responsible Company, According to the Research from Cone Communications." *Cone Communications,* 2 Nov. 2016, www.conecomm.com/news-blog/2016-cone-communications-millennial-employee-engagement-study-press-release.

9. Your Ready Business. "The Generation Game: How to Win with Centennials." *Your Ready Business*, 10 Dec. 2017, www.yourreadybusiness.co.uk/generation-game-win-centennials/.

10. Zimmerman, Kaytie. "Are Rotational Programs The Key To Retaining Millennial Employees?" *Forbes*, Forbes Magazine, 8 Aug. 2016, 08:05am, www.forbes.com/forbes/welcome/?toURL=https%3A%2F%2Fwww.forbes.com%2Fsites%2Fkaytiezimmerman%2F2016%2F08%2F08%2Fcan-a-millennial-quarter-life-crisis-be-cured-by-their-

employer%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A%2F%2Fwww.google.com%2F.

11. Stillman, David, and Jonah Stillman. "Move Over, Millennials; Generation Z Is Here." *SHRM*, SHRM, 11 Apr. 2017, www.shrm.org/resourcesandtools/hr-topics/behavioral-competencies/global-and-cultural-effectiveness/pages/move-over-millennials-generation-z-is-here.aspx.

12. Evans, Lisa. "Why You Need To Actually Talk To Your Coworkers Face To Face." *Fast Company*, Fast Company, 13 Oct. 2014, www.fastcompany.com/3036935/why-you-need-to-actually-talk-to-your-coworkers-face-to-face.

13. "What Skills and Training Americans Say They Need to Compete in Today's Economy." *The State of American Jobs*, Pew Research Center, 6 Oct. 2016, www.pewsocialtrends.org/2016/10/06/4-skills-and-training-needed-to-compete-in-todays-economy/.

14. Leopold, Till, et al. "Chapter 1: The Future of Jobs and Skills." *Global Competitiveness Index 2017-2018*, World Economic Forum, 2016, reports.weforum.org/future-of-jobs-2016/chapter-1-the-future-of-jobs-and-skills/.

15. *Matching Skills and Labour Market Needs Building Social Partnerships for Better Skills and Better Jobs*. World Economic Forum, Jan. 2014, www3.weforum.org/docs/GAC/2014/WEF_GAC_Employment_MatchingSkillsLabourMarket_Report_2014.pdf.

16. DeSilver, Drew. "U.S. Academic Achievement Lags That of Many Other Countries." *Pew Research Center*, Pew Research Center, 15 Feb. 2017, www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/.

17. Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," Monthly Labor Review, U.S. Bureau of Labor Statistics, May 2015, https://doi.org/10.21916/mlr.2015.14.

18. Science & Engineering Indicators 2016. National Science Board, 2016, www.nsf.gov/statistics/2016/nsb20161/uploads/1/1/overview.pdf.

19. Jaschik, Scott. "The Shrinking Ph.D. Job Market." Inside Higher Ed, Inside Higher Ed, 4 Apr. 2016, www.insidehighered.com/news/2016/04/04/new-data-show-tightening-phd-job-market-across-disciplines.

20. DeSilver, Drew. "U.S. Academic Achievement Lags That of Many Other Countries." *Pew Research Center*, Pew Research Center, 15 Feb. 2017, www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/.

21. "The Future of Intellectual Property." *The Future of Intellectual Property*, Denemeyer, May 2017, www.future.consulting/en/foresight/studies/trend-study/article/the-future-of-intellectual-property/.

22. "The Future of Intellectual Property." *The Future of Intellectual Property*, Denemeyer, May 2017, www.future.consulting/en/foresight/studies/trend-study/article/the-future-of-intellectual-property/.

23. Aubry, Timothy. "Don't Panic, Liberal Arts Majors. The Tech World Wants You." *The New York Times*, The New York Times, 21 Aug. 2017, www.nytimes.com/2017/08/21/books/review/you-can-do-anything-george-anders-liberal-arts-education.html.

24. Ma, Alice. "You Don't Need to Know How to Code to Make It in Silicon Valley." *LinkedIn Official Blog* , LinkedIn, 25 Aug. 2015, blog.linkedin.com/2015/08/25/you-dont-need-to-know-how-to-code-to-make-it-in-silicon-valley.

25. Hoffman, Ed. *Talent Management: Beyond the Buzzword*. NASA Academy of Program/Project & Engineering Leadership, 18 Mar. 2009, www.nasa.gov/pdf/428455main_aa_2-4_Talent_Management_03_18_09.pdf.

