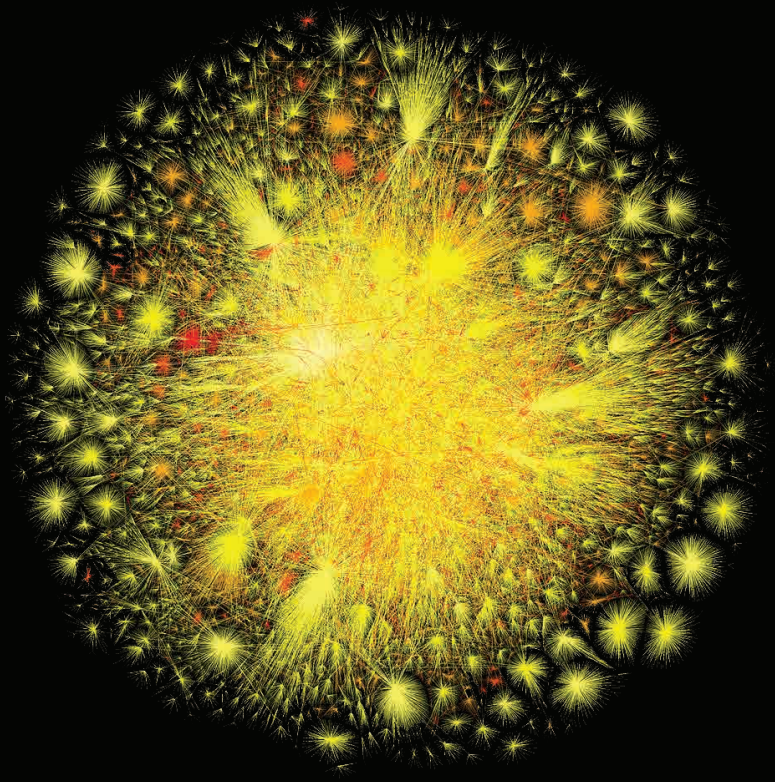

Innovative Learning: A Key to National Security

General Editors: Ralph Doughty, Linton Wells II, and Theodore Hailes

The Army Press
Fort Leavenworth, Kansas

Cover image of the internet connection graph from border gateway protocol data courtesy of Barrett Lyon / The Opte Project.

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Library of Congress Cataloging-in-Publication Data

Names: Doughty, Ralph, editor. | Wells, Linton, 1946- editor. | Hailes, Theodore C., 1942- editor.
Title: Innovative learning : a key to national security / general editors: Ralph Doughty, Linton Wells II, and Theodore Hailes.
Description: Fort Leavenworth, Kansas : Army Press, 2015.
Identifiers: LCCN 2015037711 | ISBN 9781940804231
Subjects: LCSH: Military education--United States. | Military education--Europe. | Educational technology--United States. | Educational technology--Europe. | National security--United States. | National security--Europe.
Classification: LCC U408.3 .I56 2015 | DDC 355.0071--dc23 LC record available at http://lccn.loc.gov/2015037711

2015

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Editor
Jennifer B. Fike

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Preface

This book reflects work by the members of the International Transformation (ITX) Chairs Network and is the fourth book in a series covering transformation across the spectrum of government activities. This book and its immediate predecessor examine the implications of various approaches to learning for different aspects of national security. The previous book, titled "*Changing Mindsets to Transform Security: Leader Development for an Unpredictable and Complex World,"* was produced in conjunction with NATO's Allied Command Transformation (ACT).

This year's title: *Innovative Learning: A Key to National Security* was chosen carefully. Whereas much of the earlier book focused on Professional Military Education (PME) in the US and abroad, this year's effort emphasizes the need to cut across traditional stovepipes such as training, education, and experiential learning and blend them into more integrated learning approaches, supported by point-of-need content delivery. People at all levels, from primary and secondary school students to the broad civilian workforce, to senior war college graduates, need to be prepared for the challenges that are being forced on them today by a world that is drawing everyone closer together, with information ubiquitous and knowledge spread to all levels, and for the as-yet-unforeseen ones that will change their lives and their workplaces in the future.

Dr. Cathy Downes wrote in her chapter to *Changing Mindsets*: "Educational praxis is being disrupted by broader technology-driven change. Like it, love it, loathe it, it does not matter. It is happening: live with it; thrive with it. The disruption is changing the way our future students will think, their expectations, and their needs. It is opening up new opportunities for learning and for how we educate." The emphasis on praxis (process) is very important, but it alone is not enough. Innovative learning approaches rarely have major impacts in isolation. As several authors describe here, combinations of sustained leadership, cultural change, adequate investment, information technology upgrades, and other factors all must be changed together to affect enough people to make a significant difference. Scale is important.

The ITX Chairs' basic approach starts by examining particular issues through interactions among people, organizations, processes and technology. In this volume, each of the chapters includes multiple components. Three of the chapters primarily deal with people's interactions

with learning processes, three with organizations and processes, and four with technology and processes.

People and Processes

Ralph Doughty's and Jack Kem's chapter "Tackling the Impossible: Learning by Solving Real-World Problems for Senior Leaders," addresses ways that PME institutions can draw on the "intellectual capital" of students to address very serious real-world problems, much as the Service Schools did in the interwar period. At the same time, educational requirements must be met, so creative concepts will be needed to meet the standard PME requirements while leveraging student experiences to provide useful research and recommendations. The authors offer recommendations on how to focus and sponsor such studies to produce useful outcomes. They conclude: "Leveraging our intellectual capital . . . at our PME institutions is one way we have been successful in the past – and an approach we can use to be innovative and find potential solutions to the challenges of our future."

Rich Meinhart, in "Insights for a Committed Learning Environment," broadly examines ways to build a "committed learning environment from curriculum, student and seminar perspectives." In doing this he draws on a wide range of education subjects associated with adult learning, such as learning taxonomies, types of discourse, team building and reflection. A goal is to "help shape students and faculty thinking on how best to approach and complete an educational journey with a committed learning focus."

Sae Schatz, David Fautua, Julian Stodd and Emilie Reitz, in "The Changing Face of Military Learning," point to the complexity and rate of change in the international security environment, and emphasize the need to find new ways to empower forces. They specifically focus on "increased investments in our Human Dimension," calling for "an expanded set of competencies, skills such as critical thinking, anticipation and emotional intelligence, encouraging and empowering social learning, and developing more efficient and agile pathways to expertise." Their vision for "revising the military learning enterprise" emphasizes "learner-centric" and "organizational level" approaches that enable a persistent and self-sustaining learning culture. Achieving this will depend on a shared grand strategy for the military's "Human Dimension" and the military learning system that empowers it.

Organizations and Processes

Grant Hammond, "Transforming Military Education for the 21st Century," addresses the modernization of military education, with a particular focus on Air University (AU) at Maxwell AFB. AU "is in the midst of transforming itself to deliver more rigorous, relevant education and research to the Air Force and to better integrate, share and collaborate with partners in the joint community, academia and business." He describes the importance of overhauling an "outdated information technology structure" which will take several years. AU's transformation process has involved "some initial personnel reorganization, an expanded electives program for in-residence officer PME, major new research initiatives on the Chief of Staff's major priorities, the creation of a new global teaching and learning center, and a greater emphasis on future conflict and war gaming. These initial changes have occurred. The follow on implementation of a strategic plan [is underway]."

Guillaume Lasconjarias, "A New Approach to Education: A Case Study for a 'Teacher Free School': École 42," focuses on an innovative school in France known as l'École 42 (School 42). The chapter analyzes "the pedagogical methods, or absence thereof," at École 42 (which was designed to deliver computer programming-related content, rather than degrees) to "identify and assess future trends in our educational environment as well as possible tools applicable to other educational fields, including the military." He concludes that this kind of alternative pedagogy would be challenging for the military, less for the specific content it can provide than for the threat it poses to PME organizational structures. He suggests the military should rethink the goals of military education, in particular how it can deliver "specific know-how in a particular – and challenging – environment."

Derrick Neal, "Changes in the United Kingdom Education System: The Case for the United Kingdom Ministry of Defence – Education, Development or Training?" explores concepts related to "learning (training and/or education) within the context of the United Kingdom." He feels that "over the next 3-5 years there will be a major shift in the mix of learning approaches that are utilized for both training and education interventions. The notion that students have to receive the majority of their learning by attending lectures will be a thing of the past." High level support will be important, and it is particularly important that UK authorities "have a clear understanding of what is meant by training, development and education."

Technology and Processes

In the chapter titled "Rapidly Evolving, Digitally-Enabled Learning Environments: Implications for Institutional Leaders, Educators and Students," Cathy Downes "examines the rapid cycles of web evolution . . . and the key technologies driving rapid advances in digital functionality, participation, productivity." She then evaluates "how these cycles of technology change have influenced, and are shaping the evolution of digitally-enabled learning environments in higher education, and particularly the Department of Defense professional educational system, describing conditions of Learning 1.0, 1.5, 2.0 and 3.0." The chapter concludes by identifying critical implications of these developments and the underlying catalyzing directions of web technologies for higher educational institutions in general, for their academic leaderships, for educators and for students. These implications, for example, focus on "(1) the growing gap between heritage institution educational models and the rapidly maturing and growing spread of digitally-enabled alternatives; (2) the challenges for Chief Academic Officers in hiring, developing and retaining faculty capable of creating and innovating in digitally-enabled higher education and strategic/executive level learning environments; (3) the challenges for educators in developing their digital literacies and becoming competent in new educator roles to meet the expectations and employment requirements of the upcoming generations of students; and (4) the challenges for executive-level students to upskill their own digital literacies, to take more responsibility for building and adapting their own personalized/personal learning networks and paths and developing a rich understanding and situational awareness of the technologies and uses of cyberspace and the next phases of the Digital Age."

Sue Higgins and Peter Denning, "Being in Uncertainty: Cultivating a New Sensibility in Military Education," describe the skills needed to move effectively in an emerging, shifting, unpredictable world. Technology and its implications for education play an important role. The authors outline "five essential aspects of a leadership identity [they] think are needed in the new world." The Naval Postgraduate School's Cebrowski Institute has been "exploring how to create new learning experiences to meet these needs." They are encouraged by an experiment with "Working Effectively in Small Teams" (WEST) that immerses students into practice for effective small teams using virtual worlds, and speculate that by adding a few well-designed WEST-like modules to existing military curricula, [NPS] could take significant steps toward the desired transformative effect."

Derrick Neal, "Technology and its Impact on Defense/Security Thinking and Learning Intervention Issues," highlights "the significance of the rapid advances in technology in general and that of digital technology in particular. The rate of change presents a range of challenges that have impact on individuals as well as organizations." In light of this the author proposes "that a nation's education system needs to recognize the importance of this dimension from an early stage. Such an approach should capture two aspects, namely, what is taught (the curricula) and how it is taught (technology enhanced learning – [TEL]). Having laid the foundations in schools this should be consolidated through the higher education system bearing in mind that within a period of 3-5 years many digital technologies will have advanced. From a defense and security perspective the author challenges the designers of learning interventions such as Command and Staff courses to ensure that both the curricula and the TEL is relevant and reflective of the digital world in which military staff have to operate. In order to achieve this it may be necessary to remove topics that can be described as interesting and replace them with topics that should be considered as essential."

Lin Wells and Ted Hailes, "Applying Innovative Learning to a National Security Problem," examine the accelerating replacement of jobs by automation and artificial intelligence (AI) and provide thoughts on how innovative approaches to learning can mitigate social unrest that may be generated by new technology. The analysis draws on much valuable work that has been published on the impact of automation and artificial intelligence on labor markets. A key conclusion is that "innovative learning can have significant benefits for individuals and targeted workforces, but scaling it across broad markets, national labor pools, and the growing global youth bulges will need sustained engagement by multi-sector, public-private, and transnational partners. Since many of the issues raised are beyond the planning cycle for government and private sector organizations, the chapter's intent is to inform the debate as it evolves and help develop a research agenda to support policy options that can be implemented when the time is right."

Overall, the book reinforces both the imperative for change in national security learning and the important benefits that can come from such change. The national security environment is changing, learning technology is changing, and pedagogy (and andragogy – adult education practices) need to change along with it. The outcome, if done well, can be not only a military that is better suited to meet a complex and uncertain future, but also a broader labor force that is more resilient to

equally complex challenges. However, pockets of innovative learning alone will not be enough. Sufficient numbers of people, at many levels, must be engaged to scale the results to large enough populations to make a difference. Innovations also must be sustained, and evolved, rather than being rolled back. There are several examples of once-promising advanced learning initiatives that have been stillborn, rather than course-corrected to address the inevitable problems that will arise in implementation.

Innovative learning concepts are known. Senior leaders have articulated the need to develop military personnel who can meet the emerging challenges and uncertainties. But changes are not being implemented very fast. The problem is not limited to the military. Private educational institutions are under enormous pressure, but not all are adapting. Social unrest among unemployable workers may pose serious national security problems in the future, yet no one has even conceptualized learning programs on a large enough scale to meet the employment needs of emerging youth bulges in Sub-Saharan Africa, the Islamic World, and South Asia. The challenge in all these areas, military and civilian, is how to muster the vision, will, and resources to make enough difference in time to achieve lasting results.

The International Transformation Chairs Network

The International Transformation Chairs (ITX) Network has its origins in the US Professional Military Education system, but has become an international network, adding representatives from Australia, Singapore, Sweden, the United Kingdom, NATO's Allied Command Transformation (ACT), the NATO Defense College, and the Civil-Military Cooperation (CIMIC) Centre of Excellence. The ITX Chairs' mission is to "provide a forum to challenge thinking, leverage shared knowledge, and inform the debate about the national and international security implications of global transformation." The vision is to "help national security leaders and decision-makers prepare for a future filled with complexity, chaos, and surprise." The Network approaches transformation as a process that shapes the changing nature of competition and cooperation through concept development and innovation management across people, processes, organization, and technology. Research by the network includes cross-cutting interactions among those areas.

The Network's goals are to: 1) Inform ongoing debate with forward thinking concepts on major transformational issues; 2) Conduct research that identifies cross-cutting issues, opens new vistas, and validates (or challenges) current initiatives; 3) Serve as a resource in support of national and international leaders in realizing the transformational potential of comprehensive approach and smart power capabilities; 4) Support Professional Military Education (PME), Joint Professional Military Education (JPME), and national security education development to prepare future leaders and decision-makers.

The network has published monographs, contributed to changes in US military education policy, organized conferences and workshops, and supported a variety of US Department of Defense and international activities.

In 2009, together with the Swedish Defence Research Agency (FOI), the Network co-sponsored the first International Transformation Conference, in Stockholm. The resulting publication, *Crosscutting Issues in International Transformation: Interactions and Innovations among People, Organizations, Processes, and Technology*, is in its second printing.

In 2010, the Network, in support of ACT, began to research ways to develop capability in support of the Comprehensive Approach. This work reinforced the natural synergy between the two organizations, both of which are catalysts for change and seek to bring together diverse audiences to promote learning and the development of solutions. The ITX2 Conference, *Capability Development in Support of Comprehensive Approaches:*

Transforming International Civil-Military Interactions was held at the NATO Defense College in June 2011. The event provided valuable insights into how to organize capabilities in support of Comprehensive Approach situations particularly in mission areas such as stability operations, building the capacity of partner nations and humanitarian assistance/disaster relief. It also led to the development of the Quick Wins at Low Cost (QW@LC) initiative. This initiative leverages developments that are ongoing in the private sector to deploy capabilities in months for thousands of dollars, vice decades for millions.

The Chair's third book, *Changing Mindsets to Transform Security: Leader Development for an Unpredictable, Complex World*, was published in December 2013 as a result of the third ITX conference (ITX3) on this topic held at the US National Defense University (NDU). It increased understanding of how the profound changes underway in private sector adult education, and innovative learning technology, can affect PME and JPME, as well as international military education. The conference and book encouraged movement beyond the present stovepipes of training, experiential learning, and education to a continuous, recruitment-to retirement learning environment supported by point-of-need content delivery.

All three of the previous conference publications have been, or are being, used in United States, Allied, and Partner Nations PME institutions. They also support ACT's national "Chiefs of Transformation" (COT) activities.

Current objectives for the ITX Chairs Network are to: 1) Promote innovative learning for national security leader development; 2) Increase awareness of the importance of learning as a key national security issue; 3) Forge ties to the US Joint Staff J-7 in support of Joint Education improvements and the development of concepts and capabilities; 4) Support ACT's COT programme.

Chapter 1
Tackling the Impossible: Learning by Solving Real-World Problems for Senior Leaders

Ralph O. Doughty and Jack D. Kem

Abstract

Professional Military Education institutions, such as the US Army Command and General Staff College, provide an excellent resource for innovation to address real world problems. The inter-war period between World War I and World War II was a time where many real-world issues were addressed at the service schools; this same approach is still valid today and can be easily incorporated to address the challenges of the future. To be successful, however, it is necessary that the implementation be complementary to existing PME missions and relate directly to the experiences of students.

One of the key principles of learning at the United States Army Command and General Staff College (CGSC) at Fort Leavenworth, Kansas is an approach called "the CGSC Experiential Learning Model," or ELM. The ELM serves as the methodology for both lesson plan design at CGSC as well as the dominant teaching methodology for delivering curricula. The ELM focuses more on "active" learning than on "passive learning."

The ELM model is based upon a theory of learning developed by Dr. David A. Kolb, where he describes four different modes of learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation.[1] The curriculum design and principal teaching methodology is designed to "hit" all four of the different learning modes using a "spiral of learning" approach where learning is conducted by first experiencing, then reflecting, then thinking, and finally by acting.[2] In this manner, the learning styles for all of the students are emphasized at some point in each class – making all students (and faculty) comfortable with the methodology of teaching . . . and also uncomfortable at some stage of learning.

This model is based on the premise that the best way to learn is by learning lessons from one's own personal experiences or learning something from a trusted friend or colleague that came from his or her own personal experiences. This type of learning has been validated time and again by the joint-service military officers and civilians who teach and learn at CGSC. It is accomplished by organizing the individual class sections into Staff Groups (a seminar approach) which include representatives from the

combat arms, the logistics and support officers, and all the other participating services to include Air Force, Sea Service, International officers, Interagency partners, and US Reserve Component officers.

Actual personal experiences are the most focused forms of learning. When we hear something, we remember it for a short while. When we see something, we remember it longer than simply hearing about it. But when we actually experience something, we are able to internalize it and learn from it for an extended period of time. Thus, the things we actually experience have a significantly greater impact than those things that we just see or hear about. The emphasis is not only on the experience itself, but includes the active process of reflection, thinking, and acting upon those experiences to create new knowledge.

The approach to learning – the Experiential Learning Model – provides an excellent means to address some of the challenges that exist today in the US Military. These challenges include declining resources while the security situation in the world has become more complex and dangerous. Using experiences, and then addressing future challenges in the classrooms, is an excellent way to leverage the "intellectual capital" and experiences of our officers in the classroom, while still meeting educational requirements.

The Introduction of the Office of Force Transformation

The Experiential Learning Model provides one approach to addressing challenges in the US Military; the introduction of the Office of Force Transformation provided another approach. In the mid-2000s, DOD Secretary Donald Rumsfeld initiated a program to transform the department in which he directed that each DOD Educational Institution have a senior level professor who would serve as a DOD Transformation Chair on the college faculty. One of the authors of this chapter (Doughty) came to Fort Leavenworth in 2005 and served for three years as the CGSC Transformation Chair, with key support provided by the DOD Office of Force Transformation (OFT) under the leadership of a three-star Navy Admiral (Vice Admiral Arthur Cebrowski) at the Pentagon.

At the onset, DOD's Office of Force Transformation (OFT) focused on three specific areas – "how we do business inside the Department, how we work with interagency and multinational partners, and how we fight."[3] Many of the initiatives at the OFT initially involved equipment and technologies in support of transformation; the late Vice Admiral Arthur Cebrowski suggested that "one of the great rules for transformation is if you want to transform go where the money is and on arrival, change the

rules."[4] As the OFT matured, the OFT's efforts moved beyond the focus on equipment and technologies to focusing on transforming the ways the military conducts warfighting.

The basic premise of the Transformation Chair position was that true transformation cannot be simply directed from above – there had to be thrust from below for change and acceptance of change at the senior level. Vice Admiral Cebrowski believed that our educational system was the perfect breeding ground for building a ground swell from below for change and hence wanted a chair at each PME educational institution to foster, encourage and direct that change with the student body. The students after graduation would go out to take those thoughts and push them up; as the students became senior leaders, would then push these ideas down.

As a result of a shifting focus to *how* the military conducts warfighting, OFT placed emphasis on the predecessor of what we today call "Mission Command." The key was to ensure that all members of the team fully understood the mission and each of their roles in achieving it. As the action progressed, key members could see these actions unfolding on the ground and on their real-time computer screens. The response from these key members would be to take appropriate actions when and where required to accomplish the mission based on understanding intent – all without orders from higher commanders. These combat and support missions together became the foundation for success by each participant having a "Common Operating Picture" of what is happening on the battlefield and taking actions accordingly. They were in essence "experiencing" the actions of forces throughout the battlefield on a real-time basis using world-class simulation capability. This formed the basis for "experiencing the action real-time" so that they participated directly in the Experiential Learning of how to fight in these fluid combat situations.

The Past Role of Professional Military Education in Transformation

The period between the World Wars from 1920-1939 provides an illustration of the important roles that Professional Military Education Institutions can have in driving transformational efforts. Just after World War I, the military found the geostrategic setting dramatically changed – and still changing. This time, particularly in the late 1920s and 1930s, was one of "strategic pause." Because the general public did not share military leaders' concerns about rising threats, the military came under great pressure to reduce budgets. In spite of fiscal constraints – perhaps in some part due to them – the US military developed new organizations, doctrine, and

technologies. These developments paid great dividends during World War II, enabling the United States to play the decisive role in winning that war.

Each of the services approached transformation in a unique and innovative way, focusing on the ends of winning the next war in a rapidly changing world. The budding US Army Air Corps found that the driver for change was indeed the technology of the airplane – the means as the driver for transformation. The airplane only partially realized its utility during World War I, but at Maxwell Field, Alabama, young airmen considered how to put this technology to work in the next war. At the end of World War I, airpower "was in its infancy. The new role of three-dimensional warfare was even then foreseen by a few farsighted men."[5] The increasing capability of the airplane drove doctrinal development of strategic bombing to win the future war. The Air Corps' strategic focus during the 1920s and 1930s remained on the ends – but the driver (the bomber) was the means. The Air Corps Tactical School – the predecessor of today's Air Command and Staff School – was the focus for this effort.

After World War I, the Navy deteriorated; yet realized that its ways of approaching future warfare required that it change from relying heavily on battleships to using aircraft-carrier battle groups. In 1934 it began to build up its forces – and in 1940 the service received authorization to build 11 Essex-class aircraft carriers.[6] The goal of winning the war against the rising Japanese naval threat, which led to a change in the way of fighting by shifting to aircraft-carrier groups, served as the Navy's driver for transformation in the 1930s. Much of the development of this new approach to warfighting for the Navy took place at the Naval War College in Newport, Rhode Island.

In the Army, "change agents" for the approach to warfighting included two future senior leaders in World War II – George C. Marshall and George S. Patton. In 1929 Colonel George C. Marshall became assistant commandant of the Infantry School at Fort Benning, Georgia. As head of the Academic Department there, he had a free hand to develop the course of instruction for young officers. The future Chief of Staff of the Army played a key role in developing the doctrine and tactics that his service would use successfully on the battlefield. Forrest C. Pogue notes that Marshall had "strong and revolutionary ideas, many of which had been developing in his mind for some years" and found himself in a "position to apply them to the training of young combat officers [at the] basic training ground for the Army's basic fighting branch." Marshall felt that he "could now transfuse into the Army's main blood stream" the things he had learned and thought.[7]

George S. Patton had strongly encouraged new tactics and the use of the tank for future warfare (at the Army War College, he wrote a thesis entitled "The Probable Characteristics of the Next War and the Organization, Tactics, and Equipment Necessary to Meet Them"), becoming deeply involved in a number of maneuvers that tested the tank in a combined-arms formation. At the beginning of World War II, "there was no living American Soldier who knew as much as Patton about the mobility, mechanical features, fire-power, and tactical use of tanks."[8] The Louisiana Maneuvers provided a test bed for many of his ideas about land warfare. Although Patton did not enjoy immediate success in his efforts to integrate the tank into the US Army, his drive and desire to use it in battle ultimately earned a prominent place for this weapon in modern warfare.[9]

The US Marine Corps underwent the most dramatic change in its approach to warfighting – led by junior officers developing concepts at Quantico, Virginia. Retaining the constabulary forces that characterized the Marines during the 1920s would not allow the Corps to maintain relevance in the looming global war that would require forces to conduct massive amphibious operations. In the early 1930s, the Marine Corps issued the *Tentative Manual for Landing Operations*, which became the bible of American amphibious assault doctrine in World War II, and created the Fleet Marine Force to operate as an integral part of the fleet for the purposes of capturing advanced bases. The Marine doctrine covered all aspects of amphibious assault, including command relationships between land forces and the supporting fleet, ship-to-shore movement and communications, air and gunfire support, and amphibious logistics. No other country in the world, except Japan, had such an advanced doctrine by 1939.[10] The resulting change constituted a completely different function for the Marine Corps, resulting in amphibious doctrine and the necessary equipment (such as the Higgins landing craft) to support the doctrine.

During the interwar period, the US military made enormous strides to transform the warfighting capability of the respective services – and many of these changes were made at places such as Maxwell Field, Quantico, and Newport. GEN Henry H. Shelton, former Chairman of the Joint Chiefs of Staff, noted that transforming the military requires more than just advances in technology; rather, one should focus on the resources and means as well as operational concepts and organizational structures to use these technologies on the battlefield:

> In the 1930s, the Allied powers were hard at work developing new airplanes, tanks, aircraft carriers, radar, and other advanced systems. As war broke out, the Allies had, across the board, better

> technology than the Germans, and more of it. When the Germans invaded France in May of 1940, they had fewer men, fewer artillery tubes, and fewer tanks than the Allies – and the tanks they *did* have were inferior.
>
> But they had revolutionary operational concepts for employing their systems to achieve battlefield effects far greater than the sum of the parts. The next year they stood before the gates of Moscow, having conquered all of Europe from the Arctic Circle to the shores of Greece, from the coast of France to within sight of the Kremlin. In time, the Allies learned the hard lesson that how you *employ* technology is even more important than the technology itself. But these lessons came at a fearful cost (emphasis in original).[11]

The Recent Role of Professional Military Education in Transformation

Carl von Clausewitz wrote that "everything is very simple in war, but the simplest thing is difficult," continuing his treatise with a discussion of friction and how the simplest things get complicated in the "fog of war."[12] Planning and implementing new organizational structures, technologies, and doctrines can indeed prove difficult for an organization as large and steeped in tradition as the US military. As Clausewitz would say, military operations will have more friction in the future. The military has to adjust its institutional character and structures to accommodate these new challenges.

In 1997, Lt Gen Paul Van Riper, Commandant of the Marine Corps' Combat Development Command, and Maj Gen Robert H. Scales Jr., Commandant of the Army War College, published an article in *Parameters* entitled "Preparing for War in the 21st Century." Drawing on the writings of Clausewitz, the authors observed that

> Any sustained period of peace challenges military institutions. It requires holding on to the immutable and terrifying realities of war in a climate of peacetime pursuits and ease, because only by an understanding of what war has been can we hope to glimpse what it will be. To prepare for the future, we must keep a grip on the past.[13]

Essentially, Van Riper and Scales warned against structuring a force to fight the last war, urging us instead to use history as a means to understand what may appear in the future. Years after these two articles appeared,

their message still resonates because of our tendency to cling to the past way of war fighting.

Despite the resistance to change, there have been a number of different studies in the past ten years at the US Army Command and General Staff College to address the challenges of warfighting by leveraging the intellectual capital of officer students in the classroom. These officers, many of them fresh from operational deployments, have unique experiences that they can draw upon to address these challenges. Using the Experiential Learning Model of "experience, reflect, think, and act" provides an approach to develop innovative and adaptive answers to current and future problems.

All of the different studies have been conducted with the ELM approach – and all of them have used a standard problem solving approach: Understand the environment and situation; identify the problem; develop courses of action to address the problem; test and war game the courses of action; and then provide an actionable recommendation for implementation to decision makers. The last item has been particularly useful – providing recommendations that decision makers will consider and possibly put into action adds the dimension that the study "really counts."

The first study at CGSC to leverage intellectual capital was conducted in January-February 2004. This study, sponsored by the US Army G3 IED Task Force/Rapid Equipping Force was entitled the "CGSC Improvised Explosive Device (IED) Study Group." This study, the first of its kind, addressed finding solutions to the IED problem in Iraq. The study looked at a combination of doctrinal and materiel solutions to addressing IEDs and their effects. Sixty-eight officer students and 12 faculty members conducted the research; a detailed 238-page report was completed with a number of recommendations. Many of these recommendations were adopted.

The second study was conducted in January-February 2007 and was initiated within CGSC. This study addressed the first "surge" in Iraq and was entitled the "CGSC Operational Level Iraq Campaign Plan Study Group." This study addressed different alternatives to the operational level Campaign Plan in Iraq and conducted detailed war games for different approaches to allocating coalition forces. This research was conducted by 64 officer students and 12 faculty members; a detailed 568-page report was completed and provided to the Commander of Multi-National Forces – Iraq.

The third study was conducted in November-December 2007 and was sponsored by the Department of Defense's Under Secretary of Defense

(Policy). This study was entitled the "CGSC Global War on Terrorism (GWOT) Domestic Drivers Study Group." This study conducted research on three different domestic emergencies that would require DOD support and addressed the impact of these "domestic drivers" on warfighting operations in Iraq and Afghanistan. This research was conducted by 15 officer students and three faculty members and produced a 68-page report for the USD(P).