26. Olejarz, JM. "Liberal Arts Majors Are the Future of the Tech Industry." *Liberal Arts in the Data Age*, Harvard Business Review, 2017, hbr.org/2017/07/liberal-arts-in-the-data-age.

27. Chamorro-Premuzic, Tomas, and Mara Swan. *If You're Not Helping Employees Learn, You're Not Doing Your Job*. Harvard Business Review, 18 July 2016, hbr.org/2016/07/its-the-companys-job-to-help-employees-learn.

28. "Developing a System of Micro-Credentials." *Hewlett Foundation*, Deeper Learning, Aug. 2016, hewlett.org/wp-content/uploads/2016/08/mc_deeperlearning.pdf.

29. Acree, Lauren. "Seven Lessons Learned From Implementing Micro-Credentials." Edited by Mary Ann Wolf and Alex Dreier, *The William & Ida Friday Institute for Educational Innovation*, NC State University College of Education, Feb. 2016, www.fi.ncsu.edu/wp-content/uploads/2016/02/microcredentials.pdf.

30. O'Donnell, Riia. "A New Challenge: Recruiting for Jobs That Don't Exist Yet." *HR Dive*, 30 Nov. 2017, www.hrdive.com/news/a-new-challenge-recruiting-for-jobs-that-dont-exist-yet/511592/.

31. *Emerging Technologies' Impact on Society & Work in 2030*. Dell Technologies, 5 July 2017, www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/SR1940_IFTFforDellTechnologies_Human-Machine_070517_readerhigh-res.pdf.

16

32. Karago, Thogori. "How the Freelance Generation Is Redefining Professional Norms." *How the Freelance Generation Is Redefining Professional Norms*, LinkedIn, 21 Feb. 2017, blog.linkedin.com/2017/february/21/how-the-freelance-generation-is-redefining-professional-norms-linkedin.

33. Manyika, James, et al. "Independent Work: Choice, Necessity, and the Gig Economy." *McKinsey & Company*, Oct. 2016, www.mckinsey.com/featured-insights/employment-and-growth/independent-work-choice-necessity-and-the-gig-economy.

34. Gordon, Neil. "Contractors and the True Size of Government." *Project On Government Oversight*, 5 Oct. 2017, www.pogo.org/analysis/2017/10/contractors-and-true-size-of-government/.

35. "The Generation Game: How to Win with Centennials." *Your Ready Business*, 10 Dec. 2017, www.yourreadybusiness.co.uk/generation-game-win-centennials/.

36. Stillman, David, and Jonah Stillman. "Move Over, Millennials; Generation Z Is Here." *SHRM*, SHRM, 11 Apr. 2017, www.shrm.org/resourcesandtools/hr-topics/behavioral-competencies/global-and-cultural-effectiveness/pages/move-over-millennials-generation-z-is-here.aspx.

37. Dickson, George. "20 Surprising Employee Retention Statistics You Need to Know." *Employee Recognition and Company Culture - Bonusly Blog*, 13 Dec. 2017, blog.bonus.ly/10-surprising-employee-retention-statistics-you-need-to-know.

38. Tekeli, Cha. "Let's Change Our Perception Of Employee Engagement." *Forbes*, Forbes Magazine, 8 Jan. 2018, www.forbes.com/sites/forbescoachescouncil/2018/01/08/lets-change-our-perception-of-employee-engagement/#2f40e76d139a.

39. Schawbel, Dan. "10 Workplace Trends You'll See In 2016." *Forbes*, Forbes Magazine, 1 Nov. 2015, 7:00 am, www.forbes.com/sites/danschawbel/2015/11/01/10-workplace-trends-for-2016/#649e5cff222c.

APPENDIX A – Workforce Agility Pilot Topic Deep Dives

1.1 CORPORATE RECRUITERS CAN HELP AFRL ENGAGE TOP TALENT

1.1.1 Engaging top talent requires new and innovative approaches to recruitment. As the competition for science and engineering talent grows increasingly fierce, AFRL must explore the use of new and innovative approaches to talent identification and recruitments. The use of executive search and/or corporate recruiters is one avenue that can be used to augment internal recruiting efforts and identify new talent. But, in all cases, AFRL retains responsibility for interviewing and hiring authority.

1.1.2 In general, there are three types of recruiting channels that AFRL could leverage to support its hiring needs. A healthy talent pipeline is built and curated through a blend of recruiting channels as outlined in Figure A-1. The focus and breakdown of each channel will flex over time based on the organization's specific hiring needs.

	EXTERNAL		INTERNAL
	External Recruiters	**Search Firms**	**Internal Recruiters**
Overview	Works on behalf of a client for more generalized search requirements	Works on behalf of a client for very targeted roles to match specific job requirements	Embedded employee within the organization Often knows more about the company and culture
When to Use (Generalized)	Lower level, less specialized	Hard to find candidates (highly-specialized or senior roles)	"Routine" hires
Candidate Source Pool	Active or passive candidates identified through job portals, social media, CV databases	Includes active and passive prospects, in the firm's network of industry contacts	Active seekers applying through established job portals, recruiting events, or employee referrals

Figure A-1. Three Types of Recruiting Channels

1.1.3 Well-defined hiring needs, including the type of expertise required and number of hires, and detailed job descriptions are critical to a recruiter's success. A clear idea of specific hiring needs and detailed job descriptions allows the recruiter to focus the search and provide more qualified prospects. Job requirements should extend beyond a position title and short description to include items such as management / leadership experience, previous career path or experiences, educational background, certifications, and soft-skill requirements. Toffler Associates interviewed a federal government human resources subject matter expert who stated that "the likelihood of [an external recruiter] doing a good search is dependent on clarity of role for which they're recruiting."

1.1.5 Generally, there are five phases of engagement when working with an external recruiter. Each organization and/or recruiter may use different terms but the general phases are consistent, as outlined in Figure A-2.
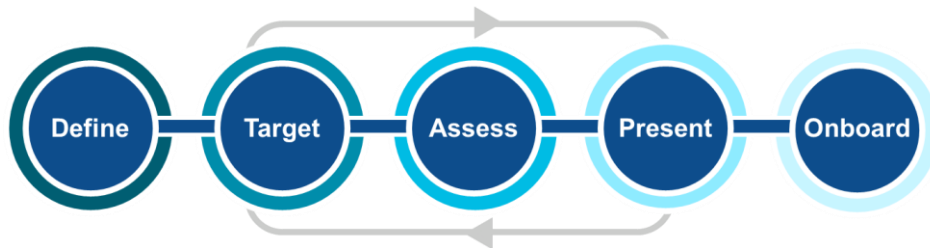

Figure A-2. High-Level Recruiting Process

Phase 1 – Define: In the Define phase, AFRL works closely with the external recruiting partner to provide clear direction on specific requirements and provide cultural insight so the recruiter has detailed understanding of needs and required fit. The recruiter will conduct an intake and kickoff the search using the specific job requirements defined by AFRL. The recruiter and AFRL should establish an open dialogue on working together.

Phases 2-4 – Target / Assess / Present: Phases 2-4 are iterative throughout the search process and will cycle through multiple times. The external recruiter will use the job requirements to gather prospects and identify candidates that are interested, qualified, and recruitable. Candidates will be presented to AFRL and if there is a mutual interest, the candidate can go through the AFRL interview process. Recruiters may source both active and passive prospects and inform the candidates of the client and specifics about the role. A single AFRL point of contact for intake (not review) of new candidates will help keep their sources clear and can escalate candidates who have multiple sources.

Phase 5 – Onboard: In the Onboard phase, the external recruiter will help with negotiations and provide support until the candidate is onboarded into the organization.

1.1.6 External recruiters augment, not replace, internal recruiting efforts. The use of external recruiters does not replace the AFRL hiring team. The external recruiter will augment AFRL's existing recruiting capabilities and manage day-to-day responsibilities but success still requires active participation from AFRL.

- The external recruiter will: identify and prescreen potential candidates based on agreed upon job requirements; provide potential candidates based on pre-established SLAs; and coordinate and manage the candidate experience.
- AFRL will: serve as the internal relationship owner and point of contact for internal inquiries; manage contract needs and SLAs; communicate staffing needs and provide supporting materials; coordinate with interviewers and hiring managers; and provide feedback on candidates presented and/or interviewed.

19

A best practice is to identify someone within AFRL who is responsible for all aspects of the external recruiting process to streamline communication and minimize unnecessary delays. It can also help with alignment to minimize duplication of internal and external recruiting efforts.

1.1.7 **Metrics and measurements are important in tracking search progress and success.** Specific metrics may be dependent on the type of firm engaged and type of candidates targeted. Some metrics will be tracked throughout the recruitment process, while others are more longitudinal. Common recruiting metrics that AFRL should consider tracking include, but are not limited to:

- Time to placement
- Number of candidates received
- Conversion rate
- Quality and time to prospects
- Quality and time to candidates
- Cost per hire
- Candidates/hire ratio by sourcing channel
- Diversity of candidate slate
- Business performance of placed candidate over time
- Placement tenure.