The fourth study was conducted in September 2007-April 2008 and was sponsored by the Department of Defense's Assistant Secretary of Defense for Policy Planning. This study was entitled the "CGSC Irregular Warfare Research Study Group." This research addressed a number of recommended topics concerning the conduct of Irregular Warfare. A total of 18 officer students and 2 faculty members conducted the research; a consolidated 141-page report was submitted to USD(P).

The fifth study was conducted in December 2008-January 2009 and was initiated within CGSC. This study addressed the initial surge of forces in Afghanistan and the Command and Control structure in Afghanistan. This study was entitled the "CGSC Afghanistan Operational Campaign Plan Study Group." A total of 32 officer students and five faculty members conducted the research and produced a 162-page report. This report was submitted to the ISAF Commander; many of the recommendations within this report were ultimately adopted.

The sixth study was conducted in October 2008-March 2009 and was sponsored by the Deputy Secretary of Defense under the auspices of the "Academic Year 2008-09 Voluntary Initiative to Leverage the Intellectual Capital of DOD Joint Professional Military Educational (JPME) Institutions." This study was entitled the "CGSC Irregular Warfare Research Study Group." A total of 10 officer students and two faculty members participated in this research and compiled a 78-page report (including the winning essay).

From February 2009-March 2009 there were two parallel study groups that formed the seventh and eight studies at CGSC; both of these studies were self-initiated within CGSC. The seventh report was entitled the "CGSC Private Military Companies Research Study Group" and addressed the number and scope of Private Military Companies in Afghanistan and Iraq. This research was conducted by 17 officer students and two faculty members; this study resulted in a 69-page report that provided support to curriculum development within CGSC.

The eighth study conducted from February 2009-March 2009 was a continuation of the "CGSC Afghanistan Operational Campaign Plan Study Group" and looked specifically at Regional Command South in Afghanistan. This study, entitled the "CGSC Regional Command South Afghanistan Research Study Group" addressed issues specific to RC-South's Area of Operations. A total of 21 officer students and two faculty members produced a 139-page report that was provided to the Commander, RC-South.

The ninth study was conducted from September 2012-December 2012 and initiated within CGSC. This study, the "CGSC Curriculum After Next (CAN) Study Group" was an in-depth study of Professional Military Education and the curriculum at the Command and General Staff College. Three different groups were formed to study the "Curriculum After Next" at CGSC, with a particular focus on addressing needed changes in Academic Year 2014-2015. This research was conducted by 10 officer students and 24 faculty members. During the research, three executive level briefings were provided to the CGSC leadership and over 20 Information Papers were produced.

The tenth study was conducted from September 2013-May 2014 and was sponsored by the Command and General Staff College and the Defense Institutional Reform Initiative (DIRI). This study, entitled the "CGSC Liberia Strategic Study Group" addressed ministerial reform and security cooperation activities in Liberia. This initial research was conducted by eight student officers, who produced a 74-page report and five related master's level theses. Based on the recent actions in Liberia and the Ebola Crisis, this study has entered a second year of study with 21 officer students for Academic Year 2014-15.

The basic methodology for each of these studies was to identify a complex problem and allow students – guided by a senior faculty member – to develop actionable recommendations for decision makers. Students acted as a planning staff, developed specific problem statements to be addressed, and actively war-gamed their recommendations. The results for each of the studies were organized into executive level briefings and detailed reports that outlined the recommendations. For each of these studies, students also "red-teamed" the conclusions and recommendations.

The Way Forward

It is important to remember that CGSC (as well as the other Professional Military Education Institutions) does not exist to provide staff studies "for hire." These institutions have an educational purpose to meet the needs of the students and the force for the future. The current curricula at

PME Institutions do a great job in meeting those requirements. That being said, using the current existing structure and approaches (such as the Experiential Learning Model) does provide an opportunity to meet educational requirements while also providing useful research and recommendations. To draw on the experiences of the students – while also meeting educational requirements – requires careful judgment.

CGSC has seven specific "course outcomes" for the core course; these are to educate officers who:

1. Are prepared to assume warfighting duties immediately upon graduation.
2. Possess the competencies and supporting skills and knowledge that enable them to perform duties effectively and help teams achieve organizational objectives.
3. Are attuned to the complexity of the operating environment and consider the impact of culture on military operations.
4. Take a systems approach to meeting organization- and strategic-level leadership challenges.
5. Are critical and creative thinkers who can adapt and thrive in ambiguous and ever-changing environments.
6. Are self aware and motivated to continue learning and improving throughout their careers.
7. Are skilled at communicating critical information clearly to reach a shared understanding of issues and solutions.

Leveraging "intellectual capital" to "tackle the impossible" and to solve real-world problems – for at least some of the officer students – fully supports meeting these course outcomes. This is particularly true for the following course outcomes: #3 (*Are attuned to the complexity of the operating environment and consider the impact of culture on military operations*); #4 (*Take a systems approach to meeting organization- and strategic-level leadership challenges*); #5 (*Are critical and creative thinkers who can adapt and thrive in ambiguous and ever-changing environments*); and #7 (*Are skilled at communicating critical information clearly to reach a shared understanding of issues and solutions*). All of these course outcomes can be reinforced by this approach.

This approach does, however, come with a cost. The studies must be limited; these studies should only augment the existing structures. There must be relevance to the studies; it was obvious that the IED study was

relevant and addressed a critical issue. There should also be sponsorship for the studies; work on studies of this type should have key decision makers who are interested and invested in the products. Finally, the studies should also be focused; there has to be an attainable product – an actionable recommendation, some insight, or way forward.

The Chairman of the Joint Chiefs of Staff, GEN Martin Dempsey, wrote the following in the Foreword of the *Capstone Concept for Joint Operations: Joint Force 2020*:

> The reality of force development is that about 80% of Joint Force 2020 is programmed or exists today. We do, however, have an opportunity to be innovative in two ways. We can significantly change the other 20% of the force, and we can change the way we use the entire force. While new capabilities will be essential, many of our most important advancements will come through innovations in training, education, personnel management, and leadership development.[14]

Leveraging our intellectual capital and "tackling the impossible" at our PME institutions is one way we have been successful in the past – and an approach we can use to be innovative and find potential solutions to the challenges of our future.

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Chapter 2
Insights for a Committed Learning Environment

Richard M. Meinhart[1]

> . . .we shall teach each other: first because we have a vast amount of experience behind us, and secondly, in my opinion, it is only through free criticism of each other's ideas that truth can be thrashed out . . . . during your course here no one is going to compel you to work, for the simple reason that a man who requires to be driven is not worth the driving . . . . thus you will become your own students and until you learn how to teach yourselves, you will never be taught by others. [2]
>
> – J.F.C. FULLER

Abstract

When educating adults, it is critically important to create a committed versus compliant learning environment, which inspires one to learn very deeply on wide variety of complex subjects and their associated challenges. A committed learning environment creates insights that will be deeply ingrained into one's thinking, so they can be implicitly or explicitly applied to address these complex challenges students will face upon graduation. This chapter broadly examines ways to build a committed learning environment from curriculum, student, and seminar perspectives. In doing this, it draws upon a wide range of education subjects associated with the following: applying adult learning concepts; proper use of different stages of Bloom's learning taxonomies; enabling different types of discourse to fully examine complex and uncertain issues with a strategic perspective; applying team building concepts within a seminar to create trust and commitment; and the importance of and ways to encourage reflection to enable one's learning. This chapter provides insights on the synergistic application of these education subjects from the academic literature and the author's perspectives associated with educating future senior leaders at the United States Army War College for almost two decades. This chapter's overall focus is to help shape students and faculty thinking on how best to approach and complete an educational journey with a committed learning focus.

Introduction

The above quote from a 1923 lecture by J.F.C. Fuller, a well-respected British military historian and educator, is on the wall of every seminar

room at the United States Army War College (USAWC).[3] These words provide broad insights to an expected interaction among students and faculty that is associated with a committed seminar learning environment. To amplify the thoughts in Fuller's quote and provide insights on how faculty can help develop a committed learning environment from curricula, student, and seminar perspectives, this chapter examines five key educational subjects that support the inquiry-driven model of graduate study that is the basis of the college's education philosophy.[4] This chapter also provides the reader insights on different ways to establish a committed learning environment using examples from the college's curriculum and seminar dynamics associated with a student's 10-month residence educational journey, where they can earn a Master's Degree in Strategic Studies.[5]

This chapter describes broad differences between a committed versus compliant learning environment to provide context to apply five key education subjects associated with developing and executing curriculum. The first two educational subjects are properly applying the theory associated with adult learning and Bloom's learning taxonomy to collectively influence curriculum design and execution that creates an intellectual foundation for a committed learning environment. The third educational subject is associated with three different types of seminar discourse related to conversation, discussion, and dialogue. The proper use of these varied discourse types will help build a more committed student and seminar learning environment as it encourages the collective intellectual capacity and willingness to explore complex issues from multiple perspectives. The fourth educational subject is applying team-building principles to develop a more trusting seminar learning team, which is essential to enhancing a committed learning environment. Finally, the last educational subject is the importance of reflection, a key part of a student's commitment that helps frame their future thinking from synthesizing academic and practical experiences on curriculum subjects.

There are five key education subjects associated with Adult Learning, Bloom's Taxonomy, Discourse, Team Building, and Reflection. These are chosen because properly applying them will directly influence developing a committed learning environment from curriculum, student, and seminar perspectives. Each of these subjects is significant in their own right, as numerous scholarly books and articles have been written about them. This chapter briefly examines each subject from an academic perspective and then provides practical examples on how a faculty member should apply them to create a committed learning environment when developing and executing a curriculum. These examples are from the author's experience

in educating students for almost two decades at the USAWC and recent discussions with faculty and students on commitment. These five educational subjects, if applied properly, combine synergistically to help create a committed learning environment from curriculum, student and seminar perspectives. Figure 1 provides a way to visualize the synergistic relationship of these educational subjects.

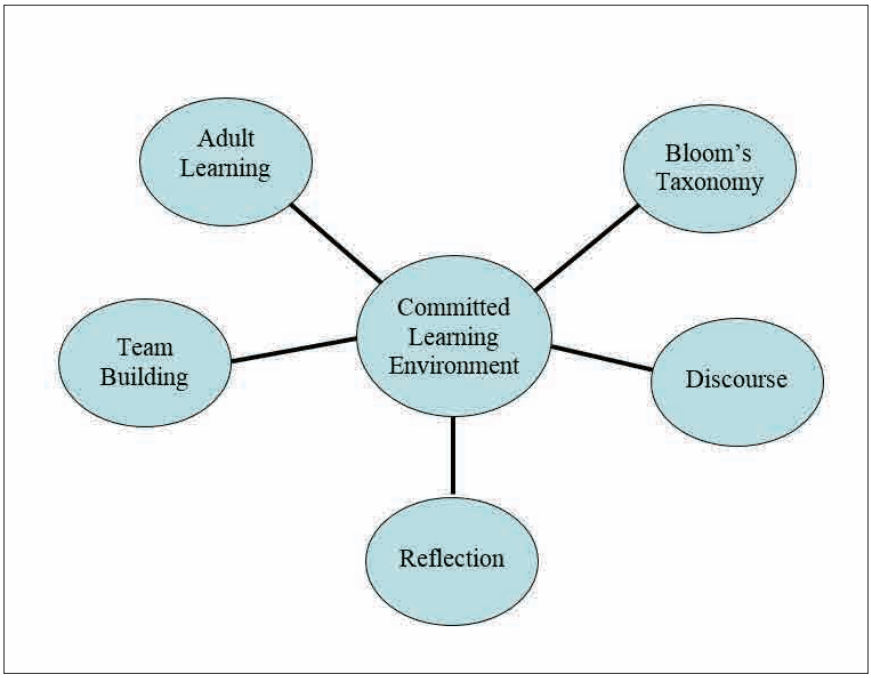

Figure 1. Committed Learning Environment. Created by author.

Committed Versus Compliant Learning Environment

The educational, as well as the business literature, makes distinctions between creating and maintaining a committed versus compliant learning environment to enable a student/employee to become self-motivated. It describes these distinctions from both faculty/leader and student/employee responsibilities. An underlying thought in many of these articles is developing one's emotional or self-motivated component to influence overall learning. Some articles use the word "heart" in the article's title when making the distinctions between being committed versus compliant.[6] The most straightforward way to articulate the difference between a truly committed versus compliant student is that a committed student wants to learn

versus being told what to learn, as they make the emotional attachment to the subject, faculty, or seminar.[7] While a student may be unfamiliar with a particular subject, the manner in which the subject is taught will create a committed learning environment over time. Faculty observations suggest that students with emotional attachment work much harder, since they feel responsible for others' learning within a seminar in addition to their own learning. This intrinsic motivation is often obvious in the creative ways students complete their assignments, and the additional research they willingly do during their studies.[8]

Commitment is not just a student responsibility, as some have argued that student commitment to some or a great degree depends on the faculty's commitment to helping all students learn.[9] The faculty has the responsibility to develop the curriculum that is relevant to the students' future challenges and is focused on insights and ways to use what is learned. Key aspects of this faculty commitment are associated with being approachable, how you interact within and outside of formal classroom sessions, and the ways you show enthusiasm for the curriculum.[10] In addition, the manner by which faculty respectfully and reflectively listen to students, ask thoughtful questions, and encourage positives further contributes to a committed seminar environment.[11]

Before discussing how these five educational concepts are related to a committed learning environment from curriculum, seminar, and student perspectives, a short examination of the USAWC's seminar composition, faculty teaching team, and curriculum is warranted. This will enable the reader to better apply insights from this chapter to his/her own educational experiences.

Seminar Composition and Curriculum

To appreciate how these five education subjects are applied at the USAWC one must first understand the college's seminar composition and curriculum. The college's resident class has approximately 380 students divided into 24 seminars of 16 students each. The students are generally in their late 30s or early 40s, and have approximately 20 years of military or federal civilian service. Military officers are in the rank of Lieutenant Colonel or Colonel, and civilians are in Grades GS-14 or 15. Each seminar is selected deliberately to be diverse with students from different occupational backgrounds that range from infantry to intelligence to logistics to aviation to special forces. The average seminar has one GS-14 or 15 civilian, and officers at the rank of Lieutenant Colonel or Colonel (or equivalent) from each of the services, with 1-2 coming each

from the Air Force and sea services, 3-4 from our international partners and 8-9 from the US Army. Further, one or two students have National Guard or Reserve experiences. This seminar composition adds to a vibrant intellectual diversity as one's thinking is shaped in some way by one's prior experiences.

From each of the three academic departments there is one teaching faculty member assigned to each seminar, and collectively they have a mixture of practical and academic experiences to teach the college's core curriculum. In addition, a historian may be assigned to each seminar to ensure history is properly integrated throughout the academic year. Finally, other members of the college may affiliate with a seminar to provide their functional expertise when needed. In summary, there is considerable work that goes into developing the seminar's faculty team, with a balance between civilian and military officers and recent and veteran professors to further enhance a seminar's intellectual diversity.

The seminar stays intact for seven months from August through February to examine subjects described by the following core course titles: Strategic Leadership, Theory of War and Strategy, National Security Policy and Strategy, Theater Strategy and Campaigning, and Defense Management. During this seven-month period, students also take a regional studies course of their choice that examines one of seven geographic global regions. An average class day consists of approximately three hours of contact time with four lessons each week. This class is usually done in seminar format, though some instructional periods have a lecturer who speaks to the entire class prior to the seminar discussion. On occasion, the students engage in more interactive course exercises or war-games, and these are generally full-day classes.

The next three months the seminar is no longer learning together. This timeframe begins with the Oral Comprehensive Exams, where students are asked comprehensive questions by a different faculty team as they must demonstrate an ability to integrate core curriculum concepts, which is a requirement to graduate. Students then take ten credit hours of electives based on their specific interests. The college takes the students on field studies to New York City and Washington, DC to engage with leaders in business, media, the defense industry and congress. For the final week the seminar comes together for a short high-level forum with civilian leaders from across the US where national security issues are discussed. With this brief description of the seminar composition and curriculum focus, the chapter will now cover how adult learning is applied in curriculum design and execution with a committed learning focus.

Adult Learning

The educational focus associated with adult learning is based upon research in the beginning of the 20th century that was documented in the 1928 book appropriately titled *Adult Learning.*[12] The adult education paradigm and associated teaching methodology gained additional traction from work by Malcolm Knowles, and in 1973 he published the widely read book *The Adult Learner: A Neglected Species.*[13] He articulated the differences between educating adults, described as andragogy, and educating pre-adults, described as pedagogy. Adults, because of life experiences, are motivated to learn in different ways than younger students, which must be considered when designing and executing the curriculum. Knowles identified the following five broad assumptions to underpin this andragogy philosophy: (1) adults increasingly become self-directed in their learning approach; (2) their life experiences are a rich resource for learning; (3) their learning needs are closely related to changing social roles; (4) their time perspective to apply what is learned is more immediate; and (5) their learning orientation is more problem centered.[14] From this brief description of adult learning, a critical question that will now be answered is: *How do adult learning assumptions affect curriculum and faculty responsibilities associated with developing a committed learning environment?*

Knowles' first adult learning assumption related to self-directed learning is perhaps the most important to develop a committed learning environment. This self-directed approach is leveraged by a faculty advisor working with students to help them develop an individual learning plan during the first month of studies and execute it throughout the year with faculty mentoring. Hence, the students help design their educational journey within the college's overall educational framework. Another way this self-directed approach can be leveraged by faculty to increase student commitment is to provide them the opportunity to write about subjects that they want to conduct research on versus assigning students an exact writing topic. A colleague once said to me that "writing is a window to the mind" to emphasize this approach.

Knowles' second adult learning assumption of a person's experiences being a rich learning resource is realized by encouraging and leveraging relevant student experiences to create a committed seminar learning environment. Consequently, more often faculty need to facilitate subjects in seminar to bring out these rich experiences rather than directly teach subjects through lecture. Knowles' third adult learning assumption that learning needs are related to changing social roles is that students want to focus more on subjects that address their future leadership roles (their

changing social role). Upon graduation, students will be interacting across higher organizational levels with greater responsibilities to include those at the strategic level. The college's curriculum focus at the strategic level and students' future leadership challenges address this assumption.

Knowles's fourth adult learning assumption related to a more immediate time perspective and fifth assumption of a problem-centered approach are very related in that students want to study subjects and problems they are expected to address upon graduation. Hence, curriculum exercises or papers should focus on real-world challenges and what advice students should provide to senior leaders to address these challenges. For example, in the warfighting part of the curriculum, students conduct an exercise to address current strategic challenges in Southeast Asia when studying how to employ war planning concepts and processes. In the leadership part of the curriculum students write papers on Mission Command or Sexual Assault Prevention and Response, which are examples of potentially relevent issues they will address upon graduation.

Research by other scholars in the educational community somewhat disagreed with Knowles' approach that broadly specified differences between andragogy versus pedagogy. They believed Knowles' learning differences and associated assumptions between pre-adults and adults were too general in nature and did not reflect an individual's learning approach. Instead, they applied adult-learning research to espouse an education philosophy under a framework called self-directed learning (SDL).[15] In this framework, adult learners gain greater learning independence, as they progress through different learning stages and accept greater responsibility for their learning. This greater interdependence more smoothly addresses an individual's personal learning process. Educational expert Dr. Gerald Grow articulated this SDL philosophy by developing a straightforward, four-stage learning model where the learner's motivation and self-direction changes from low to moderate to intermediate and finally to high.[16]

Grow's four-stage learning model identifies not only a learner's motivation and associated behaviors but resultant faculty perspectives, both of which are relevant to appreciating the characteristics of a committed learning environment. In Stage 1, the student is not interested in or familiar at all with the subject being discussed and is fully dependent on explicit faculty directions. In Stage 2, the student is interested in the subject and may be motivated to learn the material, which can occur from an inspiring lecture and guided faculty discussions. In Stage 3, the student is fully engaged and shows initiative and confidence when exploring subjects as the faculty primarily facilitate the resultant seminar discussion and dialogue.

In Stage 4, the student takes ownership for learning and conducts independent research under faculty mentoring.[17]

Based on faculty experiences at the USAWC, Stage 1 is rarely encountered among the graduate student population. Stage 2 occurs from either Bliss Hall lectures, given by distinguished scholars and our nation's senior leaders, or by faculty in seminar describing complex Defense Department systems and processes used by senior leaders to make decisions such as the Planning, Programming, Budgeting and Execution process. Stage 3 is the most common seminar condition, as faculty often facilitate students' experiences and insights on a wide variety of subjects to achieve higher-level learning objectives. To develop a committed learning environment, an open-ended questioning approach should be used during this stage to gain insights by applying or evaluating what is taught. Stage 4 occurs when students complete their Strategy Research Project, which is a 5,000 to 6,000 word paper on a strategic issue with a faculty member in an advisor role.

Whether an educator prefers using Knowles' assumptions or Grow's four-stage SDL model to describe motivations and interactions between students and faculty, a key point for a committed environment is that students must take responsible ownership for their learning. The faculty must positively respond to that ownership with a facilitating and mentoring rather than a directing approach. The college's curriculum and associated learning environment are different from most students' earlier experiences from undergraduate studies or intermediate-level service colleges in two main areas. First, the curriculum explores issues at the strategic level that often have characteristics associated with being *ill-structured* or of a *wicked* nature within a strategic environment broadly described as volatility, uncertainty, complexity and ambiguity.[18] Second, the curriculum has to meet Joint Learning Areas that are predominately focused at the higher learning levels of Bloom's taxonomy; levels that require analysis or evaluation of subjects vice knowledge or comprehension.[19]

Another way the college addresses the self-motivated learning approach is in course assessments. Faculty formally assess students individually in each course on how well they achieved or exceeded standards in meeting course objectives in the three categories of seminar contribution, writing, and overall. The standards are quite substantial with the assessment criteria specified in a Course Directive and Communicative Arts Directive. Upon graduation, a number of students are recognized as distinguished graduates based on their ability to consistently exceed standards on core academic courses, research project, and comprehensive exam. Further,

about 25 writing and research awards are presented at graduation to recognize significant individual work that adds to the academic body of knowledge. The college also provides numerous noontime lectures on a variety of subjects that are optional, but often widely attended. In total, this assessment approach develops a more self-motivated learning experience that encourages commitment. This learning focus is also enabled by how Bloom's taxonomy is applied as curriculum is developed and executed, which will now be covered.

Bloom's Taxonomy

One needs to understand Bloom's taxonomy within the cognitive domain to gain a greater appreciation of how lesson and course learning objectives are related to a committed learning environment.[20] Within the cognitive domain, Bloom specified six levels of learning, which sequentially go from the lower knowledge level, to comprehension, to application, to analysis, to synthesis, and finally to evaluation. Since lesson authors and course directors use verbs associated with these six different cognitive learning levels to specify lesson and course objectives, understanding and applying this taxonomy helps one better integrate adult learning assumptions. In the college's core course learning objectives for Academic Year 2014, five were at Bloom's first two levels, ten were at the second two levels, and seven were at the highest two levels. This overall stratification reflects the college's graduate-level education focus and the Joint Chiefs of Staff's learning criteria for joint professional military accreditation at senior service colleges.[21]

The first cognitive level, called knowledge, focuses on knowing something, such as a definition or raw data. Learning objectives use verbs such as define, describe, or know to identify this basic level. The next level, called comprehension, focuses on grasping the meaning of the information presented or being able to describe it in your own words. Learning objectives use verbs such as explain, comprehend, or understand to identify this level. Some of a lesson's readings, and when faculty introduce a subject to first start the seminar discourse, are mainly at these two basic cognitive levels. The link to a committed learning environment is that this allows everyone in the seminar to have a common knowledge or comprehension level on a subject before proceeding to the higher levels of learning as a lesson and course progresses.

The words application and analysis describe the next two Bloom's taxonomy levels. Application is the ability to apply that lesson's knowledge or concepts to actual problems or issues. Verbs that identify learning

objectives for this third cognitive level are use, apply, or solve. Analysis is the ability to break down the whole into component parts and see how they are interrelated or interact. Verbs that specify this fourth cognitive level are analyze, appraise, or examine. The link to a committed learning environment is that, as students and faculty discuss the readings and integrate their experiences and insights, the seminar is at these middle two learning levels. More course learning objectives focused at this level are in line with adult learning assumptions.

The words synthesis and evaluate describe the last two higher cognitive levels. Synthesis involves creating a new meaning or rearranging the ideas covered into new paradigms. Verbs that identify this cognitive level are combine, develop, or synthesize. The highest cognitive level of evaluation results in informed judgments about the value of ideas or concepts. Verbs that specify this level are evaluate, conclude, or appraise. These highest learning levels require a mastery of the other learning levels and the ability of a student and even the seminar to reflect. Individual lessons generally do not address these two higher levels unless they involve case studies or an exercise. The integration of the various lesson materiel and seminar discourse from all of the lessons enables the achievement of the higher course learning levels, which are essential to a learning environment appreciated by committed adult learners.

In total, achieving different learning levels defined by Bloom's taxonomy depends to a great deal on the type and quality of seminar discourse. To achieve different learning levels associated with lesson and course objectives requires an understanding and application of the characteristics associated with different seminar discourse types, a subject now examined with a committed learning environment perspective.

Discourse

Conversation, discussion, and dialogue are three distinct types of communication that comprise seminar discourse.[22] Furthermore, discussion can be further categorized in two different ways by the words *persuasion* and *democratic*.[23] Each one of these discourse types has different characteristics and purpose, but when properly used they all contribute to developing a committed learning environment and achieving learning objectives at different levels of Bloom's taxonomy.

The first and most basic discourse in seminar is conversation. This occurs from the first day as seminar members first start to learn about each other. Conversation helps start the implicit bonding process where diverse individuals begin to engage with each other to develop into a team.

Generally, conversation seeks equilibrium and is a pleasant exchange or bantering of thoughts and feelings about an issue that is less formal and structured. Conversation evolves as seminar members get to know one another better and continues all year with different levels of human interest where the "best conversations maintain a tension between seriousness and playfulness."[24] Overall, conversation focuses primarily at Bloom's lower two learning levels. A link to a committed learning environment is that faculty should have conversations with students before or after a lesson as this begins the processes to develop committed interactions with students and their learning, as it helps identify a faculty's needed approachability.[25]

Discussion is the next type of seminar discourse that is more structured than conversation, which enables the seminar or student to get closure on an issue. Discussion focuses on an intellectual give-and-take when analyzing issues or applying concepts from varied perspectives. Peter Senge, in his book *The Fifth Discipline*, compares discussion with the words percussion and concussion due to root word similarities and argues that in discussion "you fundamentally want your view to prevail."[26] In essence, this perspective implies a type of discussion that primarily builds on other's ideas to support your views. Overall, the adjective *persuasive* best describes this type of discussion. While discuss is a verb initially recognized under the comprehension learning level, seminar learning that most often reflects persuasive discussions are Bloom's middle levels of apply and analyze, but it can go to the next higher levels depending on that discussion's underlying purpose. To enable student commitment, faculty should facilitate discussions of students in seminar versus being persuasive in providing their views so as not to anchor students' thinking with a "right" answer. Further, faculty must ensure when discussing an issue that all views are fully valued and examined, even if most in the seminar disagree with a particular view. This can minimize the potential adverse impact that too many persuasive discussions may have on a committed learning environment.

Others, who do not agree with discussion's underlying persuasive motivation described in the preceding paragraph, describe discussion as being a more open exchange of ideas and use the adjective *democratic* to describe it. Brookfield and Preskill in their book, *Discussion as a Way of Teaching*, described nine different classroom discussion dispositions under the heading, *Discussion in a Democratic Society*. These nine different dispositions are hospitality, participation, mindfulness, humility, mutuality, deliberation, appreciation, hope, and autonomy.[27]

These dispositions can be useful and more effective than persuasive discussions in creating a committed learning environment that focuses on achieving Bloom's two middle learning levels, while allowing learning to smoothly transition to the next two highest levels. Hospitality occurs within a seminar when everyone feels invited to participate, which enables one to take risk and share strongly-held views. Participation involves sharing views that add to depth and subtlety, while realizing that not everyone need say something, as respectful silence is valued. Mindfulness is associated with paying close attention to what precisely is said and being aware of the overall context. Humility builds on mindfulness when one acknowledges their limited knowledge and values learning from others' different views. Mutuality occurs when seminar members realize that everyone's learning is important to create a spirit of goodwill. Deliberation involves offering arguments and counter-arguments supported by evidence and logic to convince others. Appreciation involves expressing gratitude to another for their insights that raises the level of respect for other perspectives. Hope involves reaching a new level of understanding or perspective. Finally, autonomy involves being willing to take strong stands or have the courage to hold views not widely shared.[28] Again, faculty need to facilitate seminar discussions in an open manner that enables all of these discussion dispositions to occur to develop both student and seminar learning commitment.

Dialogue is the final type of seminar discourse that tends to be more exploratory in nature than discussion and focuses more on inquiry. Dialogue causes one to be more inclined to ask "why" when exploring an issue, and this takes learning beyond one's own understanding to have a freer flow of exploration from multiple perspectives as one becomes an observer of their thinking.[29] In essence, dialogue enables students in seminar to gain deeper insights on complex issues that could not occur from individual work. As such, seminar dialogue focuses more on the higher learning levels to first fully analyze and then evaluate issues.