1.1.7 **Negotiating a good contract is the first step in establishing a successful relationship with the external recruiter or search firm.** Well-defined contracts are critical to protecting AFRL's interests and ensure judicious use of funds. The contract terms should be considered carefully. Most executive search firms have established contracts they utilize. Specific contract terms will be dependent on the type of relationship established and type of searches conducted. It should be noted that with today's low unemployment rates, candidates (and thus search firms) may have additional leverage; push-back on terms should be expected but should not prevent AFRL from active negotiation for the best possible terms that are commensurate with private sector.

The following are common elements that could be included in a contract.

- **The scope of work** will outline specifics of the position(s) being searched. It is important that AFRL clearly outlines the specific positions and position requirements being searched. This may also include whether it is a confidential or an open search. In confidential searches, the organization is not divulged until it is confirmed that the candidate has been screened and expressed interest in the role. This is often used when the role is currently occupied or concerns that the public knowledge of the vacancy may indicate the "health" of the organization. Open searches are publicly referenced and used when there are no or limited organizational sensitivities.

20

- **The payment model** will be dependent on the specific firm and type(s) of roles AFRL is hiring for. The two most common fee models are retainer and contingency based. Retained searches are often paid in advance and "retained" to conduct the search but does not guarantee a placement.
    - Retained searches are often used for senior or hard to find roles. A Director of Talent Acquisition at a leading research university shared with Toffler Associates that "retained search is preferred for 'top talent' roles." For retained searches, the payment terms should be based on milestones achieved and all fees should not be paid upfront.
    - Contingency fees are only paid when a candidate is hired (and often remain at the organization for a predefined period of time). Contingency fees are often used for staff level roles and the actual fee can be negotiated.
- **Metrics** can help drive accountability. The contract should include an agreement on what metrics will be reported on at what frequency. It is recommended that metrics are updated weekly so AFRL can monitor progress closely.
- **Guarantees** can be negotiated to protect AFRL's investment in the case that the hired candidate leaves within a specific period or the search firm does not perform as agreed. Common guarantees to consider include:
    - Replacement Guarantee: an additional search if the recruited candidate stops working within a specified period (the "guarantee period"). Guarantee periods can fluctuate based on role and position level and can range from 30 days to one year.
    - Refund Guarantee: a refund if the placed candidate's employment lasts less than a specific period. The refund could be either a flat fee or pro-rated based on the number of days of employment.
    - Performance Guarantee: less common but guarantees satisfaction with the firm. It indicates that if the search firm fails to provide a specific number of qualified candidates with a specified number of days of the search start, a partial refund can be made.

Note that Toffler Associates is not making any recommendation on specific contract terms. The items included provide an overview of the types of agreements or sections that AFRL should consider in the negotiation process.

1.1.8 Selecting the right executive search firm will be critical to AFRL's recruitment pilot success. Key considerations that AFRL should screen potential search firms for include the payment model, history with government clients, experience finding similar skillsets, and the diversity of candidates in network and sources used.

There are several search firms that AFRL can explore partnering with. These range from large global search firms to smaller, boutique forms that may have expertise in

government recruiting and/or in recruiting niche skillsets. Toffler Associates identified some representative firms to consider including K Force, JDG Associates, Millennium Search, Heidrick & Struggles, Korn Ferry, Spencer Stuart, Veratech, Carrington & Carrington, Reffett Associates, and JMJ Phillip Executive Search.

It should be noted that Toffler Associates is not providing a recommendation for any specific firm. AFRL should define its recruiting needs and conduct formal meetings with each firm to understand the firm's network, capabilities, and experience before selecting a firm(s).

1.2   MICRO-ACCREDITATION CREATES A MORE VERSATILE WORKFORCE

"The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn." – Alvin Toffler

1.2.1   The learning landscape is changing in response to societal evolutions, organizational demands, and the needs of the individual. Individuals seek to customize their learning experience, selecting time and cost-efficient education opportunities which focus on specific skill development. An NBC study found "47% said that a degree is not worth the cost 'because people often graduate without specific job skills and with a large amount of debt to pay off. [1]'"

At a societal level, job changes outpace the speed at which individuals acquire skills in traditional educational models. New, non-traditional learning channels such as bootcamps, short-term certifying bodies, online resources, digital badges, and micro-degrees have emerged in response. In 2018, the coding bootcamp industry grew to "$240 million and coding bootcamps graduated around 20,000 people.[2]"

Organizations recognize cost efficiencies associated with re or up-skilling the current workforce compared to recruiting and onboarding new employees. An Aspen Institute study found that in 2018, large corporations announced "$600+ million in upskilling investments.[3]" This also offers a potential solution to quickly close potential hiring gaps in low unemployment environments.

1.2.2   Disruptions in the learning landscape includes both who provides and how education is delivered. In response to these changes in the learning landscape, the learning is becoming increasingly democratized. Traditional academic institutions are no longer the sole providers of training and education. Not only are companies getting involved in education earlier in life, some as early as elementary school, there are new education providers that offer industry-recognized credentials in lieu of degrees emerging, such as bootcamps, massive online open courses (MOOC), etc.

Disruption is even occurring at the advanced degree level. Traditional academic institutions are partnering with disruptors to offer alternative methods to achieving advanced degrees. One such example is edX, a "a nonprofit learning platform founded by

22

Harvard and MIT." edX partners with prestigious academic institutions to offer Micro Masters®, a new type of advanced degree credentialing program that can be completed in as little as nine months.[4]

The learning landscape, as outlined in Figure A-3, should be considered in its entirety as it offers a spectrum of different learning and reskilling options that employers can offer based on individual workforce needs.
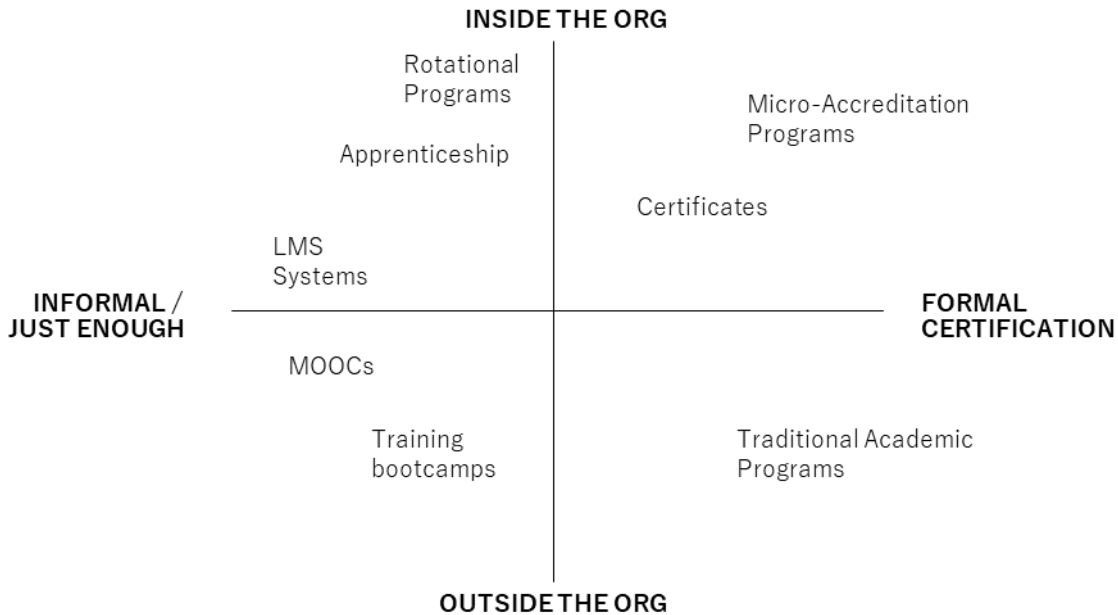
INSIDE THE ORG

Rotational Programs

Apprenticeship

Micro-Accreditation Programs

Certificates

LMS Systems

INFORMAL / JUST ENOUGH

FORMAL CERTIFICATION

MOOCs

Training bootcamps

Traditional Academic Programs

OUTSIDE THE ORG

Figure A-3. The Learning Landscape

1.2.3 Organizations are innovating and developing customized solutions for their learning needs. While a number of organizations are focused on re- or up-skilling employees, there's minimal consistency across organizations in strategy or implementation. Each has designed a solution that aligns to its individual organization's goals and priorities.