To develop a team-learning discipline associated with dialogue, which allows students and seminars to reflect upon their individual and collective thinking, requires three basic conditions.[30] The first condition is the willingness to suspend assumptions. This is the key difference when comparing dialogue with discussion's persuasive or democratic characteristics. Suspending assumptions means explicitly being aware of your assumptions, being aware of how they influence thinking, and holding them up for reexamination. While difficult to do, suspending assumptions does not mean discarding them. The second condition for dialogue to occur is that seminar members must see each other as colleagues, be fully open, and

create the positive energy in properly questioning others or ideas. The last condition for dialogue to occur is the need for a facilitator, who holds the issue's context and flow and asks the right questions to spur positive inquiry. Being a facilitator is an important faculty responsibility. Achieving and maintaining these three conditions for dialogue are hard work that requires disciplined intellectual thought, which enables a committed student and seminar by the willingness to explore others' perspectives before determining your own.

All three discourse types exist within a seminar with conversation starting the initial contact, discussion in either persuasive or democratic forms that is more structured and enables closure, and dialogue that is more inquiry and exploratory focused. Depending on where you are when examining an issue, there may be times for all types of seminar discourse to synergistically enhance one's overall commitment and seminar learning. However, more of the seminar discourse needs to be focused on democratic discussion and dialogue to enable student and seminar commitment. Understanding and applying characteristics associated with all discourse types provides one the ability to better reflect on and take responsibility for a committed student and seminar learning environment. Further, knowing the sign posts for each type of discourse helps with applying team-building insights to enable a committed seminar learning environment, a topic now covered.

Team Building

The previous section examining different types of seminar discourse is one aspect for gaining insights on ways to develop committed learning habits and techniques and build a seminar team. A seminar, like other small groups, will grow and evolve as the year progresses. Small groups, according to research by Bruce Tuckman in the 1960s, develop through sequential stages described by the following four simple words: forming, storming, norming, and performing.[31] He and others a decade later added a fifth stage called adjourning, which signifies completion. Organizational insights and behaviors associated with these stages are useful to help create a committed learning environment.

The forming stage of team building at the USAWC begins when the seminar initially meets with members introducing themselves, learning about others' backgrounds, becoming acquainted with the college's opportunities, and clarifying expectations. At this stage, people are normally polite, operate somewhat independently, and cover issues superficially. The collective seminar learning that occurs at this stage is predominately

at Bloom's lower two levels, although individuals based on their internal motivation can achieve a higher level. Generally, the seminar quickly moves beyond this forming stage, which is needed to begin to develop a committed seminar learning environment.

The storming stage of team building, as the word suggests, is characterized by intra-group conflict. This occurs as different ideas or students actively compete for their views to be accepted, disagreements over decisions are passionately voiced, and frustrations are visible, all of which may cause one to shut down. This can occur if persuasive discussions routinely dominate seminar discourse, which occurs if members are mainly focused on wanting their individual views to prevail and become leaders within the seminar. Furthermore, some issues may have emotional connotations that are not readily apparent based on the topic, but can elicit an unexpected personal response from someone. A helpful seminar technique when emotions rise is to "talk to the center of the room," so a response is not taken personally but examined collectively. A technique when an issue generates emotion is to ask students to "count to three" before responding, so their response is not overly reactive and allows time for thinking. As indicated in some of democratic discussions' dispositions, it is "ok" to share strongly-held views, disagree after carefully listening, and hold views not widely shared. However, if seminar behaviors are focused too much at the storming stage then a committed learning environment will begin to degrade.

The norming stage of team building occurs as seminar members adjust their behaviors, begin to work more smoothly and effectively together, share learning, and begin to create a greater collective trust, and leadership within the seminar is sorted. Simply, collective trust is needed for a committed learning environment.[32] Students' and faculty's professional characteristics and motivations enable this stage to occur smoothly and quickly at the USAWC. A negative condition of a norming stage is that sometimes members will not offer contrary views, and a condition called *groupthink* may occur from a desire for harmony.[33] Another expression often heard to describe decisions when conformity is desired over proper dissent is: *We are on the bus to Abilene*. A way faculty can address groupthink is to encourage an opposite perspective and ask to identify its strengths and weaknesses in an open manner. While an individual's learning can be at different Bloom's taxonomy levels, the collective seminar learning at this team-building stage is most often at the middle two levels.

The performing stage occurs when productive teamwork is evident, as members willingly take initiative and responsibility while balancing

autonomy with interdependence, all of which is reflective of a committed learning environment. A performing stage results from the dedication and hard work of all team members – students and faculty. Collectively, the seminar has the capability to achieve the highest learning levels at this stage, as there is an appreciation of everyone's intellectual contributions and achievements. Dissent can occur during this stage, but it will be positively resolved, sometimes with humor or with an open-ended questioning approach. The one caution is that once a seminar achieves this performing stage, and my experiences reveal USAWC seminars will achieve it, internal monitoring must still take place. This internal monitoring ensures the seminar stays at this stage, since a natural tendency toward complacency or a norming stage may try to assert itself.[34]

The adjourning stage occurs when a group is no longer together, and this can create an element of anxiety or sadness. A way to describe this at the USAWC is graduation day. However, seminars often stay in contact through a variety of electronic means to keep updated on member's actions or even have reunions, reflecting those strong bonds developed during the year. Some seminars set up groups on Facebook and LinkedIn just before graduation to enable learning to continue. These strong bonds are the result of a committed learning environment. Hence, collective seminar insights and learning can continue well beyond graduation.

Seminars go through these team-building stages with some stages more quickly passed through than others depending on interpersonal and institutional dynamics, as well as shared learning cultures developed from other educational or operational experiences. Furthermore, seminars sometimes go back and forth among these stages. This can occur when major changes affect the existing learning rhythm, such as different group tasks, new course material, or different faculty. However, when a seminar is at the performing stage it is more likely to stay there. The travel through these stages identifies an important individual and seminar responsibility, which is the need to self-monitor either implicitly or explicitly, to ensure needed cohesiveness and trust for a committed learning environment. This last point of self-monitoring brings to the forefront this article's last point, the importance of reflection.

Reflection

The subject of reflection was included because many senior leaders, when addressing USAWC students in Bliss Hall, have spoken passionately about their senior service college experience a decade or more earlier as a valued opportunity to view issues from many different perspectives and

shape their thinking.[35] In essence, they had the opportunity to reflect on complex national security issues rather than make time-critical decisions or lead organizations associated with their previous responsibilities. While reflection has many different definitions, a useful one is: *the thought, idea or opinion on a subject from consideration or meditation*.[36] Reflection requires hard work, as rigorous, disciplined thought is required, which is related to an individual's commitment.

A reflective learning approach can be organized into the three categories of subject, personal, and critical.[37] The subject category deals with specific insights one gains for future use from lesson or course materiel on a particular subject. This occurs as students gain insights from the wide variety of materiel in core courses and electives. The personal category deals with the concept of what you are learning about your own thinking or insights. This occurs as one's thinking is challenged or insights are gained about the habits of the mind from varied seminar discourse during core courses and after class in other social or academic settings.[38] The critical category deals with the learning associated with challenging one's assumptions and beliefs, even if those beliefs and assumptions do not change. Reflective learning associated with each of these three categories have different outcomes, but they are synergistic in nature in enabling a student's commitment as one considers issues within different contexts and they combine to shape future decisions.

Adult learning assumptions, Bloom's taxonomy, seminar discourse types, and team building stages address these three broad reflection categories, all of which influence one's learning commitment. Subject reflection occurs as the adult learner considers and evaluates relevant curriculum subjects. Personal reflection occurs more often when achieving lesson and course learning objectives at the higher levels of Bloom's taxonomy, which are helpful to spur reflective inquiry. Seminar discourse associated with discussion that combines openness, careful listening, and logical give-and-take contributes to reflection on both subject and personal categories. Seminar discourse associated with dialogue, which requires one to suspend assumptions, deals more with the critical reflection category. Faculty can enable reflection by asking more "why" versus "what" questions and exploring "how one could" use curriculum concepts in the near future. Achieving the team building stage of a performing seminar contributes to all three reflection categories, both individually and collectively, to help develop students' commitment.

Individual techniques that enable reflection in all three categories include asking questions of yourself, keeping a journal, updating a

learning plan, and doing independent research. Ask yourself questions such as: *What did I really learn today?* or *How did this experience change my thinking?* Another way to develop reflective judgment is to keep a journal focused on what was learned versus what was taught. Insights written down stay longer in one's collective memory, and these insights can later be explicitly reviewed. While the USAWC requires students to develop an individual learning plan within the first month, updating this plan as the year progresses helps spur reflection and one's commitment to learning. Writing and research experiences, especially the college's strategy research paper and the opportunity to write a personal experience monograph, provide different opportunities to reflect more deeply in all categories.

Conclusions

This chapter broadly examined education subjects associated with adult learning, learning taxonomy, discourse types, team building, and reflection, all of which in different ways contribute to a committed learning environment from curriculum, student, and seminar perspectives. Informed by the author's educational experiences at the Army War College over almost two decades, the chapter broadly applied these education subjects to identify the conditions for a committed learning environment from curriculum, student, and seminar perspectives.

In summary, when developing curricula, faculty need to integrate adult learning assumptions and focus on higher levels of Bloom's learning taxonomy to help set the foundation for a committed learning environment. When executing a curriculum, faculty need to facilitate seminar discourse that seamlessly transitions from conversation to discussion to dialogue as the issue is being examined at higher Bloom's taxonomy learning levels, but there should be a greater focus on democratic discussions and dialogue. In doing so, faculty must ensure that all students' views are valued, multiple perspectives are encouraged, and an open-ended questioning approach is used. Faculty need to encourage team-building behaviors to get to the performing stage, while creating the collective trust and mutual respect for other's views needed for a committed seminar learning team. This committed seminar team environment enables the student and seminar to collectively examine an issue at higher Bloom's taxonomy learning levels, while encouraging the student to reflect on issues from personal, subject, and critical categories by asking more "why" versus "what" questions. While developing and executing the curriculum, faculty also need to be available to students outside of seminar and create flexibility in course

assignments focused on topics students want to research to continue to enhance a committed learning environment.

The chapter's overall intent was to provide insights to help shape student and faculty thinking on how best to approach and complete an educational journey with a committed learning focus. While these insights are from the author's teaching experiences at the Army War College, many of them are applicable at other educational institutions and classrooms. Finally, reflecting on this article's concepts will provide additional insights into what J.F.C. Fuller's opening quote implies both individually and collectively in a seminar learning environment.

Notes

1. The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Army, Department of Defense, or the US Government. It builds upon an earlier faculty paper by the author used for faculty development at the US Army War College.

2. Peter G. Tsouras, *Book of Military Quotations* (Zenith Imprint, 2005), 274.

3. Tsouras, *Book of Military Quotations*, 274.

4. William E. Rapp, *Academic Programs Academic Year 2015*, accessed 25 May 2015, http://www.carlisle.army.mil/documents/AY2015%20Academic%20Programs.pdf, 9.

5. The college is accredited by the Middle States Commission of Higher Education.

6. The heart is mentioned in Mac McIntire Innovative Management Group, "Commitment vs Compliance: Ten Reasons Why You Need Your Workers Hearts not just their Hands,"accessed 15 May 2015, http://www.imglv.com/articles/Commitment_vs._Compliance.pdf; and *Kathleen Stinnett, "*Compliance vs Commitment: The Heart of the Matter," September 29, 2010, accessed 18 May 2015, http://zingerfolkman.com/compliance-vs-comittemt-the-heart-of-the-matter/.

7. Author's insights from seminar teaching experiences and articles on committed environments.

8. Michael Beck, "Compliance vs Commitment," 11 March 2014, accessed 20 May 2015, http://www.michaeljbeck.com/leadership/4784.

9. Ben Johnson, "Student Commitment Depends on Teacher Commitment," accessed 20 May 2015, http://www.edutopia.org/blog/student-commitment-depends-on-teachers-ben-johnson.

10. Center for Excellence in Teaching, University of Southern California, "Showing Commitment to Teaching and Learning," *The TA Handbook 1997-98*, accessed 20 May 2015, http://cet.usc.edu/resources/teaching_learning/docs/teaching_nuggets_docs/2.2_Showing_Commitment_to_Teaching_and_Learning.pdf.

11. Tom Drummond, "A Brief Summary of the Best Practices in College Teaching," accessed 25 May 2015, http://teaching.uncc.edu/learning-resources/articles-books/best-practice/instructional-methods/best-practices-summary.

12. Sharan B. Merriam, *The New Update on Adult Learning Theory*, "Chapter 1, Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory," (San Francisco, CA: Jossey-Bass, 2001), 3-4.

13. Sharan B. Merriam, *The New Update on Adult Learning Theory*, "Chapter 1, Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory," 3-5; and Malcolm Knowles, *The Adult Learner A Neglected Species*, (Houston, TX: Gulf Publishing1973 and 1978), ix.

14. Malcolm Knowles, *The Adult Learner A Neglected Species*, 108-110 and Sharan B. Merriam, *The New Update on Adult Learning Theory*, "Chapter 1, Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory," 5.

15. Merriam, *The New Update on Adult Learning Theory*, 9-10.

16. Gerald Grow, "Teaching Learners to be Self-Directed," accessed 15 May 2015, http://www.longleaf.net/ggrow/SSDL/Model.html.

17. Stage descriptions come from the article by Gerald Grow, "Teaching Learners to be Self-Directed," accessed 15 May 2015, http://www.longleaf.net/ggrow/SSDL/Model.html.

18. For more information on ill-structured problems, see King and Kitchner's book, *Developing Reflective Judgment*. For more information on wicked problems see Camillus's article, *Strategy as a Wicked Problem* in May 2008 Harvard Business Review. For more information on the strategic environment, see the 2010 Army War College's *Strategic Leadership Primer*.

19. Chairman Joint Chiefs of Staff Instruction 1800.01E, Officer Professional Military Education Policy, 29 May 2015. A review of joint learning area objectives at Service Intermediate Level college showed that 37 out of 43 objectives were at the comprehend level. For Senior Service college, there were no joint learning objectives at the comprehend level and 16 out of 26 objectives were at the evaluate level.

20. "Bloom's Taxonomy of Learning Domains," acessed 15 May 2015, http://www.nwlink.com/~Donclark/hrd/bloom.html; and "Bloom's Taxonomy: Learning Objective Verbs at Each Blooms Taxonomy Level," acessed 15 May 2015, http://www.au.af.mil/au/awc/awcgate/edref/bloom.htm. Material on the taxonomy and verbs in this paragraph and others come from these sources and the author's experiences. There is now a seventh level of taxonomy called creating.

21. The Bloom's taxonomy joint learning taxonomy specified in Chairman Joint Chiefs of Staff Instruction 1800.01D, 15 July 2009. For senior service colleges, 4 were at apply, 6 at analyze, 1 at synthesize and 12 at evaluate. The USAWC passed Joint Chief of Staff Accreditation that reflects these July 2009 learning levels. The most recent CJCSI, 19 May 2015, has similar joint learning taxonomy levels (see endnote 18).

22. Stephen D. Brookfield and Stephen Preskill, *Discussion as a Way of Teaching* (San Francisco, CA: John Wiley and Sons, 1990), 1-7.

23. Brookfield and Preskill, *Discussion as a Way of Teaching,* XV-5; and Peter M. Senge, *The Fifth Discipline* (New York, NY: Currency Doubleday, 1990), 240. Senge used the adjective persuasion while Brookfield used the adjective democratic to describe discussion.

24. Brookfield and Preskill, *Discussion as a Way of Teaching,* 4-6.

25. Center for Excellence in Teaching, University of Southern California, "Showing Commitment to Teaching and Learning" *The TA Handbook 1997-98*, accessed 20 May 2015, http://cet.usc.edu/resources/teaching_learning/docs/teaching_nuggets_docs/2.2_Showing_Commitment_to_Teaching_and_Learning.pdf.

26. Peter M. Senge, *The Fifth Discipline*, 240. Senge attributes most of discussion and dialogue's characteristics to physicist David Bohm, a leading quantum theorist.

27. Brookfield and Preskill, Discussion *as a Way of Teaching,* XV-8. The authors used the word democratic to broadly categorize these classroom discussions that reflect the principles of civil discourse associated with a democratic society that "emphasizes the inclusion of the widest variety of perspectives and a self-critical willingness to change what we believe if convinced by the arguments of others."

28. Brookfield and Preskill, *Discussion as a Way of Teaching,* 8-18. The nine dispositions in the above paragraph are summarized from 10 pages in the first Chapter of *Discussion as a Way of Teaching.*

29. Senge, *The Fifth Discipline*, 241-242.

30. Senge, *The Fifth Discipline*, 243-247. The three conditions covered in this paragraph are summarized from Senge.

31. Bruce W. Tuckman, "Developmental Sequence in Small Groups," (Group Facilitation: A Research and Applications Journal, Number 3, spring 2001). Republished article in Psychological Bulletin, Vol 63, Number 6, 1965, accessed 20 May 2015, http://www.infed.org/thinkers/tuckman.htm. The linkage to discourse types and Bloom's taxonomy covered in the following paragraphs are the author's views.

32. Michael Beck, "Compliance vs Commitment" 11 March 2014, acessed 20 May 2015, http://www.michaeljbeck.com/leadership/4784.

33. Glenn M. Parker, *Team Players and Teamwork,* (Jossey-Bass, San Francisco CA, 2008), 141.

34. Parker, *Team Players and Teamwork,* 143-144.

35. Author's insights from listening to Bliss Hall lectures over the past decade and a half.

36. Merriam-Webster's Collegiate Dictionary, (Springfield, MA: Merriam-Webster Incorporated, 1994), 982. This definition combines two of nine different definitions.

37. Patricia Raber Hedberg, "Learning Through Reflective Classroom Practice," *Journal of Management Education* 31(1) (February 2009): 10-12.

38. Hedberg, "Learning Through Reflective Classroom Practice." Habits of the mind are discussed in this article.

Chapter 3
The Changing Face of Military Learning

Sae Schatz, David Fautua, Julian Stodd, and Emilie Reitz

Abstract

Globalization, social media, ever-increasing computing power, and the proliferation of low-cost advanced technologies have created a level of worldwide complexity and rapid change never before seen. To remain competitive in this environment, the US Department of Defense and our coalition allies must identify new ways to empower our forces. In this chapter, we assert that part of that solution includes increased investments in our Human Dimension. Specifically, we argue that military personnel require an expanded set of competencies, higher levels of nuanced skills such as critical thinking and emotional intelligence, and more efficient and agile pathways to expertise, and that achieving these outcomes depends, at least in part, on revising the military learning enterprise.

Towards this end, we outline a vision for the future of military learning, painting a picture of the "art of the possible" and proposing a roadmap that outlines five enabling conditions needed to achieve this future vision. The conditions include: (1) Cultivate ubiquitous learner-centric, technology-enabled instruction; (2) Build upon the foundations of data-driven learning; (3) Foster a learning culture at the organizational level; (4) Encourage and empower social learning; and (5) Draw upon deliberate practices and the evidence-based body-of-knowledge from learning science. Enacting any one of these conditions will pose significant challenges, and particular science or technology gaps associated with each condition create additional hurdles. Nonetheless, we argue that the time is right, in terms of understanding and demand, to take action. One major step in that direction is to agree upon a shared grand strategy, that is a vision for our Human Dimension and the military learning system that empowers it. That is the professional dialog this chapter attempts to help inform and encourage.

Introduction

The essential nature of war remains unchanging, although both its features and the world, in general, continue to evolve at an increasingly rapid pace. Globalization, ever-increasing computing power, and the proliferation of low-cost advanced technologies have created a level of worldwide complexity never before seen. Added to that, the democratization of communication, the rise of social collaborative technology, and an increasingly fluid notion of "nation" and "identity"

enable widespread volatility. Digital communities form and take action around an idea, globally, before it even appears on the mainstream radar. The voices of government, national media, and conventional news outlets now compete with the voices of these multitudinous communities, many of whom provide greater appeal than the alternative formal channels. In short, the ways we learn, live, and collaborate are all shifting. To remain competitive, the US Department of Defense and our coalition allies must identify new, high-value targets that give our forces overmatch and allow us to thrive under volatile, uncertain, complex, and ambiguous (VUCA) circumstances. In this chapter, we assert that investments in our Human Dimension are part of that solution.

The Human Dimension comprises the people, their skills, and the performance-enabling technologies that directly enhance their abilities, such as decision-support systems.[1] Our personnel, or "human capital," carry a heavy burden in the evolving global military environment. They must be prepared to perform a broader range of missions, across all phases of war (from initial deferring activities through post-conflict stabilization and rebuilding), and across an expanded set of missions (including cybersecurity, expanded intelligence analysis, space, civil military affairs, and humanitarian assistance/disaster relief). They must possess the independent decision-making skills to operate without clear *a priori* task direction, because so many challenges they face are novel. They must have the capacity to operate on intent, balance their tactical actions against strategic goals, and integrate multiple domains of sophisticated skills (e.g., soldiering skills, sociocultural understanding, emotional intelligence, resilience, and self-reflection) all within a joint, interagency, intergovernmental, and multinational context. In other words, as Lt. Gen. Robert B. Brown, commanding general of the Army Combined Arms Center, recently remarked:

> For the last dozen years or so, the Army has said it needed people who are "comfortable" in conditions of "ambiguity and uncertainty . . . [but] If you want to win in a complex world, 'comfortable' isn't good enough. We need individuals who improve and thrive in conditions of uncertainty and chaos . . ." Needed to strengthen the human dimension are institutional agility, executing realistic training that replicates the complexity of the world, and the ability to out think the adversary and figure a way out of complex situations.[2]

Representatives from other services have issued similar statements. For instance, the *Marine Corps Vision and Strategy 2025* calls on the community to "prepare Marines for complex conditions and to counter

the unexpected" and to help small unit leaders develop their abilities to "make sound decisions... in an increasingly complex environment while potentially operating in a decentralized manner."[3] And the Chairman, Joint Chiefs of Staff (CJCS) recently published his six "Desired Leader Attributes" that centered on cognitive readiness–type skills, such as anticipation, adaptability, and critical thinking (see Table 1).[4]

Despite the urgency and high-level support for Human Dimension efforts, it seems unlikely that significantly more time will be available to create increased capacity. Therefore, it stands to reason our personnel will need to achieve an expanded set of more sophisticated skills, behaviors, and attitudes within the same (or even less) amount of time. Further, given the VUCA milieu around us, personnel should expect to continuously learn, adapt, and grow across their entire careers. In other words, three fundamental reasons encourage reexamination of the status quo:

(1) The ability to understand the environment and the effect of all instruments of national power
(2) The ability to anticipate and adapt to surprise and uncertainty
(3) The ability to recognize change and lead transitions
(4) The ability to operate on intent through trust, empowerment, and understanding (Mission Command)
(5) The ability to make ethical decisions based on the shared values of the Profession of Arms
(6) The ability to think critically and strategically in applying joint warfighting principles and concepts to joint operations

Table 1. Desired Leader Attributes. CJCS, 2014-2017 Chairman's Joint Training Guidance.

1. **Breadth:** Personnel require an expanded set of competencies
2. **Depth:** Personnel require higher levels of nuanced skills, e.g., critical thinking, anticipation, and empathy
3. **Velocity:** Personnel must gain these competencies more efficiently and have mechanisms for maintaining their relevance in an ever-changing environment

The remainder of our discussion will focus on personnel development as one part of the solution to meeting these issues. (Complementary approaches might include personnel selection, talent management, performance-enhancing technologies, and other external technological or system supports, but these fall outside the scope of this chapter.) The following sections outline a vision for the future of learning within the Department

of Defense and related coalition military agencies, painting a picture of the "art of the possible" and proposing a roadmap that, we believe, may help address the challenges outlined above and release the untapped potential of our Human Dimension.

Vision for the Future of Learning

We envision a military learning environment that produces savvy, agile, and operationally adept individuals, teams, and organizational structures. In this future, our Human Dimension approaches each new challenge with reflection and creativity, the adaptability to notice and react quickly to evolving conditions, and a strategic understanding of the larger system and far-reaching effects of actions taken within it. This future force is not only comfortable in these conditions – but it thrives in them. Personnel develop deep understanding, across a range of cognitive, affective, interpersonal, and physical competences, and they refresh and adapt their knowledge and skills as situations evolve. The organization, too, shifts and grows easily with evolving needs, rapidly capturing and integrating lessons learned and disseminating new ideas painlessly across the enterprise.

To achieve this vision, we need to profoundly redesign the integrated continuum of formal and informal training, education, and operational experience. Hence we use the term "military learning" to more generically refer to this integrated spectrum. We believe that five enabling conditions (defined below) will help bring this vision to life. If effectively realized, these conditions will construct a pervasive learning context – i.e., an intentional, interdependent learning environment composed of processes, technologies, and cultural practices. In other words, these conditions do not represent technologies nor specific modalities of delivery, *per se*. These conditions instead define the enabling context, including interaction types, desired outcomes, and delivery approaches that create the conditions for effective future learning.[5]

Roadmap to the Future Vision

Condition #1: Cultivate ubiquitous learner-centric, technology-enabled instruction

The roadmap begins with the idea of *fully blended* learning or what someone might call *ubiquitous learning*. This concept expands (substantially) upon the traditional definition of blended learning, which generally comprises some classroom delivery plus online elements. The expanded version proposed here parallels the idea of *ubiquitous computing*, i.e., where computing power exists everywhere, fills an essential role in our

everyday lives, but – enabled by smart, transparent technology – fades into the landscape, below active notice.

Stated more plainly, "ubiquitous learning" defines a learning context that is pervasive, omnipresent, and transparent. This necessarily means that formal and informal learning (including just-in-time learning and on-the-job learning) become seamlessly integrated with more formal modes of instruction. This also means that distinctions between training and education – and even between personal development and operational duties – blur. Operational decision-support systems become learning and assessment systems (and vice versa), and all of these technologies also become sensors for detecting context, performance, and tracking lessons learned.

This notion shifts key portions of learning away from something formally bound by time and place, into something continuous, timely, and expressly relevant to each learner's tasks, state, and situation. As the classic study by Benjamin Bloom exemplifies, personalized learning, such as between a tutor and a student, achieves better learning outcomes than more homogenized instruction.[6] Of course, providing individual tutors for students is cost prohibitive, but technologies can help fill this gap. Traditionally, this has been the rallying cry of the intelligent tutoring systems (ITSs) community. Today, that goal of automated, personalized learning has matured to include a more diverse set of formal and informal technologies that, like conventional ITSs, provide intelligent and adaptive learning experiences but across the broad military learning continuum as described above. This is what we mean by the phrase "learner-centric, technology-enabled."

Many decades of research – often funded by the US Department of Defense – have helped to mature the field of adaptive learning technologies and science. Most, if not all, of the raw materials exist to implement the complete vision, but more efforts and integrative work will be required in several key areas. From our perspective, those areas include the following:

Blending of Learning Activities and Operations: Although not a technology, nor even a science *per se*, achieving the ubiquitous learning capability will require new processes and an evolved organizational culture that accepts the notion of "fully blended learning." Trainers, educators, instructional technologists, and operational systems designers (to name a few) will need to demolish the boundaries that separate their disciplines (and domains of ownership). Data, learning content, and even resources will need to be shared across organizational

boundaries. Negotiating the processes to achieve this will likely prove just as challenging as developing the actual technologies that facilitate it.

Personal Assistant for Learning (PAL): Ubiquitous learning must be supported by a variety of systems, starting with a cluster of enabling technologies associated with a Personal Assistant for Learning (PAL). The PAL concept begins with an integrated learner model that captures a person's full range of attributes and formal and informal developmental experiences. Based on this data, it recommends new learning opportunities (macro-adaptation) and can inform micro-adaptation within a given learning context. The PAL must be context-aware (to enable recommendation of just-in-time or opportunistic learning) and incorporate open learner models that enable the individual learner (and, possibly, teachers and supervisors) to view his/her learning trajectory.[7]

More learner-driven options (for both time and delivery): In a ubiquitous learning environment, learners necessarily take more ownership of their own development. This offers several benefits. First, learner-driven growth is often more effective than learning that is "done to" a student. Learner-driven content fosters metacognition (i.e., individuals thinking about their own thinking) and encourages greater personal accountability for growth. It helps students learn not only the content, but also how that content fits within the larger development context (e.g., because they directly see the trajectory of learning) and objectively how they are performing within that context. Technologies that enable learner-driven development promote generative learning processes, encouraging personnel to explore new ideas, try new ways of interacting, and actively apply their learning.[8]

Second, from a practical perspective, learner-driven development is more flexible to the individual. Previously, we've written about "the paradox of the white space;" that is, any given training schedule is already densely filled with no time for more content.[9] However, if personnel can complete a learning task on their own (e.g., an online course accessible anytime/anywhere) then they can most likely find "white space" in their own schedules to meet that requirement. Increasing learner-driven options creates more flexibility. Even unsophisticated delivery of self-paced learning has been shown to be at least equally as effective as other, traditional methods (e.g., classroom-based presentation), while also creating an efficient, more satisfying, and less frustrating learning environment for participants.[10]

To achieve this increase in learner-driven development, we need to leverage enabling capabilities, such as:

- **Transmedia learning**, which enables nonlinear learning across a variety of media modalities and where students can start and stop their learning, shift between different tools and contexts, and gain additional insights from the contrasting delivery styles.
- **Live/virtual/constructive (LVC) modeling and similation**, that is, the technology that directly enables the blending of training content or educational overlays into real-world contexts (and vice versa).
- **Mobile learning**, where "anytime, anywhere" becomes a reality, only constrained by available bandwidth, as learning management systems can flexibly serve content across a multitude of mobile learning access points.

Improved Andragogical Models: To support this future learning vision, in general, as well as the ubiquitous learning capability, specifically, improved instructional models will be needed. These need to have a more robust level of detail versus current broad-based solutions while offering greater scalability versus today's ITSs. The frameworks need to tell us how to best design the open learner models, when to recommend certain learning opportunities or make specific adaptations, and how to best integrate transmedia, LVC, and mobile learning into students' personalized development trajectories.

Condition #2: Build upon the foundations of data-driven learning

The concept of ubiquitous learning requires much more effective and extensive performance measurements and evaluations (where "measurement" or "test" refers to the quality of the data collection and "evaluation" refers to the quality of the interpretation and response to that data). Without measurement, we cannot be agile, we lose efficiency with reinforcing known principles to advanced personnel, and we lose effectiveness by pushing unprepared individuals ahead. Measurement is the lynchpin to the future learning vision. Data-driven learning enables real-time adaptations, whether in an instructional or operational context (which are blended together seamlessly anyhow in the future learning vision), and it will enable organizational adaptability at higher levels. In a world where learning is constant, data in the form of measurements and evaluations will be more pervasive and must be woven into the learning experience.[11]

To mature the idea of data-driven learning, we need to further develop, operationalize, and integrate several core capabilities including the following:

Massive human performance data: Douglas Hubbard, author of *How to Measure Anything*, remarked (during a special event panel at Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) 2014): "The best way to spend 1% of a budget is to use it to optimize the other 99%." Testing and evaluation enables this, and it offers a high return-on-investment because it provides insight, enables adjustments, and allows us to make better decisions by removing some uncertainty around them. Presently, the manpower, personnel, and training system within the military does a relatively poor job testing and evaluating personnel beyond their initial entry (e.g., ASVAB) or their physical factors (e.g., pace of a mile). As Brad Carson, acting Undersecretary of Defense for Personnel and Readiness, wrote in a recent memo:

> In managing personnel, we use only a narrow slice of information about service members and, as a result, we cannot optimize assignment, training, development or utilization of the available talent pool. In short, we have a one-size-fits-all model of production, in which people are not seen as uniquely valuable so much as almost interchangeable inputs into an industrial machine.[12]

Measuring other attributes, as well as managing and analyzing a greatly expanded set of more demanding data, is challenging. Current technologies enable the capture, management, integration, storage, sharing, access, and protection of such big data, but work is needed to integrate the available capabilities and apply them towards the military human performance system, broadly defined.

Performance sensing technologies: Capturing this data will require a range of ancillary technologies, including environmentally based Internet of Things sensors, operational neurophysiological sensors, and other wearable devices.[13] Together these technologies will support more realistic measures *in situ*. They will be noninvasive, blending into the background (e.g., stealth assessments).[14] These capabilities will provide a basis for collecting data to inform the next item, expanded measures.

Expanded measures: In order to support the sort of learning outcomes described in the introduction, agencies will need an

expanded set of metrics that can accurately capture and diagnose complex, unobservable, and latent knowledge, skills, and attitudes. To be most effective, this expanded set of measures will need to be multidimensional, collected in realistic contexts, and address all levels of assessment (from Kirkpatrick's level-1 satisfaction to level-4 organizational outcomes). Further, the measures must address foundational attributes (e.g., competencies) versus highly context-specific task achievements (e.g., Mission Essential Task Lists). With the expanded scope of measures, assessments require improved psychometrics, such as greater reliability, sensitivity, repeatability, and integration into a larger assessment schema. With greater fidelity of learning and skill advancement, it would be a disservice for the assessments to remain basic go/no go summaries of performance.

Competency-based learning: Competency-based learning means focusing development interventions on the underlying human performance capacities (e.g., critical thinking and sensemaking) versus the context-specific tasks those capacities support. Competency-based learning offers two important benefits. First, focusing on underlying competencies directly supports preparation for the VUCA operational environment, where we are increasingly less able to fully define the exact tasks someone will need to complete.[15] Second, we need a standardized set of competencies so that different systems can share human performance data; that is, by agreeing upon standardized competencies, their ontological relationships, and definitions of their internal steps (or stages of learning), different databases and instructional technologies can share content and learner performance.[16]

Traceability through layers of the organization: Within the Defense enterprise, any data-driven learning system will necessarily seek to translate individual *performance* data into individual *readiness* data. More than that, the system also requires models that predict team, collective, or institution-level readiness based upon collected data. These more abstract readiness estimates are unlikely to be simple aggregates of their component parts. This means that different models will be needed, with an emphasis on shifting the goal of learning based in response to the measured outcomes, or double loop learning.[17]

Condition #3: Foster a learning culture at the organizational level

By definition, "learning organizations" are those companies or agencies that continuously transform themselves to maintain relevance within

changing conditions, respond nimbly to the newest threats, and capitalize upon emerging opportunities. To support these collective outcomes, learning organizations necessarily promote continuous improvement at the individual levels; they possess a set of organizational values, conventions, processes, and practices that encourage individuals – and the organization as a whole – to increase knowledge, competence, and performance. As a result, learning organizations reap many benefits. For example, a 2010 industry study conducted by Bersin & Associates found that those organizations with a strong learning foundation tend to significantly outperform their peers in areas such as employee productivity (37 percent greater), response to customer needs (34 percent better), and possessing skills to meet future demands (58 percent more likely).[18]

While military leaders may be less concerned with business outcomes, the underlying drivers of those outcomes (e.g., efficiency, responsiveness, and anticipation) are universal. Those attributes that support business outcomes also support the effectiveness and adaptability of Defense institutions in the face of volatility and turbulence. Defense agencies already invest heavily in lessons learned systems as well as information and knowledge management technologies. The aspiration to foster a culture of learning also already exists, but the scale and complexity of this task create challenges in all phases of the process from collection, to integration, and eventual dissemination. Emerging technologies will be needed to achieve this; two examples are provided below:

Social computing to collect lessons and forecast trends: High-impact learning cultures capture lessons learned and notice meaningful leading indicators in a timely fashion. Now reaching a sufficient level of maturity, social computing can support such processes. Social computing combines collaborative social technologies (e.g., micro-blogging), large-scale data, and associated analyses.[19] For instance, we can leverage social computing crowdsourcing to identify learning opportunities or meaningful problem solving approaches, or in a more passive modality, to collect data to inform forecasting and sensing for weak signals such as population outlooks or changes in attitude.

Automated knowledge resource creation: A particular challenge of lessons-learned systems involves efficiently processing the large quantities of input data, turning it not only into information or knowledge, but transforming it into situationally relevant education and training content. This transformation from raw-data to optimized-learning traditionally requires trained analysts and instructional designers (with necessarily limited bandwidth), but automated

semantic analysis systems can now supplement this process. For instance, performers working with the Army have demonstrated the use of semantic analysis to create standardized machine-readable data with testable topic models from doctrine or raw reports via automated semantic analysis.[20]

Condition #4: Encourage and empower social learning

Social collaborative technologies have given rise to the "Social Age," where individuals connect (often globally) in informal communities who share and access information outside of the scope of traditional governance. Organizations have conventionally "owned" the training and education messages pushed down to learners. Such organizationally designed (formal) instruction will continue to play important roles for the foreseeable future; nonetheless, formal learning content is inherently abstract. Top-down content, no matter how engaging or dynamic, is always one step away from learners' immediate reality. To augment formally created content, individuals need spaces and resources that enable them to engage with one another, to share knowledge peer-to-peer (or even from bottom-to-top), to co-create meaning, probe new ideas, and create shared narratives. That is, future learners require *social learning*.[21]

Social learning grows out of scaffolded environments that nurture and facilitate reflective, community-based, informal learning situated within participants' everyday reality. Social learning should not be confused with social media, although connective and collaborative technologies typically facilitate social learning. It is more accurately defined by the behavior, scaffolding, and community exchanges that occur.

Adopting a scaffolded social learning approach requires a certain bravery, because the organization relinquishes full control of the story. It retains ownership of the overall narrative, but the community fills it with lived experience and meaning. Under this approach, organizations work within and alongside the grassroots communities, providing access to both the formal learning resources and tacit collective knowledge. In other words, organizations develop formal elements and then surround them with social, co-creative ones where participants can bring their own experience, everyday realities, personal challenges, ideas, and resources into the learning space.

Collaborative learning approaches: Social learning communities often manifest on their own, on Twitter or Reddit, for instance. However, to create deliberate (and secure) social learning venues requires more intentionality and a greater understanding of the nature of social

learning. How can we effectively leverage peer-to-peer and bottom-up learning within the military learning enterprise (which has been, and will continue to frequently include, top-down learning)? What are the most appropriate enabling technologies and facilitating techniques that will foster genuine social learning?

Condition #5: Draw upon learning science deliberate practices and its body-of-knowledge

None of the previous roadmap elements will be possible without applying a deliberate, evidence-based approach to their design and implementation. The application of learning science helps meet this demand. Learning science is an applied, ecological discipline as well as a resulting body-of-knowledge about how people learn and how to enhance that learning. It touches on many related fields, such as cognitive science, neuroscience, computer science, educational psychology, anthropology, applied linguistics, and design science; however, it principally emphasizes the combination of human cognition and learning plus educational theory and practice. The primary goals of learning science practitioners include creating and discovering learning innovations, continuously improving instructional methods, and applying learning science knowledge to create effective, efficient, and affordable instructional interventions.[22]

Effective application of learning science can enhance any and all aspects of the previously outlined vision, and to be clear, the use of iterative, evidence-based learning science methodologies is a critical enabler of those elements. In addition to the previously mentioned items, learning science can help inform the development of the following:

Improved humans-in-the-loop: Despite the many benefits technology provides, humans will continue to support the design, delivery, and evaluation of learning in fundamental ways. We should work hard to enhance their skills and prepare them to most effectively use the supporting technologies.[23]

Ongoing improvement of instructional delivery: Learning scientists (often working in conjunction with technologists and emerging software capabilities) continue to advance the discipline each year. Recent and ongoing areas of progress include better understanding and application of neuroscience principles, increased understanding of the factors that affect optimal learning states (such as the interplay of fatigue, stress, and nutrition), how to foster implicit learning, how gamification can contribute to instructional outcomes, and how to best apply other emerging techniques and technologies, such as Massive

Open Online Courses (MOOCs). Continued analysis of such techniques – as well as many other future methods not yet popularized – will directly support the future learning vision.

Conclusion: Enabling the Future

This chapter defined five enabling conditions of a future military learning environment that reliably produces savvy and operationally adept individuals across all echelons, promotes a culture of organizational learning, and expands the breadth, depth, and agility of our Human Dimension. Admittedly, it's a big idea.

By painting this high-level picture of the "art of the possible" we hope to promote a conversation about a collective strategy for the future of military learning. As constituents of the military learning enterprise, if we work in isolation and pursue diverse projects that individually achieve limited short-term goals, then we *might* arrive at the desired emergent outcome (after considerable investment). If we work towards a shared vision, however, we can achieve success with more surety and efficiency. This means *designing* the entire learning system with the strategic outcome in mind, optimizing the whole system (versus trying to optimize individual, siloed parts of it), and considering the human element throughout that design effort. We need to work in concert towards a shared vision – a grand strategy – and with a high level of coordination among agencies, industry, and research centers.

The building blocks of the five conditions outlined above already exist; yet, no one has operationalized, integrated, or collectively implemented them into real military learning environments. Individual projects and other examples showcase the possibilities of each concept described above. They are like the raw materials needed to build a house, and the future military learning strategy (which this paper contributes to) is the blueprint for the building. We still need to put the pieces together, which is no small task. More work is needed.

We have reached critical mass in terms of understanding and demand for the future learning capability. The timing is right to unleash the full potential of our Human Dimension. All the resources are here – science, technology, and the demand – all we need is a shared strategy and the will to pursue it.

Acknowledgements

The views and conclusions contained in this chapter are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the US Joint Staff or the US Government. The US Government is authorized to reproduce and distribute reprints for Government purposes.

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Chapter 4
Transforming Military Education for the 21st Century

Grant T. Hammond

Abstract

Modernizing military education for the 21st century is mandatory for modern militaries. Given the rapid technological advancements of the last two decades, education has been fundamentally changed in many ways. Air University at Maxwell Air Force Base is in the midst of transforming itself to deliver more rigorous, relevant education and research to the Air Force and to better integrate, share, and collaborate with partners in the joint community, academia, and business. Doing so requires a major investment and overhaul of an outdated information technology structure which will take several years to fully complete. The bulk of its educational programs serve the enlisted community throughout the continental US and around the world through blended distance learning programs. The transformation process involved some initial personnel reorganization, an expanded electives program for in-residence officer PME, major new research initiatives on the Chief of Staff's major priorities, the creation of a new global teaching and learning center, and a greater emphasis on future conflict and war gaming. The initial changes have occurred. The follow-on implementation of a strategic plan for the future will occupy the coming academic year and require additional resources for the Fiscal Year 2018 Program Objective Memorandum (POM).

Introduction

The purpose of this paper is to review the development of modern military education focusing on the American experience in general and that of the US Air Force in particular. It addresses the need for, vision of, and process to accomplish the transformation of Air University, the source of military education for the US Air Force. In so doing, it examines why this is necessary. More importantly, it provides a case study of how to initiate such a process and how this transformation is to be accomplished. The intended results of this multi-year redefinition and expansion of Air Force military education for the 21st century are to rethink conflict, reimagine air power, and build agile leaders.

The formal education of the military has been a major concern for modern military establishments at least since the 19th century with the founding of the Academy for Young Officers of the Infantry and Cavalry in Prussia in 1801, which later evolved into the General War Academy in

1810. More specialized military education dates from the late 19th century. Education, as opposed to training, has come in at least two kinds. First, there is a formal in-residence instruction, generally for a period of some months, whether earning a specialized degree or certificate or not. Second, there have been a series of continuing education experiences of various durations offered for a particular service, specialty and rank. These have typically been in a centralized residential location, at disparate posts or bases, or in more modern times, through a non-resident, distance-learning program. As militaries have become more technical, acquired more complex weapons, focused more on doctrine and strategy, and become a serious profession of arms demanding both broader and deeper study and expertise, the requirements for professional and continuing military education have grown in the 20th century.

Origins

The effort in the United States to make formal military education a component of the profession of arms began at different times in different ways for the individual armed services, but they all follow on the heels of the advances in the Industrial Revolution that transformed production, transportation, communication, and weaponry. The advent of mass production, interchangeable parts, steam power, railroads, telegraphs, repeating rifles, and long-range artillery changed warfare completely in the second half of the 19th century.[1] As a result, militaries, particularly in America, began to change. The Army Command and General Staff College had its origins in 1881 when Gen William Tecumseh Sherman, Union hero of the War Between the States, founded the School of Application for Infantry and Cavalry. Secretary of War Elihu Root founded the Army War College after the Spanish-American War in 1901. The Navy Command and Staff College evolved from a number of efforts to improve seamanship throughout the 19th century. The Naval War College was founded in 1884 and Commanded by Commodore Stephen B. Luce with Alfred Thayer Mahan as one of its first faculty members. In 1909, the Navy established the School of Engineering at the Naval Academy in Annapolis. In 1912 it became the Postgraduate Department, later the Naval Postgraduate School moving to Monterrey California in 1942.

The Air Force Command and Staff College (ACSC) traces its roots to the Air Corps Tactical School founded in 1926. It did not assume its current name until 1962. Like the Navy, The Air Force established a more technical graduate education school with the founding of the Air School of Application in 1919. After a series of name changes over the years, it became the Air Force Institute of Technology in 1948 at Wright-Patterson

AFB in Ohio.[2] The Air War College (AWC) was founded immediately after World War II in 1946 and predates the founding of the US Air Force in 1947. Unlike the other services, all the Air Force professional continuing and degree granting military education institutions, save for the Air Force Academy located in Colorado Springs, CO, are co-located in one place under Air University at Maxwell AFB, AL. The centralization of military education is continuing as the US Army established The Army University in 2015 at Ft. Leavenworth, KS.

The US Marine Corps (USMC) Command and Staff College can trace its roots back to 1891 and the formation of the School of Application, later the Officers Training School and eventually the USMC Command and Staff College. The Marine War College followed and became part of the eventual establishment of the Marine Corps University in 1989. The US National War College was founded in 1946 to replace the Army-Navy Staff College founded in 1943 during the Second World War. The Armed Forces Staff College, a school composed of both faculty and students from all the US military services, was founded in 1946 and evolved into the Joint Forces Staff College in 1981. It is a subsidiary of National Defense University (NDU), founded in 1976. In addition to being the home of National War College, NDU also contains the Eisenhower School for National Security and Resource Strategy, formerly known as the Industrial College of the Armed Forces, established in 1946. That institution was a successor to the earlier effort to keep abreast of industrial developments for the Army with the founding of the Army Industrial College in 1924. While there are a host of other specialized schools and research centers in each of the services, these are the principal ones in the US military.

Each service required its own military education specific to its domain of operations, doctrine, strategy, and tactics.[3] Within their service emphasis was a need to differentiate the education (the "why" of things) received as opposed to training (how to do things). They also needed to tailor the instruction for enlisted versus officers and for company grade, field grade, and senior officers. This specialization by rank led to the development of junior NCO and officer education, mid-career intermediate professional development, and senior level officer and enlisted education for those at higher levels. As these foci of instruction became routine, the development of new technologies complicated things still further.

The Twentieth Century

In our fast-paced world of the 21st century, with the iPhone, Facebook, Twitter and other social media all born in the last decade or so, we tend

to forget about the rapid era of technological advancement in warfare that occurred before and during World War I. It saw the employment in war of aircraft, submarines, very long-range artillery, gas and chemical warfare, tanks, radio, zeppelins, infiltration tactics, and other advancements that changed warfare permanently in the 20th century.[4] These were introduced so rapidly that military leadership didn't really begin to understand the true nature of these capabilities until after the war when they studied these *ex post facto*.[5] But as they did so, the technology continued to advance and the continual extension of range, speed, power, capabilities and interaction of all these made innovation in the interwar years prior to World War II a golden age of progress in military affairs. The evolution of the blitzkrieg style of warfare created a need for greater technical expertise, strategic acumen, and tactical agility in the military. As a result, the education of the enlisted and officer corps have become major enterprises and increasingly expensive undertakings.[6]

But it was not only technology that drove military education. The depression that occurred during the decade between the Wall Street crash of October 1929 and the outbreak of war in September 1939 played havoc with national and military budgets and simultaneously emphasized the importance of economic might as the underpinning of national security and military capability. While the challenger nations seeking to overturn the status quo from the right – Fascism in Germany, Japan, and Italy – or the left – the Communist Soviet Union – saw an increased emphasis on the military and in military spending despite economic hardships, the democracies and defenders of the status quo did not. None had the wherewithal needed to match the military spending of the challengers and recognized, only belatedly, the need to do so. This resulted in a frenzy of a general arms race from 1938 into World War II.[7]

The emphasis on economic preparedness as well as military preparedness sprang from the lessons learned from World War I that waging war meant competing productivity and logistics capabilities. The US recognized this with the founding of the Army Industrial College in 1924, and began to prepare officers who were knowledgeable about marshaling resources, problems of production, storage, and distribution for war materiel ranging from minerals and fuel to arms and munitions. But knowing what was required and obtaining it were two different matters, as the 400,000 people involved in the armored exercise of the famed Louisiana Maneuvers of the early 1940s realized when cars covered by sheets and broomsticks (in lieu of rifles) were used because of insufficient equipment.

The Air Corps Tactical School developed its theory of strategic bombing based on the notion of destroying the enemy's industrial web as a major target and ever greater precision.[8] Rapid scientific progress, military innovation, and improved weapons design came to be seen as major determinants of military power.[9] In so doing, they changed both the strategy and tactics of warfare.

During the 1930s, the US military suffered from budget cuts and declining military procurement. The United States was woefully ill-equipped for war when it finally came. It was, however, intellectually well-prepared. The thinking that had gone on in the war games at the Naval War College, in the classrooms of the Army Industrial College, and in the practice formations of the Air Corps Tactical School had prepared a skeleton officer corps to think about how to conduct a two-front war, the global logistics required, and the massive amounts of materiel and ordnance that would be needed. The Navy developed carrier air operations and submarine tactics, the Marines refined the concept of amphibious operations, the Army worked on developing armored warfare and spent money on air power so that the Army Air Forces could develop close air support and strategic bombing capabilities. While ill-equipped, the US was well-prepared for World War II when it occurred because of the education and thinking that had occurred in the interwar period. Brain force was as necessary as brute force in the conduct of war.[10] More important still, success might well be determined by the mental preparation for war that occurred in peace-time while the war validated the thought invested in the process.

Military Education in the US

All the military services in the United States have generally the same model. They try to have 100 percent of all enlisted and officers at entry ranks go through some form of professional military education beyond basic training and organize additional specialization keyed to promotion to higher rank. Thus in the Air Force there are Airmen Leadership Schools (ALS) at every Air Force base to teach young Airmen what it means to be an Airman and their duties and responsibilities. There is a Non-Commissioned Officer (NCO) Academy that has 100 percent of all those who reach the rank of Sergeant, a Senior NCO Academy which takes the top 100 percent who make the rank of Master Sergeant for a year-long resident program, and a Chief's Academy for those who make it to that senior enlisted rank. Though designed for 100 percent throughput, there are some large backlogs that require waivers and exceptions.

Similarly in the officer corps, all captains attend Squadron Officers College for an in-residence five-week program. Roughly 20 percent of the Majors will attend Air Command and Staff College in residence, while the rest will be required to take it in an on-line distance-learning program for which they receive an On Line Master Program (OLMP) degree. Only the top 15 percent of the lieutenant colonels and colonels in the USAF selected for a Senior Developmental Education have a five-year window to attend the Air War College in residence, or a sister service War College. In fact, it is a reality that in all US military services, the number of officers attending other service schools in an effort to increase "jointness," – an appreciation of other service doctrine, capabilities, roles and missions – exceeds the number who attend their home service war college. Those that do not attend a War College in residence will take an on-line distance learning program from which they can receive a master's degree as well. All the services send their members at the major, lieutenant colonel and colonel levels to each other's service colleges to insure a broader joint understanding of sister services' doctrine, methods and operations. This enables better joint campaign planning and operations.

While 10-month residential education experiences have increased dramatically since World War II, the granting of degrees for these programs has been a more recent phenomenon, occurring from the 1970s and 1980s. Civilian PhDs were hired in growing numbers to augment the military faculty at command and staff colleges and war colleges.[11] As both the technological and strategic complexity of international security and warfare increased, the nature and breadth of the education increased accordingly. Granting of master's degrees became the norm in all the US military schools in the 1990s. Indeed, since officers in the US military were encouraged to obtain a master's degree on their own in order to be promoted from major, it is possible to find those in the US military with not only a personal master's degree but an additional military service sponsored one, and in some cases an additional one or two others as well. That is, a colonel in the US military might well have three or more master's degrees and have spent something on the order of one-fifth or more of his time in service in formal education. As services have moved to offering master's degrees at the command and staff college level for majors, the need to obtain personal masters degrees has subsided.

The US Air Force has mandated a major effort at transformation to expand, modernize and improve Air University, the source of all its military education save for the Air Force Academy. A major decision in the Air University transformation process is the emphasis to be placed on

Air Command and Staff College (ACSC). It has roughly 520 students in residence and thousands in a distance learning program through which students may get an on-line master's degree. It is the largest of the non-technical residential degree-granting schools, the other major one being the Air War College that has roughly 150 Air Force Students out of an enrollment of 245.[12] This includes students from other services, some civilians from agencies in the US government, and 45 international students from 45 countries. But those at ACSC touch more of the Air Force upon graduation, have a wider array of specialties and jobs, and are in the Air Force longer – for most, another decade or two. The AWC average graduate, by comparison, is retired in less than five years. The return on investment, measured in time and money, is nowhere near as great. And since officers in the Air Force will have an Air Force provided MA degree, why shouldn't the ACSC one become the gold standard and the one to focus on? Historically, ACSC has failed to meet its Department of Defense (DOD) mandated ratio of faculty to students and is currently short some 30 plus military faculty billets on its faculty. Steps are being taken to address both the number and quality of civilian and military faculty there at ACSC as a first step in the transformation process.

A better-educated officer corps has become mandatory for modern militaries. A well-educated cadre of enlisted NCOs is equally important, at least in most Western militaries, although such is not necessarily the case in others. Over two centuries after Frederick the Great, 125 years after the beginnings of formal modern military education in the US and many other countries, and 75 years after World War II began, the need for a well-educated military is of paramount consideration – or should be. Although no military can claim to be modern and capable in today's environment without the human capital investment required to use it effectively, education is often a step-child in budget drills and does not receive the sustained investment, recapitalization, growth, and refresh rate that is required to keep pace with the changes in how education is delivered and the pace of changes in science and technology that underlie military preparedness.

Education is a labor intensive, expensive, time-consuming, and difficult process. It can easily be done poorly. Doing it well is both art and science and is dependent on quality faculty and educational program design and a culture that values mental fitness as well as physical fitness. Keeping pace with educational technology to create and deliver more information more effectively and transform that into knowledge and understanding is a continuous process. More important is a military culture that values education and sees participation by its uniformed members in it – as both

students and instructors, lab scientists and area experts with PhDs – rather than being seen as a "time out" from the real military and an impediment to promotion. Promotion of a uniformed faculty member or Dean to General Officer would go a long way to prove this reality and change a culture which does not value time as an instructor for those in uniform. It will happen for the first time at Air University in the summer of 2015. It is but one step among several needed to have the Air Force place a greater value on its human capital.

Air University (AU)

As a newly created armed service founded in 1947, the US Air Force had the advantage of starting anew and building its education system from the ground up. Air University and the establishment of the Air War College and Air Command and Staff College actually predate the establishment of the US Air Force as they were opened in 1946. Unlike the other services in the United States, almost all of the Air Force's military education save for its undergraduate academy are part of a single organization, and most of it is co-located in one place. While the US Air Force Academy, founded in 1955 after the design of facilities, curriculum and construction, is in Colorado Springs, the great bulk of Air Force military education – enlisted and officer, continuing education (short courses) and degree granting (both distance learning and residential) – are headquartered if not located at Maxwell AFB in Montgomery, Alabama.[13] Montgomery has a central part of the heritage of the US as an aerospace nation in that the Wright brothers established the first flying school in the US in Montgomery in 1910. Montgomery became the site of the Army Air Service Aircraft and Engine Repair Depot #3 in 1917. In 1921 it became home to the 22nd Observation Squadron and was named for Alabama resident Second Lieutenant William Maxwell in 1922. In 1931, the Army's Air Corps Tactical School (ACTS) was moved from Langley AFB in Virginia to Maxwell AFB in Montgomery. It was at ACTS during the 1930s that much of the theory, strategy, and doctrine of the Army Air Forces used in World War II were studied. Most notably, the theory of strategic bombing, targeting of the "industrial web," and the development of bomber tactics and pursuit aviation were developed at Maxwell.[14] During World War II, Maxwell Field became a major training base for thousands of flight cadets from the Army Air Forces and allied pilots from the Free French Air Force and the United Kingdom Royal Air Force.

The only major portion of Air University not located at Maxwell AFB, other than its distributed outreach components at universities and air force bases, is the Air Force Institute of Technology (AFIT), founded in 1919

and degree granting since 1954. It is the technology MS and PhD granting arm of Air University located at Wright-Patterson AFB in Dayton, Ohio, home of the Wright brothers. It is composed of three resident graduate programs offering a variety of technical degrees: the Graduate School of Engineering and Management; the School of Systems and Logistics; and the Civil Engineer School. AFIT's faculty is a roughly 50 percent civilian and 50 percent military mix. It is funded by a number of federal agencies as well as by the Air Force and the Department of Defense, and places students in civilian universities, particularly in the health sciences and medicine fields, as well as in its own programs. AFIT has seven different research centers addressing such subjects as Autonomy, Navigation and Technology; Directed Energy; Cyber Research; Operational Analysis; Space Research and Assurance; Technical intelligence and Research; and Scientific Test and Analysis Techniques. It offers 26 different MS degree programs and 14 PhD programs in addition to hosting a number of civilian institution programs throughout the country where Air Force students are placed in other degree programs. Students can get master's degrees in fields as diverse as Physics, Computer Engineering, Mathematics, Operations Analysis, Nuclear Engineering, or PhDs in more exotic fields such as hypersonics or quantum cryptography. It is world-renowned for its programs.

Air University writ large has an enormous global reach and huge student body. It runs a Community College of the Air Force (CCSAF) that awards Associate of Arts degrees to enlisted members of the US military. In 2014, it had 286,920 students enrolled under the guidance of over 6,000 faculty offering nearly 2,000 courses in 68 degree programs in 82 countries.[15] A further 144,000 students were enrolled in a variety of distance learning programs for both enlisted and officer personnel. An additional 70,000-plus students were enrolled in resident degree programs or on-site instructional programs distributed throughout the Air Force at Air University, an Air Force Fellows program with 130 students studying at universities across the country, those enrolled in 145 Reserve Officer Training Corps detachments at American colleges and universities, Airman Leadership schools throughout the Air Force, personnel in the USAF Test Pilot School and various others. That means that in 2014, there were over 500,000 students enrolled in Air University programs. In 2014, Air University components awarded 23,157 AA degrees; 15,672 master's degrees and several dozen PhD degrees through its own programs such as AFIT or the School of Advanced Air and Space Studies or AU sponsored programs at civilian universities. In addition, it had over 22,000

personnel graduate from a variety of courses in Junior and Senior ROTC, Officer Training School, and other officer accession programs.[16] It has an international dimension as well as several hundred international officers attending the International Officers School, Air Command and Staff College, Air War College, or the School of Advanced Air and Space Studies each year. Nearly 500 of these international graduates have become head of their air force, their defense establishment or their country over the last half century. Air University is an important component of the USAF, has accomplished much, and represents an essential part of every Airman's career. But Air University is in need of transformation for the 21st century if it is to not only continue, but also improve the accomplishment of its existing missions and add USAF civilians in the process.