Sample organizations focused on re- or up-skilling employees:

- Discover Financial Services established the "Discover College Commitment" to provide full tuition for online degrees at three Florida universities. It wholly delegates teaching and upskilling responsibilities and targets key skill needs in the future.[5]

- Wal-Mart created training academies to better equip workers for success at the company. The academies offer 1-6 weeks of hands on, applicable training through a Pathways program that targets in-store employees. This effort is part of a push for a stronger company culture that puts employees and community first. The

23

program puts an emphasis on lower-skilled employees to maximize the return on investment. Curriculum is also specific to Wal-Mart, reducing potential churn.[6]

- AT&T is investing in a "Future Ready" initiative. It is a web-based platform which integrates MOOC and university course offerings and internal career guidance. By 2020, plan to reskill 100,000 AT&T employees to adapt to technological changes and employees can enroll in nanodegree programs through university partnerships.[7&8]

All the changes in the learning market will shift how employees gain credentials and how employers recognize achievements. This will change how organizations train and educate its current and future workforce.

1.2.4 Micro-accreditation programs must be designed to offer benefits to both the organization and individual. In the development of a micro-accreditation program, or any learning program, individual employee wants and needs must be considered in conjunction with the organization's goals. There must be enough draw for the individual to select to engage with the program and complete coursework. In return, there must be enough of a ROI for the organization to justify program investment.

For the individual, micro-accreditation programs develops skills that can be transferrable across organizations; provides the ability to keep up with the changing job market; provides the ability to customize career progression and learning; provides on-demand learning opportunities; and offers additional credentials at low or no cost.

For organizations, micro-accreditation programs provide a faster option for increasing skills in the workforce; increase organizational agility by enabling the movement of employees across roles; and serve as a differentiator for prospective employees by enhancing rewards package or "alternative comp" arrangement.

1.2.5 The traditional benchmark for proof of proficiency" is changing. As we move away from traditional learning, we also must replace traditional proof of proficiency (the degree). With alternatives to traditional degrees becoming more prevalent, new arrangements for demonstrating proficiency will be required. This necessitates change at multiple levels of the organization – from how HR qualifies and screens potential candidates to how supervisors accept demonstration of mastery and form teams.

1.2.6 Skills are the new currency. With work and jobs changing at an increasingly faster pace, "newer ways of working, newer literacies, newer competencies are showing up almost every day.[9]" This rapidly changing environment places a higher emphasis on the variety of skills an individual possesses, as well as how quickly he/she can acquire new skills and apply these skills in new contexts. One insurance executive shared that he believed it is a "multi-faceted issue of what skillsets of the future are needed…work is going to be different culturally and the type of work change" and employee skills must also dynamically change.

24

More so than traditional higher education degrees, skills can be constantly cultivated in intentional and modular ways that are relevant to current positions and is reflective of the most-updated thinking. As the job market continues to change, these skills, which including learnability, may become more important than degrees or past jobs held.

1.3   K-12 STEM PROGRAMS OFFER AN OPPORTUNITY BUILD A PIPELINE OF FUTURE STEM TALENT

STEM (Science, Technology, Engineering, and Math) was originally coined in 2001 by the National Science Foundation to refer to the career fields that integrated those key skills.[10] Since that time, STEM has experienced great growth and is prevalent across private-sector, academia, and government organizations. The US Bureau of Labor Statistics anticipates that jobs in STEM fields will experience 3.4% more growth compared to the overall economy between 2016-2026.[11]

With the continued expected growth, STEM has become a cornerstone in the future skills conversation and organizations have developed STEM-related programs and education opportunities for future talent. Leading companies have recognized these opportunities offer the chance to develop the STEM skills of future workers, as well as begin fostering long-term relationships with prospective employees. This talent development is critical during times of low unemployment and the demand for technical skills is high.

1.3.1   Goal-oriented, hands-on experiences are an important aspect of STEM programs.
Workplace-based STEM programs have a unique opportunity to create connection, demonstrate the value of goal-oriented work and tell the story of meaningful impact. Engagement with STEM programs must extend skill application to include a focus on higher-level goal achievement– whether that goal is advancing national security, increasing environmental sustainability, or improving citizens lives. Demonstrating how individual efforts support the overall organization vision/mission may create early passion and purpose that persist throughout the career. The leader of a Department of Defense Research Lab shared her perspective that "we talk about stupid hyper efficiency crap. We've stopped telling stories about what we've achieved and how it supports the bigger purpose (or goal)."

The concept of working for a higher purpose can be reinforced through hands-on experiences. Organization-led STEM programs have the opportunity to build upon traditional K-12 academic instruction and demonstrate how to tactically apply classroom-learned STEM skills to a real problem with tangible solutions.