Transformation

The act of transformation is to undertake to change the nature, function, form, appearance, or condition of someone or something. It is a synonym for change, but a change that is seen as major, a complete revision of things. And it is in the sense of re-vision that the Air Force has approached the process of transforming the way it goes about conducting its military education. Doing so is a complex process, for it deals with institutional identity, the service's vision, the strategy to accomplish major change, and in the process aims to change the institutional culture itself. It cannot be done quickly and will take several years if not a generation to fully implement. It is complex because it concerns how the Air Force treats and values its people, ideas, and things. It is highly dependent on technology, particularly an information technology architecture and infrastructure, but is at base about people involved in a very human endeavor. Designing the process is as important as acquiring the resources and implementing the processes to make it happen. It is not without some pain, as the re-visioning will require reallocation of resources – physical, financial, and human capital are all involved – and the process is as much emotional as well as rational.

The transformation process will require people to take risks, to try new things, to fail, to re-assess, and to innovate. It will be driven not by establishing metrics for outputs, but by establishing the effects, the outcomes that we seek and the best manner by which they can be assessed and progress measured. It will take leaps of faith and lots of time, boldness, and patience, and a sustained effort to do what is necessary to accomplish the mission. It involves leadership that can both aspire to greater heights and inspire others to reach them. This is undertaken not because Air Force military education is so bad. It is in many ways a model for what and how

things should be done. But, there is room for improvement, technology is driving new learning and the ways in which we learn and communicate, and the types of knowledge and skills that leaders require are evolving rapidly. To keep up with these trends, to shape our future, not merely react to it, we must undertake to "Rethink conflict, re-imagine airpower, and build agile leaders." That is the shorthand task – the bumper sticker slogan if you will – for what the transformation of Air University is all about.

The Chief of Staff of the US Air Force, General Mark Welsh, III has mandated this transformation and appointed a new Commander and President of Air University, Lt Gen Steven Kwast. The Chief has given him some specific directives. These are to: 1) educate more airmen, more broadly and more deeply; 2) do more relevant research on air force issues and problems now and for the future; and 3) do a better job in outreach and telling the Air Force story to publics, politicians and to ourselves. These are necessary because the USAF finds itself in an increasingly difficult set of circumstances. It needs a greater emphasis on and investment in brain force as opposed to brute force in its human capital; selective modernization in its capabilities; better strategies for shaping the future security environments with which it has to contend; and teaching its personnel how to exist in an increasingly ambiguous environment that is complex, uncertain and ever changing. In short, the USAF needs to become agile and adaptive in learning how best to cope with such circumstances. Doing so means asking the right questions before one can provide answers. It requires the ability to innovate by creating initiative out of insight and imagination. It means having a better situational awareness of the strategic landscape in which one has to operate. It requires an understanding of what others value and fear, a discernment of other's purpose and motivation, and the ability to craft a strategy through operational design to contend successfully in a wide range of contested environments. These environments are increasingly novel and ill-understood. How does one begin to create an educational process and set of programs to address such a set of fundamental and wide ranging demands? How does one organize and equip an educational enterprise to accomplish this?

The Prerequisites

General Kwast began by holding a series of conversations with people at Air University when he arrived as the Vice Commander nearly a year before he was to become the Commander and President of Air University in November 2014. He set about to get an appreciation for the many components and missions of Air University and the roles of those within each component. He spent time talking with commanders and faculty, military

and civilians, those who had been here a long time and those who were new, to compile a set of impressions and assessments of various aspects of the university. But more importantly, he was looking to get a sense of who the people were who might assist him in transforming Air University when he took command. Over the course of several months, he sought out those who possessed the traits he was looking for in those on whom he would depend to design and lead the transformation journey. As he explains them, these traits are humility, nobility, compassion, and an edge. He sought those individuals who displayed in their words and deeds these traits, the combination of which he thought essential for the kind of leadership that would be required. Having the right people in the right places to make the qualitative skilled judgments required was the first order of business.

As he defined them, these required skills and attributes were as follows: 1) Humility – the quality of being deferential to each other, unpretentious and being modest in behavior, attitude, and spirit; 2) Nobility – displaying high moral character through honor, generosity and courage; 3) Compassion – the sympathy and empathy for others and the inclination to give aid, support and mercy to ones fellows; and lastly, 4) he wanted those in whom he had trust and confidence to have an "edge." An "edge" meant having a keenness, a zest for what needed to be done as well as a margin of superiority and an ability to use the capability to cut when a dividing line was crossed, to make the hard decisions that come with leadership. These attributes that Gen Kwast sought and by which he would judge subordinates were shared with all of the schools and programs throughout Air University and the students enrolled within them. There was to be no misunderstanding in what was expected and how people were supposed to behave in the process. At the same time, he invited those with ideas, differences of opinion, or alternatives to let him know and bring them forth to discuss and consider.

After getting some idea of who he could count on, he had an ever deeper series of conversations with those whom he felt he could trust to assist him in carrying out this transformation journey. In so doing he learned about personalities, policies, processes and politics that color and shape any institution. He began to develop a sense of the impediments to change, the things that most needed changing, and those which needed to be preserved and reinforced. He then held a series of visits and discussions with the major components of the university telling each what the CSAF had asked him to do and why, asking for their inputs and suggestions and further observing the interests and talents of individuals in each area in

the dialogue that followed. He set up a SharePoint site for people to make suggestions – large or small, lengthy or short, general or detailed, and had it compiled. He invited each organization commander to send two to four personnel in whom they had confidence and appointed a few more for a two day offsite. There they discussed various portions of reorganization of Air University and its major tasks and components. All of these sessions had recorders taking notes – on both what was said and as importantly, who said it. He was thus able to glean from nearly 600 pages of ideas and comments – the "let a hundred flowers bloom" part of the exercise – an even clearer idea of the diversity of opinion, the coalescing of concentration on more fundamental issues, and another indication of the ideas, attitude and willingness of certain individuals to assist in the transformation process.

The Goals of Transformation

A clever Air University Vision, couched as a new AU Commander taking charge in 2020 reviewing the accomplishments of the last five years, was prepared over the Christmas holidays and distributed upon return to work in the New Year.[17] It served as a base to further refine where we should be headed and what had to be done to get there. Central to the accomplishment of an expanded Air University mission – to educate all Airmen – enlisted, officer, Active, Guard, Reserve and civilian not only throughout their careers but in effect from cradle to grave – were two things: A robust information technology architecture and capability which could grow in the future both quantitatively and qualitatively, and an equally dynamic and future-focused, educational technology capable Global Learning Center which could collect, organize, process, and disseminate the fruits of the learning going on and the information required for a global clientele in the military of the US, allies, and partners. The ideas collected in the various meetings and offsite – many of which were diametrically opposed to each other – were collated into specific areas of inquiry for further examination and refined by a variety of teams

Each team was composed of a team of people from across the university representing enlisted as well as officer military education, short course and degree programs, civilian as well as military personnel, and those who were opposed to much change as well as those leading the charge for it. The functions examined by the teams and the objectives sought were as follows:

Education – educate more broadly and deeply

Research – timely and relevant

Outreach – within AU, across the USAF and beyond

Doctrine – valued in product and process

Integration – effective and efficient

Support – aligned infrastructure and processes

These teams focused on lines of operation to examine both functions within the university and the accomplishment of objectives. Each of these teams were to provide ideas, processes, targeted goals and metrics for what could be accomplished by July 2015 (referred to as IOC – Initial Operating Capability) and in place for the coming Academic Year 2016; an intermediate set of goals for 1 July 2017; and those that were long-term and would not be implemented until 1 July 2018 and beyond. Those things that were under local control versus those that would require external intervention to accomplish were also noted. A "Gray Beard" group of trusted advisers who had been at Air University components for a number of years reviewed and formulated a synthesis of these team recommendations.

As a result, everyone in these teams were agreed that the future state was to create an Air University that offered timely and relevant analysis to national security challenges and threats. It was to provide Airmen who can ethically lead others to be more innovative, to have the insight, imagination, and initiative skills to meet these challenges facing the Air Force and the nation. For Air University to meet these current and future requirements, it would need to train, educate and exercise Airmen to be prepared to develop and integrate the concepts, ideas and technologies for the future.

The Initial Reorganization

On 9 February 2015, Gen Kwast made a series of announcements designed to move people about in order to get a critical mass of those in whom he had confidence and trust to begin to implement the transformation he envisaged and to get far enough along in the next few months that he could achieve Initial Operating Condition by 1 July 2015, less than six months away. Chief among these changes were the following:

1) The creation of the office of Provost to serve as the Commander's and President's right hand in guiding the transformation process. The Provost was specifically charged with overseeing the major research initiatives to be launched for Academic Year 2016 and their support.

2) A change in the Deans at both the Air War College and the Air Command and Staff College, the two MA degree-granting ten-month residential programs physically located at Maxwell AFB. These enroll about

650 USAF officers, but they are the top 12 percent of the officer corps at their respective ranks.

3) The reorganization of the AU HQ into a more functional structure utilizing a Senior Financial Advisor (who was already in place and had come nearly eight months earlier) to help with the financing of the resources required for transformation.

4) The designation of a Director of Personnel position at Headquarters to oversee all personnel changes throughout the University of all kinds and categories (military who were Active, Guard or Reserve; civilian academics as well as government Civil Service employees – (GS) or contractor – and the ways in which positions and people could be hired, fired or repurposed.

5) A Director of Operations to oversee the accomplishment of these transformation directives to reach IOC by 1 July 2015 and the reallocation of office and classroom space, apportionment of available faculty, and development of institutional effectiveness metrics based on program outcomes.

6) A major expansion in research capability through changing a premier two-term AWC elective program called Blue Horizons into a non-degree granting Intermediate and Senior Developmental Education program in which students would participate full-time in a specially designed research seminar, series of war games and intensive individual research.

There was some initial confusion and changing choices regarding personnel to lead and/or be assigned to these Research Task Forces, but these were eventually worked out and things progressed more smoothly. This is an indication that the process will not be mistake-free and that failures will occur. But to continue, these must be recognized, addressed and corrected. The mantra is to fail early, often, and forward. These were the major personnel changes and the reorganizations seen as most immediate and the least disruptive enterprise-wide in order to facilitate the changes required.

The Transformation Process

There were a series of procedural and programmatic changes that were also required if we were to address the CSAF's directives in full. They constituted the other half of the initial actions taken to begin the transformation journey. It is accepted by all that this is a long process and will unfold over time in various dimensions and at various levels. The remaining half of the initial dozen changes currently underway is as follows:

7) A series of Research Task Forces, each of which would have a number of faculty (about six variously involved) and students from both Air Command and Staff College and Air War College in a two-term joint elective researching items of specific concern for the CSAF on the following topics: Cyber/ Electronic Warfare; Air Power; and Deterrence and Nuclear Issues.

8) An expanded electives program based on a common university elective schedule to allow students from ACSC and AWC to enroll in whatever electives they wish in two elective periods offered each Wednesday in two elective offerings in the Fall for AWC and two in the Fall and Spring for ACSC.

9) The initial steps in the establishment of an Air University Global Learning Center which would serve to collect, organize, cross reference, and disseminate in synchronous and asynchronous distribution via video, audio, and on-line blended learning with a variety of materials and services for faculty and students.

10) The organization and support facilities for a new effort in Officer Professional Military Education (OPME) which will get $2.5 million and 25 new faculty and staff to deliver this via enhanced distance learning programs beginning in October 2015.

11) An initial effort to repurpose space and acquire additional technology to support a greater degree of classified research, outreach and interchange on secure communications and data links across the Air Force, DOD and Federally Funded Research and Development Corporations (FFRDCs) to enhance and expand the quality and significance of research.

12) All of the above are dependent upon a massive expenditure in people and money in support of the design and implementation of a new, more capable and robust information technology infrastructure and the necessary linkages and gateways to other users globally. Initial campus-wide WIFI, expanded bandwidth, and reconfigured firewall systems are underway now as are plans for the entire system.

There were only two formal curricular directives for each of the schools and programs to implement. How this was to be accomplished was left to each to design as it preferred. The inclusion of these in the curricula, however, was mandatory. The first new requirement was to include consideration of future conflict in each curriculum. Faculty and students were to consider the rapid evolution of the strategic landscape already underway and the impact of accelerating technological change, as well as the changing demography and economic geography of global

trade and production in energy, information and productivity underway. The second was for all courses to consider the use of case study teaching and war gaming as a part of their instructional activities. Again, how to do so was left to each program and course to determine. All of these were contained in a series of transformation directives that were issued over the first two months of the transformation process. An Executive Committee of the leadership team put in place at Air University Headquarters meets weekly and, in turn, with school Deans and Commandants to ensure steady progress is being made. Thus far we are on course for the implementation of these changes in the coming academic year. Much of the difficult work will remain for the coming year in order to continue the transformation and cement the changes yet to be made in place. It will require millions of dollars and hundreds more people to be accomplished and sustained.

Conclusion and the Importance of the Process

The underlying motivation of the transformation at Air University is a realization that the US Air Force had disinvested in its human capital and had produced too few Airmen with a more holistic view and understanding of the fundamental Air Force mission: To be able to project air, space and cyber power globally to present options to the President to hold targets at risk to defer, defend, defeat, or assist as required. As specialization in technologies and weapons systems and processes increased, the overall appreciation of the integration of air, space and cyber space had waned. Moreover, the USAF finds itself with an aircraft inventory whose average age is 25 years old, a series of new challenges in a rising China, a resurgent Russia, and a terrorist muddled Middle East. It is confronted with the need for modernization of its air assets, its missile fleet, its nuclear weapons, and its strategy and doctrine. In the current budgetary environment, the resources to do all of the above are lacking. At the same time, there has developed a culture in which higher education is undervalued, seen as a "square filler" for promotion rather than as an essential investment for the future, where instructional duty is seen as a detriment to promotion, and where it has not husbanded the investment it did make in those in uniform with advanced degrees. It must think its way out of these dilemmas and make the hard choices necessary to contend successfully in the future.

Ultimately, the transformation of Air University is the centerpiece of the transformation of the Air Force and a return to the legacy of the Air Corps Tactical School in addressing current and future problems. It demands attention to the Air Force's five core missions, not its thirteen Core Function Lead Integrators (CFLI) or its disparate major commands (MAJCOMs) which have become separate tribes. It means redefining an

Airman's identity to include a holistic appreciation of the necessary interaction of air, space and cyber space. It requires a changing vision of what the Air Force is, what it needs to become, and how to accomplish that. And ultimately, it means reinvigorating an Air force culture that will embrace ambiguity and wicked problems, take risks, fail without ending careers, and innovate constantly. Doing so is essential if we are to cope with the combination of emerging threats and accelerating change that are shaping the future.

The accomplishment of this will take years. But if it is not begun now, it cannot happen in a timely manner. The costs could be staggering compared to the levels of disinvestment in the past in military education. That said, they are, in the vernacular, relatively so much "budget dust" in the larger scheme of things. All militaries require better human capital, more science and technology capable personnel, more and better strategic thinking, and better research, development and war-gaming if they are to be able to compete successfully in the future. The requirements can be reduced to a few essential ingredients. These are: 1) an investment in quality faculty and in the recruitment, promotion and sustainment of them and the best and brightest of the enlisted and officer corps; 2) a robust information technology/educational technology infrastructure capable of reaching any Airman, anywhere, anytime, 24/7/365 on any device to deliver instruction and information that is on demand as well as on command, off-site as well as on-site, in time as well as at that time as required; 3) a much more robust general and classified research and information sharing capacity that focuses on Air Force missions, not the components of the organizations and their platforms and capabilities; 4) the sustainment of the effort and the requisite change in culture required to value these – forever; and 5) the continued commitment of senior leadership to reinforce and support these values.

For this transformation to be fulfilled, the US Air Force will have to place a premium on investment in Air University and understand that investment in the human capital and technology necessary for it to thrive in a synergistic manner will be essential. To date, it has done so and the process is well and truly launched. Sustainment, however, is critical and alas, often personality dependent. So far, the stars have aligned to make this a reality. For those who doubt the wisdom of investing large sums of time, money and effort in such activities, the answers to the following questions would seem to be in order. If not us, who? If not this, what? If not now, when? If not here, where? If not in this way, how? Perhaps the most important question is, why not?

Notes

1. An older but very readable account of the complex process of the emergence of the modern military is Larry H. Addington, *The Patterns of War Since the Eighteenth Century* (Bloomington, IN: University of Indiana Press, 1984).

2. Wright-Patterson AFB is the home of two other hallmarks of the modern military emphasis on education for the US Air Force. The Air Force Research Laboratory (AFRL), was founded in 1993, but has roots dating back to the establishment in1917 of the Foreign Data Section of the Army Signal Corps Airplane Engineering Department, later the Air Technical Intelligence Center and then the Foreign Technology Division of Air Force Systems Command. The National Air and Space Intelligence Center (NASIC), was founded in 1997 with the combining of thirteen more narrowly focused research directorates. They are representative of the emphasis on scientific and technological innovation and the importance of the investment in military intelligence gathering and its implications. The other military services have similar institutions.

3. The emphasis on "jointness," the multi-service roles, missions and operations of the armed services, and the joint education and assignment of the military in the US does not occur until after the passage of the Goldwater-Nichols Reform Act of 1989. It has, however, become a growing area of emphasis within the US military.

4. For an interpretation of the broad sweep of the so-called "revolution in military affairs" placed in context, see Max Boot, *War Made New: Technology Warfare and the Course of History, 1500-Today* (New York: Gotham Books, 2006).

5. For an overview of the period, see Williamson Murray and Alan Millett (eds.), *Innovation in the Interwar Period* (Cambridge, UK: Cambridge University Press, 1998). For the specific development of Blitzkrieg by the Germans, see James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence, KS: University of Kansas Press, 1992).

6. While specific budget data is difficult to acquire given the different ways in which the separate services and the Department of Defense account for program expenditures, even a 5 billion dollar expense for professional military education in the US, a not insignificant expenditure, would amount to roughly only one percent of the total defense budget.

7. See Grant T. Hammond, *Plowshares Into Swords: Arms Races in International Politics, 1840-1991* (Columbia, SC: University of South Carolina Press, 1993), Chapter 5. 105-130.

8. See David E. Johnson, *Fast Tanks and heavy Bombers: Innovation in the U. S., Army 1917-1945* (Ithaca, NY: Cornell University Press, 1998) and Stephen L. McFarland, *America's Pursuit of Strategic Bombing, 1910-1945* (Washington, DC: Smithsonian Institution Press, 1995.)

9. See Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military*, Ithaca, NY: Cornell University Press, 1991.

10. This phrase was popularized by Alvin and Heidi Toffler in their book *War and Anti War: Survival at the Dawn of the 21st Century* (New York: Little Brown & CO., 1993), 10. The reality is, however, that the transition had begun long before the 1990s.

11. This process has been rather slow and cumbersome to say the least. The first recommendation from the Board of Visitors (BOV) of Air University to hire civilian PhD subject matter experts to enhance the quality of the faculty was made in 1951. It was not implemented until 35 years later beginning in 1986.

12. The Air Force institute of Technology, a constituent part of Air University, grants more MS degrees than the number of MA degrees awarded at the Maxwell AFB campus.

13. As an example, the Holm Center for Officer Accessions is the largest source for newly commissioned Air Force officers. It is the non US Air Force Academy (USAFA) source for newly commissioned officers in the Air Force. The Holm Center not only operates the onsite Officer Training School (OTS) program at Maxwell AFB but also is the headquarters for the Reserve Officer Training Corps (ROTC) program that oversees 145 separate USAF ROTC detachments at American college and university campuses throughout the country.

14. See Robert T. Finney, *History of the Air Corps Tactical School*, Center for Air Force History, USAF Historical Studies No. 100: March 1955 edition.

15. Unless otherwise noted, all figures presented here are taken from "The Air University 2014 Annual Report," Maxwell AFB, AL. 2014.

16. Unless otherwise noted, all figures presented here are taken from "The Air University 2014 Annual Report," Maxwell AFB, AL. 2014.

17. This was drafted by Dr. Matthew Stafford, the Vice President for Academic Affairs, whose career has spanned both Air Force and civilian education experiences ranging from an AA degree to a PhD and who is admirably equipped and well positioned to help lead this transformation process.

Chapter 5
A New Approach to Education. A Case Study for a "Teacher-free School:" *École 42*

Guillaume Lasconjarias[1]

Abstract

Among the multiple challenges that education faces in our current societies, two main obstacles have to be tackled: how to ensure that children/students do not fall behind and, ultimately, drop out from a school system which seems too rigid and unconducive to creativity. The concept of engaging learners by using new technologies in the classroom is not new, but some have gone a step further by advocating that the whole educational system has to be overhauled. At *l'École 42* in Paris, developed and financed by a French information technology (IT) tycoon, a radical solution has been devised: why have teachers and a curriculum, when almost everything is to be found on the internet? Based on "learning by doing" and "peer-to-peer" models which are similar in approach to apprenticeship, the idea is to attract and select the most motivated students of their generation, offer them a tuition-free curriculum, provide them with top-notch technology and encourage them to explore the IT world so as to define what they want to achieve and create. Based on a problem-solving attitude and a combination of technical and social skills, the idea is to educate rather than train or lecture, by encouraging creative disorder and "out-of-the box" solutions: a true cultural challenge for stove-piped and strongly hierarchized organizations.

Introduction

Investigating educational strategies has long been a domain in which faculty and teachers explored new ways and methods of achieving learning outcomes. For decades, the battle has raged between those who argue that content (the "*what*") is key, whereas others believe that the transmission of knowledge and understanding (the "*how*") is essential to usefully impart any new information. Over the past decade, new technology has played an increasingly important role in our daily lives, and it is impossible to be disconnected from what seems to be a true "revolution in schooling affairs," pointing to an epic battle between the Ancients and the Moderns. Well-founded reasons exist for the mismatch: a growing disconnect, and even discontent, with those who still support the old-fashioned ways of teaching opposed to those who believe that the current fundamentals of the educational system are ill-suited for the 21st century. Because schools are complex institutions, characterized by a bureaucratic organization

responding to political pressure and institutional imperatives, there is a tendency to separate the schooling from the learning, although the first is the principal institution devoted to the second.[2] Those who believe in the advances of the cognitive sciences think that it is now time to break away from the standard one-way approach, which favors only students who are compliant with the "mainstream" logical mindset. Articulated differently, the aim is to reach out to more students "by presenting materials in a multitude of ways and giving them options in how they may convey their own understandings."[3]

This is in line with the generation of students currently studying at university, who belong to the so-called "Generation Z:" those who are "digital natives," born in the 1990s and who have in common an inclination for the use of new technologies and a strong attraction to technological "gizmos" when it comes to problem-solving. Educating this generation is likely to prove challenging, especially as they question the place and role of teachers and faculty in general.[4] From the educational community's perspective, the challenge is even more formidable, since they face a public which is more demanding in terms of new learning approaches, insists on collaborative thinking and is determined to make maximum use of the technologies at hand. Generally speaking, it looks like a competition between what was hastily labelled as "outdated teaching methods" – mostly platform-centric and place-dependent – versus new, innovative and adaptable learner-centric, tailor-made models.

Crosscutting the whole of the educational system, the problems affect even those institutions which at first glance would seem secure, such as the military. Military services are not immune to these influences, and any discussion about the future of Professional Military Education (PME) will have to tackle these issues.[5] They arise in part from a common understanding that military education has to be varied so as to embrace the widest possible academic domain to develop an open mind in the soldier. The "long war" fought in Iraq and Afghanistan recognized the need for educated and adaptable leaders. Throughout the network of military academies and war colleges, the trend has been to make the best use of available materials to foster, train, educate, promote and retain those who will be intellectually and mentally agile enough to spare the crucial time needed for rapid response and adaptation on the battlefield. To spare the time and the resources in a money-driven environment has been a struggle, as well as finding the right educational tools – "enablers" or "enhancers." In this sense, the use of new learning technologies and on-demand content has already begun, and is growing. However, the question as yet

unanswered is how to move beyond the straightforward implementation of new technology in the classroom, and deal with the consequences in terms of pedagogy, outcomes, careers and faculty.

If the military is still struggling with these pressing issues, some civilian schools may already have found the answer, in quite a radical way. This chapter aims to describe what future education could look like in an environment where the concept of faculty would have disappeared, where Internet and e-learning would provide answers to all sort of questions, and where flexibility and imagination would be the most relevant skills.[6] This chapter focuses mainly on one case study, *l'École 42* (School 42), based in Paris and named after the famous "geek's bible" *The Hitchhiker's Guide to the Galaxy.*[7] Founded by the French billionaire entrepreneur Xavier Niel, the school aims at reducing France's shortage of computer programmers by a very selective process of recruitment of students who then enjoy tuition-free schooling. By analyzing the pedagogical methods – or absence thereof – in use at École 42, one can identify and assess future trends in our educational environment, as well as possible solutions applicable to other educational fields, including the military.

Taking Stock of a Broken Educational System

École 42 represents a clean break in terms of learning and teaching, not just in the French educational environment, but in education generally. Often seen as "one of the most ambitious experiments in engineering education, it has no teachers. No books. No MOOCs. No dorms, gyms, labs, or student centers. No tuition."[8] Its founder, Xavier Niel, is a successful businessman from the telecommunications and technology industries, best known as the founder and primary shareholder of the French Internet service provider and mobile operator Iliad.[9] Niel is an atypical individual: his approach is based on addressing new challenges, anticipating market expectations, chasing innovation, and often introducing himself as a modern-day Robin Hood in the new technologies domain.[10] His aggressive policies in the mobile phone and Internet markets proved correct, setting new standards for pricing and services – in a sector previously heavily dominated by traditional firms such as Orange (formerly state-owned France Telecom,) Vivendi, or Bouygues.[11]

Announcing in March 2013 the opening of a new type of information-technology school, based on a "unique pedagogical approach and accessibility to all, completely free of charge," Niel's intention was to break the bonds of a French educational system which he believes is failing French youth.[12] His approach was initially justified by his position as an

entrepreneur, admitting that his main problem had been to discover and attract talent, and especially find the developers he needed for the design of innovative products, as well as maintaining the leading edge in computer programming. Pointing at the rigidity of the national educational system, Niel acts like another Bill Gates or Mark Zuckerberg, who advocated that coding should be taught in school and that the time had come to overhaul an ineffective educational system. From his own perspective, Niel lays the blame: "France has been losing ground in the digital domain [*and*] this decline is attributable, among other things, to an educational system that is no longer capable of training the talent that is required by companies in the new technologies field."[13] Worse, youth unemployment in France is at a 14-year high, with the paradox of French companies not finding enough IT specialists, and thousands of young computer enthusiasts not getting the training because of a lack of specialized schools. Caught between a free university system which is poorly adapted to the needs and characteristics of business firms, and expensive private schools that are selective but exclude a lot of talent because of tuition fees, lies a gap that Niel intends to fill with his project, proposing a "daring response […] to the challenge of information-technology skill development, as well as a source of innovation for the future,"[14] a challenge which Niel has taken seriously, when one considers that the tycoon has invested more than 70 million euros (approximately 80 million USD) in the project.[15]

Winds of Change

When asked why École 42 is not just new, but innovates in the area of pedagogy, its Director, Nicolas Sadirac, usually starts with a description of the current revolution in programming and IT.[16] The school, he argues, has taken on board the rapid changes in new technology, and especially in the field of computer programming. At the start of the IT revolution, computer engineering still belonged to the support function of companies, banks and institutions, in close association with complex logistics. However, since connected devices play an increasing role in our daily lives, IT engineers have seen their job develop dramatically: Internet networks, connected devices, software automation tools, 3D printing, and cloud computing are among the key innovations in the IT sector that have changed our lives and work habits, and which may contribute to creating wealth. For companies – private and public – big data is the future challenge, as is the protection of personal data and security. Not a week goes by without press reports of cyber-attacks, industrial espionage, or hacking. IT engineers have seen their role expand beyond the maintenance and organization of an IT network to become key actors in the development and introduction of new products.

Indeed, the most successful companies in the past 10 to 20 years have seen their value based on IT engineering: Uber, Facebook, and Google are just a few of the well-known examples. Henceforth, the conventional image of the IT "geeky" engineer has been replaced by a new generation which is directly contributing to developing new models, new technologies and new trends together with artists, businessmen, and virtually anyone who has an idea to make it happen, in a truly collaborative way. Sadirac underlines that firms and companies – especially in the private sector – do not live by the rules of social Darwinism, but evolve on a regular basis for fear of disappearing: one of the major trends in economics, the co-evolution of gene culture, strengthens his idea.[17]

What is taught – or in the case of École 42, not taught – is henceforth supposed to enable students to learn and choose among a whole array of digital career paths, from developers to social media managers, or specialists in augmented reality space. It therefore doesn't really matter what the students know, but it is how they think that counts, and the more "out of the box" it is, the better. The mantra at École 42 is that the school does not teach the students: they have to find the solutions to any potential problems. The uncertainty and difficulties of predicting the future are key considerations, bringing out the ability of these students (and future entrepreneurs) to react to any difficulty. To do so, they have to learn by themselves. On the contrary, formal academic training teaches an already extant solution and a model that prevents and hinders innovation. Similar to the "garbage can model" developed by James G. March in 1972, the process encouraged by the school is fluid, whereby a constant stream of problems is met by a constant stream of solutions from virtually every participant.[18] Indeed, École 42 simply implements organized anarchy in this educational pursuit, benefitting from the freedom and accessibility offered by the Internet, where everything seems to be available and within reach.[19]

Nothing could be further from the truth than believing that the "classrooms" – three "clusters" in the so-called "Heart of code" building that hosts École 42, in Paris – looks like a:

> Factory floor or a coding sweatshop, with row after row of Aeron-style chairs facing row after row of big monitors . . . The layout is designed to facilitate small-group collaboration, with the monitors staggered so that students can easily talk to one another, on the diagonals between the monitors or side by side with the people next to them.[20]

In a school were the key word is "collaborative," an open space is critical to the promotion of an open mind.