The Ford STEAM Academies prepare high school students for the real world by providing them with hands-on learning. Instead of staying in general classes while attending regular high school, students spend most of their day in Ford facilities working on projects related to possible future jobs based on industry trends in engineering, information technology and manufacturing.[12]

1.3.2 **STEM programs should focus on subject and skill.** The true successes of STEM are not in the subject area; the value and success lie in the underlying skills developed. STEM must be more than a job category or major; it should reflect an integrated approach to learning and the development of foundational skills that all jobs require in the future such as analytics, problem-solving, and hypothesis development. The applicability of these skills extends beyond the "math and science" programs to non-traditional subjects and jobs such as history, writing, and the arts. As one Harvard report states, "STEM students can care about human beings, just as English majors can investigate things scientifically. We should be careful not to let interdisciplinary jockeying make us cling to what we know best.[13]"

To truly prepare the future workforce, programs should also include a focus on traditional soft skill development such as communication, writing, and leadership. One report indicates that only 35% of "corporations feel new recruits and students are well prepared with both hard and soft skills to perform at a high level in a professional environment.[14]" Abbott facilitates several STEM programs, including one for high school students. The program curriculum includes an intentional focus on soft skills such as communications, workplace professionalism, and resume building.

1.3.3 **STEM programs offer an opportunity to develop relationships with future employees.** The goal of a STEM program should not solely focus on program participation. An important goal should be the relationships developed through STEM programs and how those relationships are cultivated and curated over time. Program participation may identify potential talent but, to serve as an effective source for future talent pipelines, programs should focus on cultivating ongoing, personal relationships with the students, parents, caregivers, teachers, and other influencers within their ecosystem. A study on the use of financial college scholarships to attract rural students found that when relationships were developed "with local high school principals, teachers, parents and students,"[1] the yield rate was 44% higher. These cultivated relationships can not only increase potential likelihood for employment consideration but can increase general brand awareness of the organization and its mission.

As one Toffler interviewee stated, "recruiting is a contact sport" and these personal relationships offer an opportunity to stay in contact with students beyond specific program dates.

1.3.4 **A national-led, local-flavor model drives strategic alignment while providing the flexibility to customize for local needs.** STEM programs must balance efforts between the national strategy and ability to execute based on local market needs. A central, national-led strategy creates alignment among offices and employees, shares best practices, leverages cost efficiencies, and integrates strategic priorities into program activities.[1] The national STEM program should serve as the champion, define overall objectives, and provide supporting materials. One STEM non-profit CEO believes there should be a "national banner with core principles of practice."

26

Local markets should execute within the national objectives but have the flexibility to customize programs based on their audience, which could include cultural considerations, language requirements, and/or any specific community needs. Local execution should also reflect the diversity of the workforce. This creates an environment where future talent can see themselves working in the field or with a specific organization. One interviewee suggested that "if I see one third of the room is like me, I'm more likely to participate and engage in those activities related to STEM. If less than a third of the room (looks like me), I feel uncomfortable."

Toffler Associates spoke with the STEM Program Manager of a pharmaceutical company who shared how their program utilizes this model. She stated "our program is managed at the corporate level. We then have a STEM champion in each location who is the on-site resource and helps identify projects for interns to help with...the project work is different based on each local office focus, but the general protocol is the same."

1.4 PILOTING NEW AND INNOVATIVE METHODS CONTRIBUTE TO AFRL'S WORKFORCE AGILITY

1.4.1 **Constant innovation pulling from government and industry...**Based on its knowledge of changing workforce expectations and experience working with AFRL, Toffler Associates developed a list of potential pilots that AFRL could consider as it looks to test new methods to increase its workforce agility:

- **STEM Talent Pipeline**: Strengthen regional STEM talent pipelines and professional networks, focused on fostering relationships with K 12 students
- **Micro Accreditation:** Improve organizational staffing agility and attractiveness to top talent by providing access to individual "resume worthy" development (i.e., "badging") opportunities
- **Leadership Development:** Foster a growth mindset among supervisors and senior leadership to help change the organizational philosophy around change
- **Short Term / Gig Employment:** Increase AFRL flexibility and agility related to bringing in the right people for the right job for the right amount of time
- **Onboarding Process:** Set new hires up for success by equipping them (and employees taking on new jobs within in the organization) with the knowledge required to succeed in their roles
- **Active and Reserves Component Utilization:** Improve how the organization finds, matches and utilizes skillsets across the Active and Reserve components
- **High Performing Individuals:** Engage, challenge and retain the best talent within the Air Force ecosystem
- **Alumni Network:** Create a vibrant alumni ecosystem that remains active with and supportive of AFRL talent needs (e.g., coaching, ideas, referrals, private sector opportunities, transition, etc.)

- **Open Innovation:** Increase internal and external access to (and reintegration from) dedicated innovation platforms
- **Succession Planning:** Establish a leadership talent pipeline that supports transition within and out of the organization while preserving institutional knowledge and experience.

1.4.2 **A standard set of criteria can help determine the most appropriate pilot concept to explore.** Leveraging the design thinking principles of desirability, feasibility, and viability, Toffler Associates developed a set of potential criteria AFRL can use to determine which pilot(s) may be most beneficial to AFRL and its organizational goals.[15] These criteria include:

- **Organizational Disruption:** How disruptive the pilot will be to ongoing activities and operations, workforce and human capital considerations, geographies and number of people impacted.
- **Strategic Alignment:** How supportive the pilot concept is to AFRL's strategic vision, goals and objectives, broader research and development priorities and workforce goals, and desired organizational culture and philosophical mindset.
- **Cost:** Relative cost in terms of human resources, out-of-pocket funding, and time to establish.
- **Desirability:** How desirable the end state would be relative to the workforce across geographies, AFRL senior leadership, and other identified stakeholders.

APPENDIX B – Appendix A References

1. Dann, Carrie. "Americans Split on Whether 4-Year College Degree Is Worth the Cost." NBCNews.com, NBCUniversal News Group, 7 Sept. 2017, www.nbcnews.com/politics/first-read/americans-split-whether-4-year-college-degree-worth-cost-n799336.

2. Eggleston, Liz. "2018 Coding Bootcamp Market Size Study." *Course Report*, 21 Aug. 2018, www.coursereport.com/reports/2018-coding-bootcamp-market-size-research.

3. Fall, Jaime. "Upskilling Year in Review 2018." *Upskilling Year in Review 2018*, The Aspen Institute, 19 Dec. 2018, www.aspeninstitute.org/publications/upskilling-year-in-review-2018/.

4. Agarwal, Anant, et al. "How EdX Is Redesigning Learning for the Future." *Managing the Future of Work - Harvard Business School*, 24 Apr. 2019, www.hbs.edu/managing-the-future-of-work/podcast/Pages/podcast-details.aspx?episode=9506447.

5. Weier, Mary Hayes, et al. "Three Important Takeaways from the Tomorrow's Talent Forum." *Workday Blog*, Workday, 13 July 2018, blogs.workday.com/three-important-takeaways-from-tomorrows-talent-forum/.

6. Europe, Box. "Employee Training Rendered Personal for the Walmart Family." *Medium*, Box Insights, 14 Feb. 2018, medium.com/boxeurope/employee-training-rendered-personal-for-the-walmart-family-d8beddddefbe.

7. Weber, Lauren. "Why Companies Are Failing at Reskilling." *The Wall Street Journal*, 19 Apr. 2019, www.wsj.com/articles/the-answer-to-your-companys-hiring-problem-might-be-right-under-your-nose-11555689542.

8. Caminiti, Susan. "AT&T's $1 Billion Gambit: Retraining Nearly Half Its Workforce for Jobs of the Future." *CNBC*, CNBC, 13 Mar. 2018, www.cnbc.com/2018/03/13/atts-1-billion-gambit-retraining-nearly-half-its-workforce.html.

9. Agarwal, Anant, et al. "How EdX Is Redesigning Learning for the Future." *Managing the Future of Work - Harvard Business School*, 24 Apr. 2019, www.hbs.edu/managing-the-future-of-work/podcast/Pages/podcast-details.aspx?episode=9506447.

10. Hallinen, Judith. "STEM EDUCATION CURRICULUM." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., www.britannica.com/topic/STEM-education.

11. Mammen, Taylor, and Ryan Guerdan. "2019 STEM Job Growth Index." *RCLCo Design*, 31 Jan. 2019, www.rclco.com/publication/2019-stem-job-growth-index/.

12. "Ford Next Generation Learning: Ford STEAM Experience." *Ford Steam Experience*, social.ford.com/content/ford-steam/programs/FordNextGenerationLearning.html.

13. Brynjolfsson, Erik, and Andrew Mcafee. "The Business of Artificial Intelligence." *Harvard Business Review*, 5 Sept. 2018, hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence.

14. *Building Tomorrow's Talent: Collaboration Can Close Emerging Skills Gap*. Bloomberg Next, 2018, *Building Tomorrow's Talent: Collaboration Can Close Emerging Skills Gap*, unitedwayswva.org/wp-content/uploads/2019/07/Building-Tomorrows-Talent-Collaboration-Can-Close-Emerging-Skills-Gap.pdf.

15. "IDEO Design Thinking." IDEO, designthinking.ideo.com/.