"Leave us kids alone:" Learning by Doing and Peer-to-Peer Education

To highlight the principles of this innovative teaching method, one of the members of staff likes to tell a story: "On the first day, I ask the students: 'When did the battle of Marignan take place?' Everyone answers: 'In 1515.' But when I continue: 'And who opposed who?' there is always one person who knows the answer. So, I tell them: 'You see, you need no teachers, everyone has some knowledge he can deliver to the group. Use that as a guideline.'"[21] As a matter of fact, École 42 claims to have implemented a type of "participatory learning that allows students to unleash their creativity through project-based learning."[22] Based on the permanent and enduring involvement of all students in collaborative projects, the educational principles have in common a shared passion – IT and all aspects of computer engineering, which depends on learners having mastered the basics of language programming; and a common ambition, aimed at developing a set of skills expected in real life and in the business world: immediate output, continuous learning, great personal commitment and the determination to reach one's goals. As in their future working environment, what is expected from the students is their ability to provide answers to ever more complex problems, for which no one has a solution – including the staff. And since there is no solution, why would a course or a lesson be needed? If there are no lessons or courses, why have a faculty or teachers? The staff is reduced to a skilled maintenance crew, with a team of managers who are more interested in challenging the students and encouraging them to assemble their own knowledge than lecturing them in a top-down fashion.

Again, at center stage in École 42's pedagogy is the concept of peer-to-peer learning. This method of knowledge acquisition sees each student interact with the others, and the focus is on problem-solving rather than straightforward learning. The idea is to enable the students to solve more and more complex technical issues; if the solution requires a basic understanding of an algorithm or C-code syntax, then the student might have to google online courses or books so as to explore what he thinks will be relevant to his problem. He may also turn to others to figure out a possible solution. This justifies the no-teachers approach, as nearly anything you need to know about programming can now be found, for free, on the Internet. But having no teachers doesn't mean there is no evaluation at all. Peer-to-peer learning means that your work will be assessed by your

own colleagues and fellow students, in a peer-review process based on rates and guidelines. In addition, as the school values teamwork, if one person fails, the group fails, which strengthens internal cohesion.

Hence, to be efficient and to succeed, students have to be rigorous, autonomous and full of pragmatism, complete their project and meet their objectives. Through their school years, they will learn three fundamental skills: the "know-how," the ability to interact – where the main qualities are the ability to listen and discuss with others, but also to manage a team – and operational excellence. Rather than having students complete a job from one week to the other, the goal is to motivate them to be mature and responsible enough to define when they want to complete it; if in theory, an average student would need three years to complete the curriculum, the best can pass with flying colors in a year, while those with more difficulties would need four years. The notion of curriculum doesn't even make sense, as the idea is to have students complete a masterpiece – anything related to programming, from social network to augmented reality – and École 42 can, in this respect, be compared to an apprenticeship. It means that students are ready when they have completed their own challenge. Some will extend their time at École 42 and benefit from in-depth technological knowledge, working on the latest challenges in industrial projects, while others might consider the acquisition of the mandatory skills as a sufficient stepping stone to become entrepreneurs and (successful) business men and women in the IT domain. To make a long story short, the goal of this new type of education is to train IT programmers who are highly-qualified, self-motivated, well-rounded in all aspects of software engineering, and willing to work hard.

Selective, Bold and Ambitious

One of the mottos of École 42 is that everyone deserves a chance. Actually, the school could also adopt as a motto Churchill's famous quote on "blood, toil, tears and sweat" as that is what awaits the students when they apply. Of course, as there are no particular entry requirements (no degree, or even high-school diploma) except for age (applicants have to be between 18 and 30 years old, and have at least an interest in computer programming), so selection is key. Passing the examination tests requires motivation, hard work, social skills and the ability to challenge oneself. Since École 42 is a private school, but tuition-free (which means that recruitment will not be based on financial discrimination), the idea is that everyone can seize this opportunity.

A first screening is online-based: after the hype in 2013 where more than 70,000 applicants went on the school website to take the tests, in 2014, just over 50,000 people applied. There are multiple-choice questions containing cultural questions, logical items and some questions about motivation. Then starts the series of games and cognitive skill tests, which in some cases last a couple of hours; no hints are given, no explanations are given, the applicant has to find out the rules and the ultimate goal of the game by him/herself. Among the 15,000 that complete the test, 4,000 are invited to proceed to step 2, the "swimming pool."[23] The "swimming pool" is a four-week long challenge, where the applicants are carrying out increasingly difficult coding challenges, which require them to work under pressure, for long hours – but at their own rhythm. And they are not alone: they are encouraged to work as teams to overcome particular hurdles. Tests are essentially pass-fail: you either make it or you fail. Sadirac – whose father was in the military – calls it an obstacle course, where you are on your own but where you also have to help the weakest to finish the run.

The experience is tough. According to one applicant, the main goal is to force the students to step out of their comfort zone. On the first day of the swimming pool, candidates receive no welcome address, they are invited to sit in front of their computer, and then it starts: no speeches, no explanations, no instructions. As a consequence, those who are familiar with the French school system are a bit lost.[24] Applicants are tested on their resistance to pressure: right on the second day, the "Coding Marathon" starts: every hour, for 24 hours, a new exercise is given. What really matters, ultimately, is not only the ability to succeed, as graduation rates depend on additional skills: an open mind and readiness to help others are highly regarded. This means that the selection process takes into account not only the results at coding, but social interaction as well (in fact, École 42 has hired a data scientist to analyze where applicants sit and how they interact). In the last few days of the "swimming pool," each of the applicants votes for 10 others. If one applicant receives more than 10 votes, s/he scores a bonus on the teamwork, friendliness and helpfulness metric. This is consistent with École 42's aim of selecting applicants who maximize the benefits of joint effort, rather than individualism. In the end, around a thousand students are selected. The first intake, admitted in November 2013, comprised 890 students with an average age of 22, females representing 11 percent of the total.

Ways Towards a New Educational System?

École 42 is more than an airlock between school and the professional world; its pedagogical principles aim at streamlining school projects

with what happens in the real world. It demands performances, imposes timelines and expects deliverables, just as would any business. École 42 doesn't even have to tell its students to work hard, as they are doing what they like, and what they believe in, in optimal conditions. Based on the principle that these students are the agents of their own success, what is expected from them is an ability to get their acts together and demonstrate their determination. Deputy Director Florian Bucher puts it simply: "You're going to give all what you've got. And you will help your followers. It's not going to be easy, far from it. You will be on your own and you'll be accountable of your own failure or success. But how rewarding it is!"[25] Hence, it blurs the line between training and education: because of the specific nature of computer programming, some basic understanding of the nature of programming is required. However, because of the challenges that the students are supposed to overcome, fundamental priorities are the ability to challenge oneself, to think out of the box and to look for solutions that either have yet to be identified or have deliberately not been provided. In terms of pedagogy, École 42 illustrates the crisis that modern education is facing: based on the idea that information is everywhere, why bother going to school, the main task of which is precisely to deliver the same information all the time? École 42 offers a sharply relevant perspective on the legitimacy problem that the whole educational system is currently facing. In addition, École 42 plays on the mismatch between students' expectations and the general inability of schools, as institutions, to answer current needs. In short, École 42 capitalizes on advantages that every educational system or institution could benefit from: it offers a practitioner-oriented "curriculum," where the mix of different students with a variety of backgrounds and experience helps to broaden perspectives and orient everyone towards enhanced problem-solving capacities. By deliberately taking students outside their comfort zone, selecting only those who have a combination of technical and social skills, and insisting on a philosophy where teamwork and autonomy go together, École 42 is in a way replicating forms of elite education and training that can be found in the military – special forces, for instance.

Where the main difference lies is the no-teacher, no-faculty approach. To be sure, the role and place of teachers in general, and faculty in particular, are growing sources of concern, as traditional academies increasingly discuss the balance and composition of their academic staff with a view to reflecting current challenges or expectations. École 42 is at the forefront in innovative pedagogy, claiming that the time of traditional education is gone as everything is available everywhere. Indeed, the

Internet conveys all the information needed and the content available doubles every 18 months – in a process that can even be overwhelming. And that's where the problem lies. Education is more than just the ability to do cherry-picking: it is also about selecting, analyzing, testing and using information, which requires at least some skills to distinguish what is right and what is wrong, what makes sense and what does not. To justify the lack of faculty by an argument that "what is true today, might be wrong tomorrow" – meaning that what is taught today, has a short life expectancy – might be true for some technological high-ends. However, there's a risk in downgrading traditional education and faculty: one must not forget that the (social) justification of teachers lies in their ability to convey research and knowledge, thus building bridges between what is going on in some particular fields and giving students the ability to go beyond. If there's no faculty, no research, what is the future of academia in general? It is because of their specific knowledge and skills that academics can lecture on available online courses; if they disappear tomorrow, how is the Internet going to replace them? The Internet is just a gigantic supermarket, where you can find everything, but if you have no map and no indications, you can lose your way. In addition, if you build upon the comparison with supermarket shelves, if no one is there to replace the products after their expiry date, you might get food poisoning. The peer-to-peer learning process provides access to information, not to knowledge; thus, it might be useful for training, but might be limited when it comes to education.

Conclusion

École 42 is definitely a breakthrough in education. Because of its particular status and the charisma of Xavier Niel, it has attracted a great deal of attention. While not seeking accreditation with the French Board of Education, École 42 has established some relationships and linkages with Art and Design Schools or Schools of Economics.[26] There again, the goal is to bring together students with various backgrounds, play on the complementarity of heterogeneous profiles and have these small groups carry out innovative projects and build start-up businesses. As such, the École 42 model perfectly suits a dynamic and competitive private sector; it also explains why the still-outstanding issue of whether École 42 is entitled to deliver degrees and diplomas is not high on the agenda. The proof of the pudding will be in the eating, as Niel argues that companies buy know-how and Sadirac highlights that the students can show their "portfolio" just as any art student does, but in the IT domain. Indeed, the first surveys tend to corroborate the management's position: more than half of the first promotion sent for internships in firms and IT companies were judged as

already employable. However, as the school is still young, a comprehensive assessment and review will have to be undertaken in 2016, when the first "graduates" will be joining the workforce.

For other specific domains and, in our case, for the military, this type of alternative pedagogy is rather challenging, not so much for the content of what is taught as in terms of the structure that frames it, i.e., our organizational chart. There lies the true challenge for today's militaries: we should maybe rethink the goals of military education and not consider the question of degrees, but the ability to deliver specific know-how in a particular – and challenging – environment.

Notes

1. Guillaume Lasconjarias holds a PhD from La Sorbonne University and is currently a researcher at the NATO Defense College in Rome. The views expressed in this paper are his own and do not necessarily reflect the views of the NATO Defense College, or the North Atlantic Treaty Organization.

2. David Olson, *Psychological Theory and Educational Reform* (New York: Cambridge University Press, 2003).

3. Howar Gardner, "What We Do and Don't Know About Learning," *Daedalus* (Winter 2004): 5-12, 11.

4. Diana G. Oblinger and James L. Oblinger, eds. *Educating the Net Generation*, EDUCAUSE, 2005, accessed 15 June 2015, http://www.educause.edu/research-and-publications/books/educating-net-generation.

5. For a wrap-up of the current ongoing discussions in the United States, see Kevin P. Kelley and Joan Johnson-Freese. "Getting to the Goal in Professional Military Education," *Orbis* (Winter 2014): 119-131.

6. Kourosh Houshmand, "Schools of 2030: No Grades, No Exams, No Teachers?" *The Globe and Mail*, October 4, 2013, accessed 12 May 2015, http://www.theglobeandmail.com/news/national/education/schools-of-2030-no-grades-no-exams-no-teachers/article14699733/.

7. Douglas Adams, *The Hitchhiker's Guide to the Galaxy* (New York: Harmony Books, 1979). In this science fiction novel, 42 is "the answer to life, the universe and prime numbers."

8. Dylan Tweney, "This French tech school has no teachers, no books, no tuition – and it could change everything," *Venture Beat*, June 13, 2014, accessed 9 June 2015, http://venturebeat.com/2014/06/13/this-french-tech-school-has-no-teachers-no-books-no-tuition-and-it-could-change-everything/.

9. He also co-owns one of the iconic French newspapers, *Le Monde*.

10. To better understand his communication skills, see Jean-Baptiste Diebold, "Niel: la communication qui tue," *Challenges*, January 2012.

11. Xavier Niel has understood the need for an efficient and active communication policy, always with an element of provocation in his discourse (see the remarks on the coming war on mobile phone prices by Cuvelier, Frédéric, "Comment Xavier Niel peut encore bouleverser le prix du mobile.," Clubic, April 30, 2015, accessed 22 June 2015, http://pro.clubic.com/entreprises/iliad-free/actualite-765286-xavier-niel.html.

12. According to the official statistics of the French Board of Education, there are over 140,000 school dropouts very year (12 percent of the 16-25 year-old cohort).

13. Xavier Niel, "L'édito de Xavier Niel." *École 42* (also available in English), accessed 8 May 2015, http://www.42.fr/ledito-de-xavier-niel.

14. According to the *École 42* website, http///www.42.fr, accessed 8 May 2015.

15. For the French journalist Romain Gueugneau ("Qu'est-ce qui fait courir Xavier Niel?" *Les Échos*, November 2014), Niel can also be seen as using his

school to go beyond recruitment requirements, and work on developing national talent, thereby contributing to building a 21st century-type of capitalism, consistent with the needs of our modern society.

16. Interview with Nicolas Sadirac, Director of École 42, Paris, 29 January 2015. Nicolas Sadirac was previously the Director of EpiTech, one of the first French schools dedicated to IT.

17. Jonathan Haidt and David Sloan Wilson, "The Grand Theory of Business, From Charles Darwin," *Forbes Online*, November 2013, accessed 27 April 2015, http://www.forbes.com/sites/darwinatwork/2013/10/11/the-grand-theory-of-business-from-charles-darwin/.

18. Michael I. Cohen, J. G. March, and J. P. Olsen. "A Garbage Can Model of Organizational Choice," *Administrative Science Quarterly* 17.1 (March 1972): 1-25.

19. This key assessment might be discussed, Sadirac himself doesn't believe that e-learning or MOOCs are everything. He argues that you find all you want on the Internet, but that doesn't mean his students do not have to be curious and explore the outside world.

20. Tweney, "This French tech school has no teachers, no books, no tuition – and it could change everything."

21. Quentin Descamps, "Alt garderie pour bébés Niel," *Libération*, March 2015. In the French collective memory, the battle of Marignan (in what is now northern Italy) in 1515 is among France's most famous. The decisive defeat of the Swiss cantons by King Francis I was exploited throughout his reign as an historical event reinforcing the legitimacy of the King and his prowess as a warrior.

22. École 42, «Revolutionary Computer Training Free and Open to All," accessed 8 May 2015, http://www.42.fr/42-revolutionary-computer-training-free-and-open-to-all.

23. The name "swimming pool" refers to a military exercise where recruits have to swim without panicking and without dropping any item of equipment.

24. To have some ideas of the month-long experience of one of these apprentices, see Castor, Laurène. Chronicles of a Drowned Girl (blog), accessed 23 May 2015, http://laurenecastor.com/42-les-chroniques-dune-noyee.

25. Interview of Florian Bucher, Deputy Director of 42, accessed 8 May 2015, http://www.42.fr/biographie/florian-bucher.

26. Paul De Coustin, "HEC et l'école 42 s'associent pour des programmes d'entrepreneuriat. " *Le Figaro Étudiants*, June 2015.

Chapter 6
Changes in the United Kingdom Education System: The Case for the United Kingdom Ministry of Defence - Education, Development or Training?

Derrick J. Neal[1]

Abstract

This chapter seeks to explore a number of dimensions that constitute learning (training and/or education) within the context of the United Kingdom. The chapter first explores the drivers for change within the education community with particular reference to the influence of politics within the context of the state of the UK's economy. This exploration works progressively from the school sector through to the tertiary sector where significant changes have taken place in the university sector in particular. The chapter then contextualizes the issues within the Ministry of Defence (MOD) with particular reference to the training and education of the officer core and the impact that 11 years of being on operations has had on training and education policy combined with the impact of technology and the move to Technology Enhanced Learning (TEL). A key point covered in the chapter concerns the MOD's view of what constitutes training and how it differs from education with particular reference to an expectation that officers can accumulate credits that can be counted towards an advanced degree. The analysis goes beyond the progression of military officers and considers the parallels that exist for their civil servant counterparts and highlights the need to ensure that a coherent approach to training and education needs to be applied if the Ministry of Defence is to be able to improve its performance both on operations and within the business space. The chapter then concludes with the author's view of the changes that may start to take place over the next three to five years with the heavy caveat of "beware of the law of unintended consequences," which has been a feature of the changes in the UK education system and changes in the UK MOD over the past two decades.

Introduction

In most societies today the issue of education is fraught with challenges that are grounded in and shaped by many aspects, such as gender, religion, unstable environments, politics, finances, or simple geography of being able to get to a place of learning. This represents a highly simplified view of the challenges and not only are there many more dimensions, in most cases, the reality is that combinations of these factors are at work in varying proportions at any point in time. It is beyond the scope of this

chapter to try to capture the picture on a multi-national basis, and the focus will be on the education system in the United Kingdom. Whilst this has a sound and well developed education system, it is not without its challenges. A key point that will feature in this chapter is that when viewing the education of the populace of a nation, it is necessary to ensure that there is coherence from primary school through to the delivery of advanced degrees. However, throughout this spectrum a wide range of different stakeholders have a strong voice in terms of what is delivered and the means by which it is delivered.

The UK, like many other countries, has a mixed economy when it comes to education, as it is a society where choice is a key tenet of its democracy. It follows that government has a huge role to play in the provision of early years education (nominally from the age of 5 to 18) and of course this comes with an associated cost which comes from the public purse. When a nation is in a period of prosperity this aspect does not take on great significance, but when the economy is in a downturn it shines a light on all forms of public expenditure. Of course it is common to hear the politicians state that today's young are tomorrow's future and as such we need to protect education budgets. Equally, politicians can also see the benefits of bringing in private sector stakeholders with funding to offset the pressures on public expenditure. In recent years under the reforms put in place by the Secretary of State for Education (at the time Michael Gove), an initiative was developed to make provision for the establishment of Free Schools (able to set their own agenda) and the creation of Sponsored Academies for both Primary and Secondary schools. In effect an Academy can shape its own future with freedoms over the curriculum and scope to employ and pay staff the necessary market rate to get the individuals they want to teach in the school.

Although this seemed like an attractive proposition on paper, the expected uptake was nowhere near the levels that the politicians hoped for, and this led to some unfortunate behavior on the part of the politicians. In effect, they made it mandatory that any school that was put into Special Measures (failing to meet the required standards) was forced to become an Academy and to be put under the wing of a well-performing school in their vicinity. To ensure that this measure worked, the government raised the bar in terms of what was acceptable and used an independent body, the Office for Standards in Education, to monitor the quality of school education. Not only did this force the issue but it also delivered in terms of the "law of unintended consequences" when it was found that, in many cases, the well-performing school that had taken on responsibility for the failing

school was itself now suffering. The incorrect assumption was that the well-performing school knew how to fix the failing school. Assumptions are dangerous things.

The second order effect in this matter was that due to public expenditure pressures. Local governments also lost money and one of the areas that was cut by some Local Authorities was the support to schools through reductions (and in some cases total removal) of School Improvement Teams. Instead in many cases the Local Authority simply went out to contract in resources as and when needed. This misses the point that School Improvement Teams know the local schools very well and see their role as prevention rather than recovery. They can achieve this through the constant contact with the schools and can pick up the signs of problems at an early stage hence avoiding a school going into Special Measures.

The key points being highlighted here are that politicians have a huge role to play in the domain of education, and they are driven by a range of factors which may link to personal ambition through to pressures from the state of the economy and the public expenses limitations. Changes are not always easy to reverse, and there is always the possibility that a change of government will signal a radical change in policy; but in this case, even the change in the Minister (Gove was removed from this Ministerial post) can herald yet further changes.

The output from the secondary sector is the input to the tertiary education sector and this has not been immune from changes that have again been driven by politicians. For example, a target was set in 2002 by the then Prime Minister (Tony Blair) that by the end of the decade 50 percent of individuals aged between 18-30 would be in full time higher education (studying for a nationally recognized qualification) and that the majority of these would be in university education. The tertiary sector had already begun some restructuring, and the first wave took place in 1992 when a large number of former polytechnics and technical colleges were either absorbed into existing universities or in many cases were reclassified as universities in their own right. Then in the mid-2000s (2005-2007), in direct response to the Blair plan, a second wave of institutions became universities with degree awarding powers. Again, the law of unintended consequences came into play as these institutions started offering degrees and were less interested in the lower level qualifications that they had previously provided that ranged from trade qualifications through to Higher National Certificate (HNC) and Higher National Diploma (HND) qualifications. The consequence of this was that the UK found itself with a shortage of qualified people with trade skills or professionally qualified

individuals within the Certificate and Diploma part of the spectrum. This situation then led to an explosion of migrants moving to the UK with particular skills in the building trade (bricklayers, electricians, plumbers and carpenters to name but a few) in response to a demand in city centers (such as London and Manchester) driven by new developments and re-development/refurbishments of residential properties. This did of course slow down somewhat post the 2008 financial crisis and at the time of writing (2015) is slowly returning.

To make matters worse, many of the "new universities" also generated new degrees that have subsequently been found to be of little value in the jobs market, covering such things as hospitality, or golf club management, and an explosion in what is generally called media studies. Such qualifications fail to underpin the needs of the UK economy. The consequence is that if you graduate from a low grade university with a soft degree in some obscure subject you have probably jumped ahead a couple of places in the queue for a job stacking supermarket shelves.

Again the issue of finance has played a large part in the evolution of tertiary education in the UK and dates back to 1997. Irrespective of changes in government, the situation has progressed through to the current situation where a student graduating today with a Bachelor's degree could easily be in debt to the tune of £30-40k. This move has not been without protests from students, and despite the Liberal Democrats stating that they would oppose student tuition fee increases in England, the Conservative/Lib Dem coalition government won a vote in the House of Commons which resulted in universities being able to charge students up to £9,000 a year for the annual tuition costs. This represented a 300 percent increase from the traditional maximum fees of £3,000 per year. At the time 64 universities announced their intention to charge the full £9,000 allowed by the government from 2012, with the remaining 59 all charging at least £6,000. In some cases the increased fee situation has led to students travelling overseas to attend university where tuition fees do not apply, and in the case of some of the brightest students they have been able to gain scholarships to attend American universities (where the cost of university education can also be expensive), thus promoting a brain drain.

Again the law of unintended consequences comes into play as graduating students find themselves with some difficult decisions. Firstly, having a degree is no guarantee of getting a job and even if one is successful, the position may well be at a very low level within the organization. Given that the job market has been poor in the UK, it even led to graduates being willing to work for nothing in order to be able to show on their Curriculum

Vitae that they have some experience. Secondly, students with good first degrees will find it easier to get a job and given the debt they hold may elect to do this and hence not consider continuing with postgraduate study. Equally, students from wealthy backgrounds may well have been 'bank rolled' through their first degree and may even have the luxury of being financially supported through a second degree. Graduate students with poor prospects in the work environment may well be tempted to continue their studies on the basis of differentiating themselves from others with only a first degree.

The final point to note in this section is that the clarion cry from industry in the UK, by way of a variety of employer federations and the Confederation of British Industry, is that the skills and knowledge that universities are embedding in graduates are not at all well-suited to their needs. Indeed, it has been argued that university degrees (along with A level examinations) have been dumbed down so that institutions can show that they have met national pass rate targets. Equally, a student paying £9,000 per year has an expectation that their hand will be firmly held through the process such that they pass the assessments. This has already resulted in an increase in student complaints and grievance claims against institutions on the basis that the university had not provided the student with the support and input to enable them to pass. In other words the institution failed – not the student.

The author contends that policy decisions taken by the government of the day may well be made with good intent but the consequences of such decisions may endure for some considerable time and have negative consequences that were not identified at the outset.

The reason for this lengthy introduction is to highlight the complexity of an education system, even in a mature and well-developed society, and the role that politics, finances, and the state of the economy can have on decision making. All of these factors are relevant from the point of view of the military as the output from the national education system is the input to the military officer core which forms the basis of the next section.

The MOD Context

The UK MOD, like many corporations, repeatedly makes the claim that they value people and make it clear that they have achieved IIP (Investors in People) status. However, it also has to be noted that when it comes to the recruitment of individuals on a career track leading to being commissioned as an officer, the military are looking for key characteristics associated with leadership and leadership potential. As a man/woman

progresses through their military career (irrespective of their service), they are exposed to a number of learning interventions that are either linked to their rank and promotion or to the needs of a role or task that they need to undertake. This is not at all peculiar to the UK, and most countries have their equivalent Academies and Colleges that perform the same or similar function providing Command and Staff courses.

1. Career Development Courses	**Rank**	**Duration**	**Age**
Sandhurst Commissioning	N/A	Months	18-23
Intermediate Command & Staff Course	Major	Months	Mid-30s (all)
Advanced Command and Staff Course	LTCOL	Months	Mid-40s (selected)
Higher Command & Staff Course	COL/BRIG	Months	Mid-50s (selected)
2. Training Courses	**Delivery**		**Duration**
Joint Officers Leadership Program	Sandhurst & e-Learning		
Joint Officers Tactical Course	Attendance		4 weeks
Military Knowledge 1	e-Learning		Variable
Military Knowledge 2	e-Learning		Variable
Military Analysis	Attendance		2 weeks
Captains Warfare Course	Attendance		8 weeks
Acquisition Employment Training	Attendance		5 weeks

Table 2. A sample of the range of Career Development and Training courses for the UK Army. Source: Author and British Army Web site.

The progression for a young Officer in the British Army is given in Table 2, and although this covers the generic or prescribed courses there are a raft of other forms of learning that may also apply but that are too numerous to capture in this chapter. In particular the raft of MSc education interventions has not been included.

However, this introduces the issue of understanding what the military provides to its officers in terms of whether it is education or training or development or indeed a mixture of these elements. For the purposes of this chapter and debate, the author will adopt the position of stating that learning takes place and that it is a mixture of education and training. The only difference for any particular intervention is the balance of the two elements which will determine the focus. The reason for making this distinction is that it then provides a basis for analysis of what the Officers receive and the way the organization portrays what they believe they are delivering.

According to Kevin Wheeler (2013), Founder and Chairman of the Future Talent Institute, "training is about teaching a specific skill, especially by practice and it is systematic instruction and drill."[2] Clearly this fits very well with the early years of an officer's career where they spend a significant amount of time actually being drilled in the ways to function, the values of the organization, and even down to how to march. These are by definition repetitive activities that have little if anything to do with education other than perhaps educating them as to what the organization expects of them. It is worth noting that the vast majority of officer recruits join their service having already completed an undergraduate degree, for example 85-90 percent of Army recruits going to Sandhurst have a first degree.

When one moves into the realms of education, rightly or wrongly, there is a perception that the individual is engaging with an organization that has a structured delivery of knowledge and skills that are new to the individual. The individual will be taken on a journey over a period of time that will involve forms of assessment that will enable them to demonstrate their knowledge and understanding at an appropriate level to warrant credit towards a recognized qualification. In the case of the UK military, this takes place at a number of institutions ranging from traditional universities, delivering undergraduate degrees through to the Defence Academy of the United Kingdom delivering postgraduate awards. However, this is only a perception rather than a reality since "education focuses on learning new skills, knowledge and attitudes that will equip an individual to assume a new job or to do a different task at some predetermined *future* time."[3] The point being that even at a Masters level the intended learning outcomes will typically involve both knowledge and skills elements and in many cases the latter can be viewed as training rather than education. For example, the skills elements might include producing PowerPoint slides or how to use spreadsheets and while such skills will have utility beyond the

immediate course they are skills that would be considered training. Individuals regularly attend short training courses to develop these skills, and yet when it is part of an MSc degree program for some reason the military likes to consider this as an education intervention.

This example is instructive in making the point that even learning that is correctly defined as education will contain elements that clearly fit the description of training, and one might argue that this could be of the order of 80:20 in favor of education. Equally, even a specified training course will have elements that could be defined as education as knowledge is gained that has both immediate and longer term utility. The reason for highlighting this point is that organizations frequently misuse the terminology in an effort to portray something to meet their own objectives. The UK military, and no doubt other militaries, are classics in this regard since they start an officers career with significant amounts of training, as noted earlier, but as the officer progresses through their career there is an assumption that they should be engaged more and more in education, and that as a supporting statement of this being the case the officer will gain recognized academic qualifications. This has certainly been the case in the UK military over the past decade or more where some of the major learning interventions (as shown for the case of the Army in Table 1) such as those delivered at Sandhurst and the Defence Academy of the United Kingdom, are expected to deliver academic credits that work towards a recognized qualification. Although the Defence Academy of the United Kingdom likes to argue that it delivers education, it is clear that some of the courses sit in the training space – for example, the Acquisition Employment Training course – while others are clearly in the education space such as the range of MSc degrees.

Confusion seems to exist in the Command and Staff Courses (both the Intermediate and the Advanced) since they do not sit at either end of the spectrum, but rather are a mix that is probably closer to a 50:50 split between education and training. The author argues that such a split might be better described as "development" for the purposes of clarity. However, the Services would like to think of such courses as being education and part of the argument to support this view is the fact that numerous high profile speakers are often attracted to deliver to such courses. However, while a very senior member of the MOD may deliver a most enlightening and powerful address, this in itself does not give it the academic credibility or credentials that would position it as education.

The consequence is that the organization tries to overplay the education card when in reality this is not justified based on what a university is prepared to accept as the required level of the delivered material. Of course

not all universities take the same approach as to levels of attainment, and it is certainly the case in the UK that some universities are prepared to give credit transfer that is not based on any specific academic achievement. For example, some universities will give an Army Major 30 Master level credits simply for having reached that rank. Other universities take a much stronger line in defense of academic standards and do not chase the fees based on a lax entry requirement.

It is the case for the UK military that they would like to link each of the Command and Staff courses to Masters level credits such that as the young officer progresses through their career, they accumulate credits in such a way that they have a Masters qualification prior to being promoted to a Lieutenant Colonel. Indeed, to press this matter, the Army intends to make a Masters qualification a pre-requisite for promotion to Lieutenant Colonel. As a consequence, the academic providers (universities) delivering the raft of learning interventions starting at Sandhurst are seeking the opportunity to provide input to the various programs at a Masters level and tie this to associated assessments such that academic credit can be justified. However, the law of unintended consequences yet again features in that the promotion progression path for an officer will be measured in decades from a raw Lieutenant (average age 23) to a Lieutenant Colonel (mid 40s). Unfortunately this timescale does not sit comfortably with the idea of a coherent academic progression and indeed in many areas the subject matter and technology will have moved forward to the extent that the early credits gained bear no resemblance to the final award of a degree. Many universities apply a maximum registration period for a student to cover this very point and typically five to six years will be applied for a part time postgraduate degree.

In addition to the prescribed learning interventions, military officers may also pursue postgraduate qualifications by a number of other routes, perhaps as a personal objective in their own time, where the likes of the Open University distance learning is seen as a viable option. In addition, the MOD will also place officers in a Masters course that is deemed to be pertinent either to their career specialization (such as engineering/technical Masters) or in advance of going into a particular post where the subject matter studied will help their performance.

It should be recognized that there are differences in approach to further education between the three services, and whereas the Royal Navy and Royal Air Force are supportive of taking an officer out of their day job to attend a one-year Masters full-time, the Army is less supportive of full-time education. This was highlighted about eight years ago when the Army

decided that its preference was for its officers to study on a distance learning basis through a Modular Master's Program (MMP) which essentially required to officer to study away from the Defence Academy (even whilst on operations) and to attend a summer school of three weeks once per year. The drop-out rate for this approach was so significant that the idea was dropped within three years; in hindsight, it was most unlikely that any officer was ever going to fight during the day and study in the evenings, and as such it was an ill thought-through concept that had been predicated on the MMP being a cheaper form of delivery compared to attendance for taught modules. Again, this was a dangerous assumption as bespoke distance learning material is expensive to develop and maintain, it also has the potential to lose the richness that comes from peer to peer learning and the dynamic debate that can take place in a classroom.

While it is fair to argue that the academic provider institution has the main say in what is taught on the Masters MSc programs, it is often the case that the MOD desires to have a clear voice in aspects of how material will be delivered, and this is increasingly involving Technology Enhanced Learning (TEL) with on-line support, use of podcasts, and the development of dedicated Apps. This is not at odds with the view of many universities, as they also see this as a way forward and most forward-thinking institutions have or are developing TEL as part of their strategy. They also recognize the need for a blended approach to learning interventions.

To a large extent, the learning interventions for military officers are reasonably well-defined, and they either know what they have to attend or it becomes apparent by virtue of their postings and/or their chosen specialization. However, this has not been so clear when it comes to the other major part of the MOD, namely the civil servants, where learning interventions have been less structured. Since 2010 this situation has and continues to change significantly, with the Civil Service Reform plan under the initial stewardship of Sir Bob Kerslake, and some good progress had been made between 2010 and 2014.

A key part of the Civil Service Reform was the identification of four pillars of capability that were in need of development. This has provided a focus for the Civil Service Learning (CSL) organization to ensure that they have the necessary learning interventions to cover the following:

- Leading and managing change.
- Commercial skills and behaviors.
- Delivering successful projects and programs.
- Redesigning services and delivering them digitally.

In July 2014, following some Political machinations, Sir Bob stood down as Head of the Civil Service, and although he was replaced by Sir Jeremy Heywood, the Civil Service Reform continues on the same track. The key objective of the reform is to make the Civil Service more efficient and effective in delivering support to government in the delivery of its policies. The scale of the challenge is dramatic, with the projected staff reductions over a five year period from 480,000 in 2010 to 380,000 in 2015 – no small challenge.

To put MOD civil servants into context, it should be noted that in 2014 there were 410,000 civil servants covering 36 departments of State and of these the MOD accounts for about 57,000 (which is low compared to about 110,000 that worked in the MOD in 1997). However, this can be misleading if the simple numbers are considered because within this period an outsourcing strategy has been applied which resulted in functions that were previously performed within the MOD now being conducted by the defence industry. Part of the outsourcing strategy involved MOD civil servants being moved to commercial companies under TUPE[4] arrangements which in effect means that the same people are performing the same functions but within the context of an external organization. Of course, the expectation was always that a commercial organization would find more efficient and effective ways to perform those functions and the company would be on a contract that would strive for profit through improvements in efficiency.

The real and present challenge for any organization is to be able to address up-skilling and downsizing at the same time while also meeting the required delivery outputs, and the Civil Service in general and the civil servants in the MOD in particular are struggling to come to terms with these challenges. One of the misplaced expectations within the change literature is that an organization can embark on a major change without any impact on the outputs delivered by that organization. If outputs are to be maintained, then additional resources need to be injected into the organization as part of the change program, recognizing that change is not and never has been a "free lunch." An up-skilling initiative is being progressed within the MOD by the Head of Profession for the commercial function by actively driving an agenda to provide a comprehensive and coherent training and education intervention to make this function more professional, efficient and effective in delivering military capability to the Armed Services. However, at the same time they have to deal with the fact that in many parts of the MOD, they have to operate with many unfilled vacancies and staff suffering from low morale. Although the initiative is

to be applauded, one also has to recognize that it takes time to design and develop a raft of new learning interventions, which range from relatively low-level material through to full Masters programs, and then find the time and space for their delivery.

The final factor to be considered within the topic of training and education within the UK MOD is that although there are some well-defined pathways for service personnel and for civil servants, the true test of the organization's performance is its ability to deliver defense in support of the needs of the government of the day. To that end, it is imperative that the services and the civil servants are able to work together in a structured way and in order to achieve that, it is necessary that they have a common language and shared understanding of a wide range of subject matter. This is particularly important when operations are involved, but it is also true in the realm of defense capability acquisition since this represents the future of the MOD's ability to defend the nation. It does, therefore, make sense to have learning interventions that are shared between military officers and MOD civil servants, and to that end, a number of the learning interventions do indeed make space for both civil servants and officers.

What Does the Future Hold for Learning Interventions in the UK MOD?

The starting point is to truly understand the distinction between education and training as composite parts of learning, and to be realistic as to the mix that exists within a given intervention. This would then enable the classification as to whether it is strongly at one end of a spectrum or the other, or indeed that it sits closer to the middle. In the latter case it would then be helpful to use a different descriptor, such as development as mentioned earlier, that recognizes the balance. In order to achieve this it is first necessary to be clear about the objectives of the intervention in order to determine the approach or approaches to be adopted in the content and delivery of the course material.

The next factor to be recognized is the time gap that exists between career progression courses that may be mandated and the period over which a university is prepared to allow credits to be carried forward towards a qualification such as a degree. This is a mind-set issue and one that requires careful management of expectations on the part of the individual, the MOD, and the universities awarding the qualification. Equally within this space is the notion that if a young recruit enters the MOD with an undergraduate degree, then everything that is delivered beyond this point (from an academic perspective) should be at a Masters level or above.

This is also a mind-set issue that needs to be changed and built into the thinking at the outset of development of learning interventions.

The easy part of this challenge can be dealt with when considering the range of MSc degrees that are available to MOD staff as they clearly fall into the education end of the spectrum; and as a sub-set of this, universities also provide Post Graduate Certificates and Post Graduate Diplomas, which are also clearly education.

At the other end of the spectrum, there are specific training courses that may not have any form of assessment at all or may have some element of test that does not count towards any form of academic credit. On-line mandatory health and safety training would fall into this category, in that one has to complete the course and demonstrate that the information has been understood. Equally, some of the pre-deployment training courses would fall into this category, in that the individual is given practice at using the systems and equipment that they will find when they go into theater so that they arrive up and running as on the job training in theatre is a luxury that cannot be afforded.

This leaves the difficult middle ground of the Command and Staff type courses that are a mix of education and training and which, historically, the MOD has wished to define as education, and has been the cause of some concern to universities delivering to such courses. In recent years, the MOD has sought Masters-level credits for elements or large parts of such courses but the evidence, based on course content, is that it is not sufficiently grounded in academic theory to justify the award of credit. The recent moves in the UK MOD are for Command and Staff courses to take the opportunity to reduce some of the core content on things like campaign planning or informative descriptive material to make space for some deeper Masters level academic material. This, together with appropriate assessments, will enable the university in question to be justified in giving academic credit to those that pass the assessment. However, even if this can be achieved and using the Army as an example, it still has the problem of the time gap between an individual attending Sandhurst to completing the Captains Warfare Course (CWC), to the Intermediate Command and Staff Course (ICSC). These courses are ones that all Army officers will attend, and beyond this a selected number will attend the Advanced Command and Staff Course (ACSC). Given that it is the intent that upon completing the ICSC, the Army officer will have completed a Masters qualification, it begs the question as to what they will be awarded upon completing ACSC since they will not need another Masters and will not have enough time during the ACSC course to complete another award.

So far the debate has centered on the military officer, but there is also the case to be made for the MOD civil servants; as they do not have the equivalent of the Command and Staff courses to contend with, the matter is somewhat simpler. Core parts of the Civil Service contribution to defense include program and project management, commercial (includes finance and legal) as combined they are about delivering defense capability for current and future requirements. To deliver in these areas the previously mentioned up-skilling initiative being driven by the Head of Profession for the Commercial function is setting out a range of learning interventions. One way of taking this forward is to recognize that professional qualifications have as much of a role to play as do academic qualifications. In the area of defense acquisition, the Chartered Institute of Purchasing and Supply (CIPS) has a key role to play and can make a significant contribution to the training end of the spectrum. At the other end of the spectrum, the education elements can be delivered by universities with MSc degrees such as the Defence Acquisition Management MSc awarded by Cranfield University at the Defence Academy of the United Kingdom. Again the challenge that needs to be addressed is one of progression, but it is less of a problem since the civil servant does not have to contend with the "development" courses equivalent of the Command and Staff courses but it does not overcome the need for joint training, development and education between the military and the civil servants.

The section above has considered the issues of what is delivered (in terms of its status) and when it is delivered; the remaining key issue for the future is the topic of how it is delivered. The chapter has already raised the points about distance learning and the reluctance to support full-time education. Although the military are supportive of attendance on the developmental courses such as the Command and Staff courses, there is still a view that for training and education courses the delivery partners need to be more innovative in their approaches. For example, there is support from the MOD for other forms of engagement through the use of mentoring/coaching, reflective learning, delivery at the place of work (as opposed to students going to a College or Academy), further use of technology to support self-learning, and peer-to-peer learning, to name but a few of the ideas being considered.

Such approaches certainly have merit and cannot be discounted, and at the training end of the spectrum have particular utility. Matters become more challenging for some of these ideas when dealing at the education end of the spectrum, given that a university needs to be confident that Masters level intended learning outcomes (ILOs) have been met and that

the learning and associated assessment processes meet the standards set out not only by the university itself but also those of the quality assurance agency.

It is the view of the author that over the next three to five years, there will be a major shift in the mix of learning approaches that are utilized for both training and education interventions and certainly for the education intervention the notion that students have to receive the majority of their learning by attending lectures will be a thing of the past. One can only hope that prior to any of this that the customer (MOD) recognizes many of the points raised in this chapter such that they have a clear understanding of what is meant by training, development, and education, and that they can come to terms with and find a solution to the time disconnect issue between interventions and the timing tied to career progression. Finally, that they do not make the mistake of thinking that the alternatives to "in class" traditional teaching methods will be a cheaper means of imparting knowledge and understanding. Mentoring and one-to-one type interventions are time-consuming and expensive, and while it is possible to tailor the delivery to the specific needs of the individual, it also negates much of the benefit gained from "in class" peer-to-peer learning that takes place through facilitated debate. In the case of education, they also need to understand the issue from the university perspective of being able to demonstrate that the depth and rigor to meet Masters level requirements has been met.

Notes

1. The views expressed in this chapter are those of the author and are not necessarily those of the UK MOD or Cranfield University.

2. Kevin Wheeler, "What are the Differences Between Training, Education, and Development?" The Future Talent Institute, accessed 3 March 2015, http://futureoftalent.org/whats-the-difference-training-education-development-learning/.

3. Wheeler, "What are the Differences Between Training, Education, and Development?"

4. TUPE means Transfer of Undertakings (Protection of Employment) which means that your current terms and conditions will remain in place until or unless you agree adjustments with your new employer.

Chapter 7
Rapidly Evolving, Digitally-Enabled Learning Environments: Implications for Institutional Leaders, Educators and Students[1]

Cathy Downes

Abstract

This chapter examines the rapid cycles of web evolution from Web 1.0 through 2.0 and now into 3.0, and the key technologies driving rapid advances in digital functionality, participation, and productivity. The chapter then evaluates how these cycles of technology change have influenced, and are shaping the evolution of digitally-enabled learning environments in higher education, and particularly the Department of Defense professional educational system, describing conditions of Learning 1.0, 1.5, 2.0 and 3.0. The chapter concludes with identifying critical implications of these developments and the underlying catalyzing directions of web technologies, for higher educational institutions in general, for their academic leaderships, for educators and for students. These implications, for example, focus on (1) the growing gap between heritage institution educational models and the rapidly maturing and growing spread of digitally-enabled alternatives; (2) the challenges for Chief Academic Officers in hiring, developing and retaining faculty capable of creating and innovating in digitally-enabled higher education and strategic/executive level learning environments; (3) the challenges for educators in developing their digital literacies and becoming competent in new educator roles to meet the expectations and employment requirements of the upcoming generations of students; and (4) the challenges for executive-level students to upskill their own digital literacies, to take more responsibility for building and adapting their own personalized/personal learning networks and paths and developing a rich understanding and situational awareness of the technologies and uses of cyberspace and the next phases of the Digital Age.

"…digital technology is the fabric of nearly everything associated with teaching and learning… digital technology is the core strategic enabler of learning in higher education…Our thinking about digital technology is shifting from seeing it as IT infrastructure and instead toward conceiving it as a digital learning environment."

--Malcolm Brown, Director
EDUCAUSE Learning Initiative, 2015[2]

Coming, Ready or Not!

The World Wide Web started as digitally-linked static documents (web pages) in standardized templates for viewing by consumers and customers. Just a few years later, a second generation of digital technologies emerged – the social and collaborative web – Web 2.0 – characterized by openness, user-generated content, sharing, interactivity, and participation. We are now seeing other digital technologies emerging, interacting with each other, and leveraging off Web 2.0 technology advances, to create Web 3.0 – the Semantic Web, the Data Web, and the Internet of Things.

As a result of these developments, new and different ways of working, and delivering goods and services, engaging in civic, political and social affairs and learning and teaching are being enabled and catalyzed. The effects are disruptive. They challenge deeply-established success-proven practices across social, economic, government, private-volunteer and educational sectors.[3] Crowds are increasingly wise. Customers are also producers. Learners are teachers. The dominance of the Westphalian state system to exercise sovereignty over people is being tested on many fronts.[4]

Yet, with the exception of pockets of innovation in online learning, the higher education sector (including the US Department of Defense (DOD) professional educational system) has largely insulated and shielded itself from disruptive digitally-enabled changes that have affected other social, economic and political sectors. As Davidson and Goldberg remark in the introduction to their 2009 report on the Learning Institutions in the Digital Age:

> Modes of learning have changed dramatically over the past two decades – our sources of information, the ways we exchange and interact with information, how information informs and shapes us. But our schools – how we teach, where we teach, who we teach, who teaches, who administers, and who services – have changed mostly around the edges.[5]

This insulation and the rapid, wide-scale changes affecting higher education have significant implications for academic leaderships, educators and students in the higher education sector of the US DOD professional education system.

Web 1.0, 2.0, 3.0, and…

As we have progressed further into the Information Age, it is clear that the Age is not one state of being, but is rapidly morphing through perceptible cycles of evolution. This is perhaps best recognized through

the coining of the term "Web 2.0" in the early-2000s.[6] In rapid succession, we have seen matching ideas of Enterprise 2.0, Gov 2.0, Collaboration 2.0, Knowledge Management 2.0, eLearning 2.0, Organization 2.0, etc. emerge.[7] It is too easy to dismiss these ideas as just piggy-backing on a sticky idea in information technology. On deeper examination, we are seeing sector leaders embracing these cycles of web evolution concept and understanding how these advances catalyze and enable corresponding effects and impacts in their sectors and enterprises.

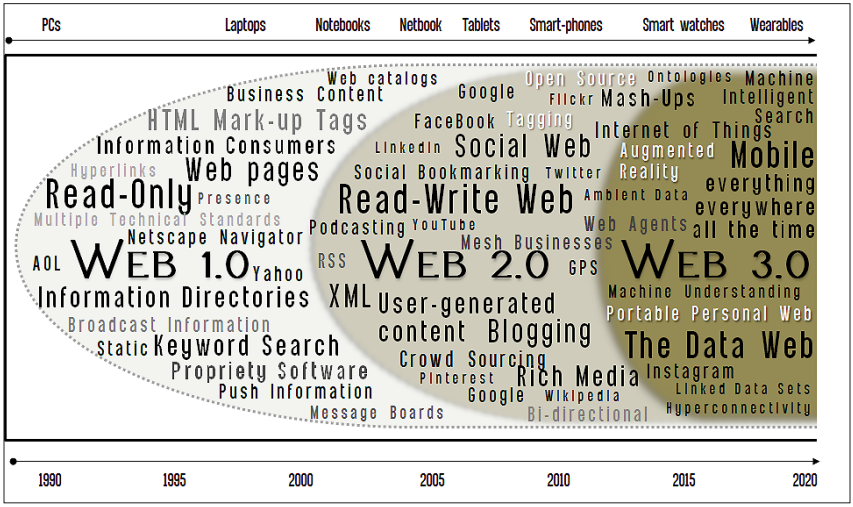

Figure 2. Distinguishing Features of Web 1.0, 2.0, and 3.0. Created by author.

The idea of Web 1.0, 2.0, 3.0 describes an evolutionary path with particular dynamics. Each iteration rests on, and leverages off, the applications, functionalities and concepts of the preceding iteration. At the same time, the enabling information technologies have reached the "knee of the curve" of exponential growth and speed of entry of new applications, infrastructures and platforms. As a result, while one iteration is maturing, it is being modified by the next one's defining emergent technologies. Thus, presently, we see a maturing Web 2.0 merging with an emergent Web 3.0. Given the increasing rate of technology change, it is likely that future iterations of the Web will deepen and widen this blurring. This dynamic is represented in Figure 2: Distinguishing Features of Web 1.0, 2.0 and 3.0.

Each iteration of the Web is an intensely rich and complex phenomenon of multiple technologies and interactions. Describing such phenomena is a precarious balance between too much and too little information.

The aim here is to focus on the distinguishing features of each iteration, particularly those of relevance to shaping, catalyzing and enabling corresponding cycles of evolution in higher education teaching and learning.

Web 1.0 Characteristics

Web 1.0 is the original World Wide Web conceived and constructed of linked web pages, documents of information that could be accessed by users using the physical network of linked computers – the Internet. Web 1.0 is the Read-Only web – a one-to-many, broadcast interaction where companies, governments, organizations and individuals created and made available online static content. Interactions were passive with users only being able to read – "receive" – what was published and "surf" from one linked page to another. As web pages and sites grew, web browsers and portal websites emerged as responses to the user challenge of finding sought-after content.

Web 2.0 Characteristics

In the early 2000s, Web 2.0 is kick-started by technology advances, including software application languages to create web- rather than PC-based applications and services, for linking content rather than just web page formats and linking more types of content beyond just text (particularly images, data sets and video). These advances enabled the transition from the Read-Only Web to the Read-Write Web, the Social Web, the participatory, collaborative interactive Web.

Unlike Web 1.0, content creation is no longer restricted to organizational or enterprise programmers. This lowering of entry barriers has unleashed a global flood of self-expressive and collaborative authors and producers of web-pages, blogs, videos, audio, data sets, and web services. For example, just taking the statistics for one of the main blogging websites, WordPress, in May 2015, over 400 million people read over 20 billion WordPress blog pages. In the same month, users posted over 57 million new blog pages and 54 million new comments.[8] For example, in February 2015 Tumblr had 217 million blogs with 99 billion posts, with over 100 million posts being made on any one day.[9]

In terms of video, YouTube for example has over one billion users, with 300 hours of video being uploaded every minute and 400 billion views every day.[10] It is the second largest search engine, after Google. In terms of images, Flickr has over 92 million users, 10 billion images and an average of one million images shared daily.[11]

In opening up source code, individuals as well as organizations are able to create, co-create and crowdsource dynamic, editable, online information platforms. Examples of Web 2.0 sites include Wikipedia, which in May 2015 contained 4.9 million articles (in its English language edition). In the same month, there were nearly 10 million "Wikipedians" with a 2014-2015 average of 850 new articles added each month.[12]

If Web 2.0's technologies have lowered the barriers to mass participation and co-creation, they have also facilitated online social communities of unprecedented scale that are the main expression of Web 2.0 as the Social Web. Examples of social and business networking, micro-blogging, photo and video sharing and messaging include Facebook, Twitter, LinkedIn, Pinterest, Sina Weibo, Tumblr, Flickr, Google+, Renren, SnapChat, and WhatsApp.[13]

Two other strands of digital technologies have converged with other Web 2.0 technologies and share many of the same defining features. These are Massive, Multiplayer, Online Role-Playing Games (MMORPGs) and virtual online worlds both of which involve people engaging as avatars in virtual 3D spaces. In both cases, gamers and users engage interactively with others who hold similar interests and expertise in immersive social, business or fictional virtual environments.

Tapscott and Williams in their 2006 book capture the heart as well as the head of Web 2.0:

> Low-cost collaborative infrastructures – from free Internet telephony to open-source software to global outsourcing platforms – allow thousands upon thousands of individuals and small producers to cocreate products, access markets . . . in ways that only large corporations could manage in the past . . . Once a bastion of "professionalism," credentialed knowledge producers share the stage with "amateur" creators who are disrupting every activity they touch . . . Individuals now share knowledge, computing power, bandwidth, and other resources to create a wide array of free and open-source goods and services that anyone can use or modify. What's more, people can contribute to the "digital commons" at very little cost to themselves, which makes collective action much more attractive. Indeed, peer production is a very social activity . . . We're all participating in the rise of a global, ubiquitous platform for computation and collaboration that is reshaping nearly every aspect of human affairs. While the old Web was about Web sites,

clicks, and "eyeballs," the new Web is about the communities, participation and peering.[14]

Web 3.0 Characteristics

At least three trends in digital technology distinguish the emergent Web 3.0. These are the ever-reducing ties to location with increasingly portable "smart" devices – the Mobile Web (everything, everywhere, all the time); the exponential evolution of machine-to-machine connections – the "Internet-of-Things," the Data Web; and standards, protocols and applications that improve the ability of machines to "understand" and behave intelligently.

It is estimated that by 2016, 80 percent of global internet access will occur through mobile devices.[15] By 2020, 80 percent of the world's population will have a smartphone and there will be two to three times the number of smartphones as PCs. With over 3.5 billion people online in 2015, it is also estimated that the next billion users will come online via smartphones.[16] 3G and 4G infrastructures are evolving into 5G, significantly enhancing the speed, capacity and functionality of mobile devices. For example, according to Apple and Intel sources, a 2014 iPhone computing processing unit had 625 times more transistors than a 1995 Pentium computer.[17]

New mobile applications start off as Web 2.0-enabled, with real-time, always available, data-based web information, payment, location, and other services. Applications development is also integrating with the Internet of Things (see next paragraph) with the smart phone becoming a personal control hub for devices and services.

It is estimated that by the end of 2015, the majority of web browsing and media consumption will be being done on smartphones. While smartphones first got physically smaller and then incorporated larger screens, with the launch of Apple watches, health monitoring devices, and Google glass, we are also entering the era of commercially viable wearables which will provide vehicles for augmented reality and ambient intelligence for the user.

Web 3.0 is the hyperconnected web of "things" – sensors, PCs, phones – that can be identified by an IP address and so connected. Estimates vary wildly on how many devices could be connected data gatherers, analysts and sharers. A mid-range estimate of the MIT Technology Review is about 25 billion by 2020.[18]

This is the space where mobile, computing, and the internet converge as standards and protocols for inter-connectivity are maturing and costs and the size of sensors, processors and networking are reducing significantly. The result: "smart" objects and environments, homes, cars, refrigerators, and toothbrushes able to create, share, and interpret the data they are gathering.

Finally Web 3.0 also reflects a milestone – the Semantic Web, the "meaning" Web for machines – on the way to artificial intelligence. Web 2.0 has evolved applications to connect people in ways that allow them to achieve the synergies of sharing and collaborating.

Leveraging off this, the goal of the Semantic Web is to help people and computers connect, analyze, and create insightful information through protocols, standards, and computer languages that attach meaningful contexts to data. This advance seeks to address the exponential growth of digital data. In 2012 it was estimated that there was about 2.7 *zettabytes* of global data, with this figure likely to double by 2015 and continue to double every two years after that.[19] By annotating data with contextual and meaning attributes, computers can search, find, link and connect, recognize people, places, events, products, etc. and the relationships between these things substantially faster and more efficiently than keyword search for example.[20]

Learning 1.0, 1.5, 2.0, and…3.0?[21]

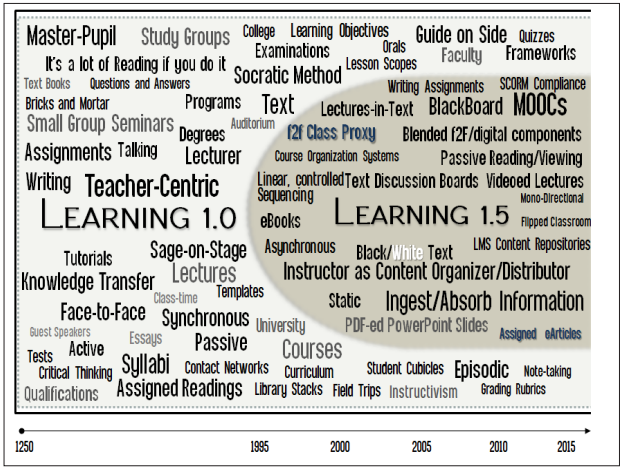

Figure 3. Distinguishing Features of Learning 1.0 and 1.5. Created by author.

In the higher education sector, we have seen Web 1.0 and 2.0 catalyze, shape, and influence new learning environments, and reconfigure and upgrade existing learning environments. Enabled by technology advances, new understandings about teaching and learning have evolved that improve the quality of the learning experience. New and upgraded learning spaces have been created for students who have been excluded from

existing institutional models. However, by comparison with many other sectors, the higher education sector has evolved extremely slowly and in a very patchy way.

Learning 1.0 Characteristics

Today's heritage higher education models reflect their roots in Europe's *12th century universities*. These institutions took on teaching practices of early Church schools, which served to distinguish *university* education from trade/craft guild-based vocational training. Young and adult learners and educators largely interact in a master-pupil relationship. The principal teaching method involves a credentialed, research-proven, lecturer lecturing, with or without visual aids, face-to-face (f2f) to groups of students amassed in one bricks-and-mortar location. The student role is primarily passive, ingesting information provided by the lecturer. Students are expected to prepare for class by reading textbooks or journal articles also assigned by the lecturer. Lectures may be followed by smaller group tutorials led by teaching assistants and enriched by occasional field studies or other practical activities.

Students study in groups and individually, using library resources to achieve learning objectives defined for each course. The main goal is usually knowledge transfer. The extent of this transfer is measured by tests, examinations, and written assignments graded by the lecturer or automated scoring. Students progress through programs of courses to meet institutionally-defined standards for an academic qualification. While students may have some choice in what subjects and courses they take, the balance of choice rests with the institution.

In the military school-house this model predominates with highly doctrinaire schema of "Learning Areas and Objectives" dictating what and how students must study and faculty-student ratios dictate where learning can take place.[22] The learning experience is primarily centered around the teacher as the provider of organized content, the selector of appropriate readings, the developer of slide decks, and the presenter of pre-selected models and frameworks to save students time and help them traverse complex knowledge areas.

Over time, this highly teacher-centric method of Learning 1.0 has been refined. For example, the "sage-on-the-stage" re-roles as the "guide on the side" with students usually taking more active roles in discussion sessions – often referred to as the "Socratic method" to practice critical thinking. However, as Cobb observes:

> The idea of an expert, tutor, or mentor who conveys knowledge and experience to a student . . . has been around at least as long as recorded history. The teacher in this relationship holds the position of dominance, and, while there may be dialog between teacher and learner, the teacher is the authoritative source. The Socratic method, for instance, is a time-honored approach to such dialog. Socrates engages the learner in a series of questions, but ultimately, it is Socrates who has the answer.[23]

Learning 1.5 Characteristics

Learning 1.5 is characterized by the ongoing refinement of the Learning 1.0 f2f model and the advent of first generation e-learning. While the latter has been a significant change in its own right, this learning era only gets a 0.5 designation. This is because of the narrowness of vision that shaped the technology adoption strategies of most higher education institutions which reflected the usual desire to fit new technologies into existing and familiar organizational structures and practices.

The starting point for this narrow vision has been the academic profession's valuation of Learning 1.0 as the premier way for students to learn and for teachers to teach. Therefore by definition any other format must be of a lesser quality and a technology strategy should seek to emulate or approximate as best it could the f2f experience as closely as possible.

The key characteristics of the e-learning component of Learning 1.5 can be summed as:

- digitized text and basic graphics in static, minimalist web-pages replicating hard-copy text formats, and e-books/journal articles, packaged into a linear series of lessons that can be viewed by the student via a computer;
- one-way knowledge transfer from educator to student with the latter being responsible for reading and absorbing e-content with minimal interaction with the educator or other students;
- the principal role of the educator is to research, organize and package relevant content into an ordered sequence of lessons supported by a set of matching, usually text-based, writing assignments, quizzes for students to complete and submit electronically;
- use of e-mail communications and asynchronous "chat" (text) threads that permit the exchange of text messages between students, and between students and educators; and

- automated systems (for example, Moodle, Edmodo, ConnectEDU and Blackboard) for organizing and delivering course content and scheduling, statistical tracking of student activity, grades and transcripts, communications, uploading of student assignments and feedback electronically to remotely located students.

At least two new eLearning formats have emerged in recent years that have been heralded as great advances in eLearning. Yet, when strip-down evaluated, at their core, Massive, Open, Online Courses (MOOCs), and "Flipped Classrooms" are very much Learning 1.5 products based on Learning 1.0 models.

MOOCs are marketed as being taught by lecturers from the some of the world's most highly respected bricks-and-mortar universities.[24] Yet, while opening up a new platform for delivering higher education to many who could not otherwise afford an f2f experience, many MOOCs rely on canned videos of faculty 1.0-style lectures similar to those given to their f2f students and using the same textbooks they have written for publication. Few of the participating universities and lecturers are highly reputed for their leading edge online learning praxis. Moreover, many rely on practices that, while minimizing educator time/cost commitments, are as yet unproven in their efficacy for student learning. There are some developmental path options for MOOCs. One path will be continuing to seek to replicate (at scale) Learning 1.0 education methods and outcomes. On this path, MOOCs will be continue to be assessed against Learning 1.0 f2f standards such as high completion rates while lacking the positive and punitive incentives for students to achieve such standards (such as tuition fees, academic credit and credentials). MOOCs may evolve along another path that engages more Learning 2.0 and even 3.0 learning and teaching praxis and concepts.

For their part, flipped classrooms are not an advanced form of online learning, but rather another way to enhance the existing f2f Learning 1.0 experience by providing canned video lectures to students for viewing before coming to class so as to free up class-time for more interactive faculty-facilitated discussions or activities. Just as for MOOCs, flipped classroom concepts could remain just a tool for making better use of time spent in the f2f classroom, or it could evolve by employing more Learning 2.0 and 3.0 learning and teaching praxis and concepts.

Learning 2.0 Characteristics

If Learning 1.5 was shaped by the goal of replicating the f2f classroom, the impact of Web 2.0 technologies on the evolution of Learning 2.0 has

been transformative. As much as Web 2.0 technologies have fundamentally re-shaped the Web, these technologies have also created opportunities for different learning experiences that educational theorists and researchers suggest are more enabling of student learning.

The shift from the Read-Only to the Read-Write Web has enabled a significant shift in eLearning to incorporate more learner-centric learning experiences. For example, using more open, free, user-friendly authoring tools, it has been possible for students to engage in Wikinomic-type co-creation projects.[25] This is where educators create content examples, and students create their own contributions.

An example of such learning events can be seen in the author's graduate degree course on interagency collaboration for national and homeland security leaders. In this course, students and faculty create video interviews of interagency practitioners. By 2015, the Google Site video gallery held over 70 co-created interviews accessible by current and future students.

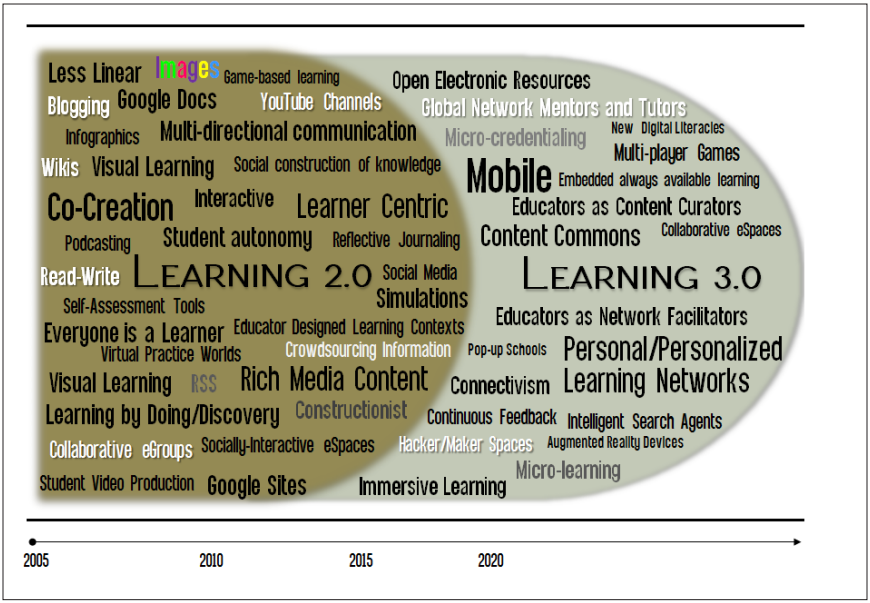

Figure 4. Distinguishing Features of Learning 2.0 and 3.0. Created by author.

In this activity, students and faculty seek out a suitable interagency practitioner. They practice their engagement skills with their selected practitioner to gain his or her buy-in. Students and educators also practice digital video filming skills, and their skills in question design and

interviewing (using Charlie Rose's meaningful dialogue style as a guide).[26] In Learning 1.0, a corresponding activity might be students attending an f2f guest speaker presentation that may be followed up by a class discussion facilitated by an instructor. By contrast, as a co-creator, the student learns by doing, by discovery. In addition, many also additionally benefit from the connection they make with their selected practitioners, many of whom follow up as informal mentors.

Web 2.0 technologies have provided tools for the inquiring educator to design other digitally-enhanced learning events that provide greater student choice and autonomy and practice. These include for example:

- games and simulations
- blogging, tagging, and reflective journaling
- self-assessment tools
- creation and exploration of virtual Worlds
- design and construction of infographics
- wiki-enabled course products
- creation of web-pages
- crowd-sourcing features

Another defining feature of Web 2.0 is its socialness in reducing barriers to, and the addictive encouragement of, group and individual participation. Social Web technologies have enabled more interactive online learning environments where students can interact in collaborative ways. Such collaborations on challenges, experiments, games, wikis, simulated practice situations, and product creations assist students to construct shared meaning and new insights and perspectives that each student can internalize for future application.[27]

Social web technologies have also shaped Learning 2.0 environments with activities that help students to develop and practice their leader and contributor skills, which are increasingly required by Digital Age working environments. Downes explores this concept by distinguishing the features of traditional groups and Web 2.0-enabled networks. He observes that a "group is elemental, defined by mass and sameness . . . a network is diverse and changing, defined by interactions – like an ecosystem."[28] He distinguishes traditional group-work as requiring unity, coherence, privacy or segregation and focus on voice. By contrast, Downes observes, networks work through diversity, autonomy, openness and interaction. Digitally enabled Learning 2.0 environments expand the opportunities for students to work autonomously or collaboratively in networks as well as in more traditional group settings.

Web 2.0 technologies have also enabled educators to change out static, black and white Web 1.0 text content with more rich media combinations of text, links, voting, surveys, images, interactive charts, diagrams, gamified content, videos, podcasts, etc. Intuitive authoring tools are increasing daily for educators who do not need to have a software coding competency. These tools are enabling educators to lead the design and development of more authentic, active and immersive digitally-enabled learning events for students.[29]

Another key feature that distinguishes Learning 2.0 is the shift from using digital technologies to simply expand student access to also change what students learn. For example, Davies, Fidler and Gorbis, identified ten key workforce skills needed by Digital Age workforce members:

- Sense Making
- Social Intelligence
- Novel and Adaptive Thinking
- Cross-Cultural Competency
- Computational Thinking
- New media literacy
- Transdisciplinary
- Design Mindset
- Cognitive Load Management
- Virtual Collaboration[30]

As Web 2.0, and now 3.0, are reshaping the competencies needed by Digital Age workforces and leaders, so Learning 2.0 is evolving to provide digitally enhanced discovery spaces, practice events for example where students can develop these digital literacies and skills.

Learning 3.0 Characteristics

Just as Web 3.0 is in early emergence, so too is Learning 3.0. Even for early innovators and adopters, this is still a period of experimentation. Also, mainstream Web 2.0 technologies are evolving by leveraging emergent Web 3.0 technologies. Three features of the emergent Web 3.0 are likely to shape the functionalities of Learning 3.0:

- mobile technologies that are making learning anywhere, anytime possible;
- maturing Web 2.0 applications and Semantic Web technologies, along with internet infrastructure developments, that are making always-on personalized/ personal learning networks, and alternative educational digitally-based spaces and facilities possible; and
- data web technologies that are likely to influence how educational institutions measure, evaluate, analyze, customize and adapt group and individual learning experiences.[31]

Mobile applications for education are quickly moving out. Instead of seeing the mobile device as simply a way of accessing web content designed for larger PC screens, increasingly new web applications include mobile versions.

Gaming and simulation apps are being designed to offer students enhanced learning through replay, active practice, and multiple opportunities for low-stakes formative assessment.[32] Other developments include apps for students to access institutional student information systems, and wide-ranging online learning resources through their mobile devices. We are also starting to see Web 3.0 features such as augmented reality and intelligent agent information services being integrated into mobile devices.

Mobile device ownership is expanding rapidly. For example the Pew Trust's April 2015 smartphone survey shows that 84 percent of 18-29 year-olds and 79 percent of 30-49 year-olds own a smartphone. Mobile devices have also changed how users engage with the Web for accessing information, learning, communicating continuously, creation, and reflection. For example, 30 percent of 18-29 year-olds surveyed had used their phone to "take a class or get educational content."[33] In other studies of higher education students, these percentages are substantially higher – 60-80 percent.[34] In their 2015 survey of US teens and technology, Pew Research found that 92 percent of teens report going online daily, with 24 percent using the internet "almost constantly" and 56 percent going online several times a day. The survey also found that 91 percent of teens send between 30-40 messages daily on average and that nearly three quarters of teens play video games on their mobile devices. The 2015 Pew survey of teens and social media found that 39 percent of online teens share their own artwork, photos, stories or videos, 33 percent create or work on webpages or blogs for others; 28 percent create their own online journals or blogs; 27 percent maintain their own personal webpages and 26 percent remix content they find online into their own creations.[35]

Web 2.0/3.0 technologies are not only facilitating the shift from teacher to student-centered learning approaches. They are changing where and when learning can take place, and who is involved in determining what is learned for what purpose.

The conventional understanding of education as the *singular* qualifying event that transforms the novice, the amateur, or the ignorant into the qualified, credentialed societally recognized knowledgeable and capable professional is increasingly being challenged by the exponential growth of new data, information and knowledge. To sustain professional

competence, currency, agility, resilience, and relevance in the Digital Age, professionals (and their employers) are increasingly seeking frequent, easily accessible, affordable, and relevant-to-need and often just-in-time learning opportunities.

Equally, the model that the learner must come to the societally approved educational institution for learning, and that institution (and/or a professional association) will determine completely both the process of learning and the performance changes that the learner needs to make, is being challenged by the emergence of digitally-enabled non-traditional learning providers who successfully leverage Web 2.0 and 3.0 technologies. Moreover, maturing Web 2.0 technologies that connect people are merging with Web 3.0 technologies that focus on open access to exponentially expanding resources, data, information, and knowledge.

These high entry barriers (in terms of accreditation requirements, faculty qualifications, facility expectations, etc.), which have protected expensive and heritage institutional monopolies (including those in the DOD professional education system), are being outflanked by innovation in the higher education marketplace fueled by Web 2.0 and 3.0 technologies. There is an increasing range of learning opportunities being developed outside, alongside, or on the edge of the traditional academy – MOOCs, games, nano- or micro-credentialing, and also include the more established practice of webinars.[36]

These factors are creating opportunities and incentives for learners to take more initiative in selecting the what, when, where and how of their learning activities and to create for themselves digitally-enabled personal and personalized life-long learning networks. In Learning 3.0, we are seeing the 1990s aspiration being realized through Web 2.0/3.0 technologies that enable students to create independently, or with guidance from educators, their own online continually evolving collection of learning resources (blogs, websites, wikis, twitter and RSS feeds, online courses, content repositories, etc.)

These two breaks in conventional practice, along with Web 2.0 and 3.0 technology enablers, have opened up new approaches that challenge the centrality of the heritage bricks and mortar higher education institution. Moving away from segmented learning events controlled by heritage institutions, we are seeing the emergence of customizable learning "flows" or pathways, as described by Institute for the Future's Future of Learning Program:

> New technologies, work patterns, and practices are disrupting how we learn, where we learn, and what we need to learn. The definitions of teacher and student are becoming fluid, and education itself is moving out of episodic experiences in traditional institutions and their classrooms, into learning flows that course through our daily lives. People of all ages dip in and out of these flows, engaging in continuous learning channels that are contextually relevant and always available. Opportunities and resources for learners are no longer scarce but abundant; they are pervasive rather than localized.[37]

Further, two of the classic mainstay features of heritage higher education – the textbook and the course – are also undergoing transformation enabled by Web 2.0/3.0 technologies allowing more opportunities for students, not just educators, to personalize and customize learning experiences. Over the last decade particularly, we have seen the rapid maturing and expansion of Open Educational Resources (OERs) – digitally available, free, open source software and development tools, open courseware, content projects, free courses, Learning Object repositories, and open standards and licensing tools that are outflanking the central place of textbooks and journal articles.[38] As Brown remarks:

> The ever-growing abundance of ancillary content relevant to education (e.g., iTunes, U, MOOCS, and repositories such as OpenStax, CNX), enables students to skip the purchase of core textbooks altogether and instead seek basic explanations of content from these open resources.[39]

The traditional concept of the "course" is also being challenged by alternative digitally-enabled learning spaces and content bundles that can be accessed easily, cheaply and directly by students. These range from the growth of "content commons" such as YouTube (videos), Flickr, Pinterest (images) Slideshare (presentations), through to newer platforms that are designed to connect up and organize disparate sources of information and data or provide easy access to self-paced online courses primarily suited for knowledge transfer (for example, Carnegie Mellon University's Open Learning Initiative, Udemy, Udacity).

We are also seeing new types of educational institutions emerging. Already mentioned for example is the growth of MOOCs, with providers such as Coursera and FutureLearn in the UK, iTunesU and edX, that are not constrained by the location encumbrances, qualification restrictions

and cost profiles of traditional campus universities that limit student access.

The third area of Web 3.0 technologies influencing Learning 3.0 is that of the Internet of Things and the Data/Semantic Web. The increasing amount of data from automated processes, coupled with the evolution of predictive algorithms and data analytics capabilities, holds the potential to provide insightful information to support more efficient and responsive administration. Also, as students increasingly pursue their learning through and by digital means, data patterns can be collected to provide educators (and students) with greater situational awareness of performance so that they are able to amend, adjust, reprioritize, repeat, etc. learning events and provide timely formative feedback to help students to achieve learning outcomes.

The US Department of Education in its 2013 briefing on Data Mining and Learning Analytics provides this perspective on how Learning 3.0 could apply and be shaped by improving data analytics:

> New computer-supported interactive learning methods and tools – intelligent tutoring systems, simulations, games – have opened up opportunities to collect and analyze student data, to discover patterns and trends in those data, and to make new discoveries and test hypotheses about how students learn.[40]

Implications and Recommendations

Implications for Educational Institutions

Heritage higher education institutions, particularly those serving adult learners, are under increasing pressure to adapt their controls over academic credentials, credit hour measures, course structures and schedules etc., as students, educators, and employers seek the advantages of Learning 2.0 and 3.0 opportunities. As Peter Smith, President of Kaplan University's Open College observes:

> Our system of higher education is based on . . . the principle of scarcity, that the resources needed to provide an education must be collected in one place – a campus . . . The principle of scarcity says that for an institution to be valuable to the community around it, it must offer a service that community members can't get more cheaply or with higher quality somewhere else . . . Technology is obliterating the old boundaries defined by the campus and its schedule, leaving multiple possibilities to provide organized learning opportunities.[41]

To date, higher education institutions, including the DOD professional education system, have "seen off" challenges to their preferred Learning 1.0 teaching model and practice, firm in their belief that these models and practice represent the apex of quality. This has led to views that dismiss the relevance and impact of digital technologies. Moreover, it is also believed that enough accommodations have been made with first generation eLearning models. For example, the Online Learning Consortium (OLC) survey of late 2014, found that "even amongst those institutions with the most extensive online offerings, about two-thirds [of chief academic officers] report that their faculty do not accept it." The report also found that only just over a quarter of higher education faculty members accept the "value and legitimacy of online education." Even more startling is that this level of non-acceptance has not changed in a decade.[42]

Another institutional impediment to leveraging Web 2.0/3.0 technologies is the inertia and rigidity of Learning Management Systems (LMS) that have failed to evolve much beyond Learning 1.5. Their focus on automated academic administration has also controlled the design of digital educational practice and content.[43] In evaluating the effects of this overstretch, Weigel in 2005 observed:

> The downside of the CMS [Content Management Systems] is that it canalizes our collective creativity by forcing e-learning technologies into the familiar classroom categories of lectures, discussions and exams, reinforcing uncritical acceptance of the traditional features of the classroom model.[44]

And a decade later, leading educational technologist, Downes put it even more bluntly: "It's not new just because you've added 'on a computer' to some pre-existing model or idea . . . It's not even new on a computer . . . today's online learning models are yesterday's models with new names."[45] Although LMS providers have continued to "bolt-on" software upgrades, they have not evolved past their DNA-level goal of emulating Learning 1.0 models and flawed assumption that administering and enabling eLearning are one and the same.[46]

Mainstream institutions also have a critical need to reassess how educational technology fits into institutional investment strategies. All too frequently, educational technology is seen as a "back office" administration issue. This influences how technology requirements are formulated, prioritized and deployed, as Churcher, Downs, and Tewksbury observe:

> Those routinely employed to implement these technologies are not educators, but more commonly technical consultants and IT

staff. Their primary goal is to make the technology function properly and effectively, not necessarily to think of issues such as student learning outcomes or best teaching practices.[47]

IT staffs and enterprise administrators are often unaware and uninterested in the limitations imposed on educators' ability to design and deliver learning events, particularly leveraging the unique properties of the online medium to help students develop higher-level Bloom's taxonomy cognitive skills that are better achieved in substantially more interactive, participatory, immersive learning environments.

This dysfunction is exacerbated by often unresponsive institutional IT systems and acquisition practices and, in the DOD professional educational system particularly, cripplingly high-barrier cyber security defenses that compromise edtech innovation and the functionality of digitally enabled environments for military and civilian national security professional students.

While many of the author's Learning 1.0 colleagues might disagree, it is reasoned here that the confident and effective integration of leading edge (with some bleeding edge) relevant, educator- and student-friendly enabling technologies is increasingly critical for educational mission success.[48] This includes:

- prioritizing educational technology investments over bricks-and-mortar infrastructures,
- appointing or developing and supporting Chief Information and Chief Academic Officers who are edtech "savvy" and edtech evangelists, and
- assigning organizational authority for edtech to qualified academic leaders.

The exponentially expanding influence of digital technologies upon contemporary and future work environments is of such a magnitude that how higher education institutions, and especially within the context of this book, how DOD professional education institutions, leverage Learning 2.0 and 3.0 models is likely to influence their continuing relevance to potential students, and their employment sponsors. This is particularly the case as both students and employer sponsors are increasingly able to access alternative educational providers who are more agile in continuous development and deployment of new learning experiences, and are more customer-focused, and skilled at leveraging technology cycles.

Also, as Web 2.0/3.0 technologies create new levels of user-intuitiveness, customization, participation, and democratization of

access in other ecosystems, higher education institutions are inevitably going to be judged not by comparison with peer institutions, but against leading performance in these other sectors – for example, how do our student information systems compare with Amazon.com customer-centric information systems; from a student perspective, how do our lectures and presentations compare with TED Talks; and how do our highly regulated and institutionally controlled schedules of courses and evaluations compare with 2U, Minerva Project, and pop-up schools for example.[49]

And in response to the inevitable criticism of comparing apples and oranges, and concerns over the "tail wagging the dog," employers, users, and learners do not care. They will blithely translate experience from sector to expectations they have of another. Relying on the presumption that Professional Military Education (PME) and Joint Professional Military Education (JPME) students and their sponsors will have no other choice but to accept the current education options on offer from the DOD professional education system is both high-risk and ill-advised.

Implications for Institutional Academic Leaderships

Institutional academic leaders are also challenged by the growing gap between the mainstream and the leading edge of professional educational praxis and administration, between educational innovators and early adopters and late adopters and the trailing edge in their institutions.[50] This expanse is growing not simply because of shortening cycles of digitally-focused discovery, experimentation, development and deployment. It is also expanding because the rate at which mainstream higher education, and DOD professional education institutions, are adopting and integrating new technologies is halting at best.

Academic leaderships sit between the proverbial rock and a hard place. On the one hand, Learning 2.0/3.0 is evolving fast. On the other hand, most of their educator workforce is not. Many faculty feel their authority and competence is being eroded and threatened by these changes. They see little value in them. They remain unconvinced of the need to expand their practice beyond familiar and proven models. In this context, it is interesting to note the reaction of US Chief Academic Officers in a 2014 Online Learning Consortium survey, where although 71 percent of 2,800 CAOs surveyed agreed that online education is critical for their institutions' long-term strategy, and acknowledged the lack of faculty acceptance as a critical issue, many commented that they were pursuing strategies to work around faculty intransigence.[51]

At the same time, institution leaders are facing the aspirations and frustrations of the innovators and early adopters of Learning 2.0/3.0 amongst their educator workforce. As the pace of technology change increases, most educator innovators are frustrated by tepid, rhetorical and caveated support for their experimentation and innovation efforts and the technology emphasis on enterprise, one-size-fits-all LMS and walls-up information security. As Mott observes:

> Many students, teachers, instructional technologists and administrators consider the LMS too inflexible and are turning to the web for tools that support their everyday communication, productivity and collaboration needs. Blogs, wikis, social networking sites, microblogging tools and other web-based applications are supplanting the teaching and learning tools previously found only inside the LMS.[52]

For academic leaders, leveraging the best from both sides of this divided workforce is also made more difficult by the fact that, unlike virtually every other profession, higher education practitioners are not usually appointed for their capabilities as best practice educators.

In the DOD professional development system, military officers particularly are assigned to the faculty of the War Colleges, and National Defense University, for example, not for their qualifications or demonstrated best practice as educators, but on the criteria of rank, military occupational specialty, operational experience, and service. This practice is reinforced with the re-hiring of retiring military officers into civilian faculty appointments. Underlying these practices are two presumptions: that content knowledge is the more important and difficult to acquire and so has to be hired or assigned in, and that anyone can teach after at best some orientation briefings and "on-the-job" observation and practice.[53]

The purpose of graduate education at the senior war and joint colleges is substantially about helping students develop their strategic and enterprise thinking and leadership skills. In this context, content knowledge is not a substitute faculty qualification for competency in educational theory and practice in designing and crafting learning events and course learning structures that are effective for adult student learning in higher end cognitive skills.[54] And it is not a viable alternative faculty qualification for the task of designing digitally-enabled learning events that leverage the unique and constantly innovating properties of the online medium.

Faculty members assigned to a war or joint college need to be developed as educators capable of performing the spectrum of educational

roles in all learning environments. Similarly, there is a need for many long-standing civilian faculty to substantially expand and strengthen their digital literacies to enhance their confidence and capabilities to lead other faculty in digitally-enabled learning environments.

To address these needs, there is a critical and urgent requirement to institutionalize and prioritize sufficient financial and human resources to support comprehensive leading edge professional development programs for civilian, military and visiting faculty. Such programs should:

- help faculty members see themselves and develop themselves as higher education educators and members of the education profession;
- provide safe, non-threatening learning labs where all faculty can develop their digital literacy competencies working on projects of personal and institutional relevance; and
- provide well-resourced (tools, apps, digital resources) experimentation spaces, and qualified faculty and edtech guides for designing, testing and developing new learning events.

These programs need to be designed and led by educators recognized for their teaching skills, their innovation in digital technologies, and their understanding of their institution's culture. Participation in such programs needs to be recognized, valued, and incentivized in performance appraisals and promotion criteria.

There is also a need to vitalize, value, and validate faculty innovators and experimenters and create paths to rapidly socialize and mainstream their successful experiments across and beyond institutional boundaries. As the Higher Education Funding Council of England noted in their report on Enhancing Learning and Teaching Through the Use of Technology, "the challenge for institutions is to move beyond pockets of innovative practice carried out by enthusiasts."[55]

There is a palpable need to develop, resource, and empower a vibrant educational innovation community across the entire DOD professional education system. Such a community needs low entry barriers, easy and incentivized sharing of best practice learning events, development tools, and content resources (such as videos, images, games, simulations).

Implications for Educators

As observed above, the gap between Learning 1.0/1.5 and Learning 2.0/3.0 teaching practice and competencies is widening rapidly as the former changes little, and the latter is evolving at an increasing rate. For

many educators, that there is a gap is irrelevant as long as they are able to continue using Leaning 1.0 methods of practice. However, the evidence presented above foreshadows a situation where there may well no longer be a choice to continue solely with these methods of practice. If this is the case, then the gap does matter, and the fact that the gap is growing is of significance.

As digitally-enabled learning environments become more pervasive, rapidly changing, and more sought after by students and employers, educational technology mastery can no longer be a skill-set for specialist ed-tech technologists or "instructional designers."[56] There is a pressing need for educators to grow beyond their Learning 1.0 praxis and develop their professional skills and digital literacies for designing learning events and courses that leverage the unique properties of Learning 2.0/3.0.[57] With the speed of developments, taking this initiative now as a priority is critical before the gap between current and needed skills levels widens so much that it is too challenging to bridge.

Learning 2.0/3.0 also calls for educators to expand beyond traditional direct or indirect teacher-centric roles. New roles include that of educational experimenter and innovator. As the development cycles for educational technology shorten, traditional research practice carried out by academic researchers is struggling to serve this role. Moreover, this space is being filled by software and publishing house vendors, new alternative education providers, and students themselves. Front-line educators should not be limited to being deliverers of pre-packaged content that can only be changed at the margin through hierarchies of inflexible, cumbersome "mother-may-I" approval processes.

Other Learning 2.0/3.0 roles and responsibilities could include serving as guides for life-long learners in creating and evolving their personalized/personal learning networks; designer and constructor of Learning 2.0/3.0 learning events including games, simulations, videos, assessment tools, websites, etc., for a wide range of access devices, spaces and places; and serving as peer advisers to new faculty to help them develop their own digital literacies.

Implications for Students

Particularly the graduate part of the higher education sector and the senior level of the DOD professional development system are confronting a learner generational issue. Baby boomer generation and Gen X adult learners have been socialized by their youth Learning 1.0 experiences to expect and accept teacher-centered school experiences and accept learning

as a requirement for professional accreditation. For military practitioners particularly, continued professional standing and advancement has been tied to regular, spaced injections of education and training. Such students expect to leverage their years of professional experiences in each episode of education or training but equally expect a "full-service" experience where, for example, all learning materials are prepared for them.

As we move into more learner-centric 2.0/3.0 environments, many baby boomer and Gen X students may find they need to significantly upgrade their digital literacies and capabilities that they will require not only for episodic and continuous learning events, but also within Web 2.0/3.0 shaped work and operational environments.

By contrast, US Millennials and Gen Zee are socialized by their living and learning experiences, immersed in the rapid-fire changes of Web and internet technologies, and the unbundling of learning opportunities out of conventional Learning 1.0 educational systems.[58] These are the generations of adult students who are shortly to enter our mid and senior PME and JPME educational institutions, and who, for the most part, have very different and demanding expectations and preferences for autonomy, participation, collaboration, mobility, IT support, electronic resources, personalization, etc.

At the same time, while it would appear that these upcoming generations are more familiar with and active on many Web 2.0 social and current affairs apps, and depend upon always-on, personalized connectivity, it cannot be assumed that they possess advanced digital literacies for leveraging the web for learning purposes, as a British Library/Joint Information Systems Committee report observed about the "Google Generation:" "although young people demonstrate an ease and familiarity with computers, they rely on the most basic search tools and do not possess the critical and analytical skills to assess the information that they find on the web."[59] Although slightly counter-intuitive, it would seem also likely that Millennials and Gen Zee students will require learning opportunities that either directly or indirectly help them upgrade their digital literacies and capabilities.

Learning 2.0/3.0 3.0 environments open up opportunities for students to learn by their own discovery, by their own practice, and by their own collaborations. While many students may relish the idea of not being overly prescribed, directed and controlled in their learning activities, this empowering freedom also transfers a degree of responsibility from educators to students which may not necessarily be as welcome. While learning

2.0/3.0 educators may guide and assist, much more of the initiative and discipline for learning rests with the student.

As episodic learning opportunities prove inadequate for professionals to keep up with subject matter developments and maintain their digital capabilities, and as more anywhere, anytime learning alternatives go mainstream, most professionals will become active continuous life-long learners. To support this habit, learners are likely to need to develop their skills in designing and maintaining their own Learning 2.0/3.0 personalized/personal networks and paths – to become informed customers, rather than passive recipients of institutional direction. To guide their selection of learning experiences to incorporate, they are likely to establish continuous relationships with a number of local or global educators and mentors.

Also, we are likely to see changes in the traditional work environment – concepts of work productivity and what gets done at work – to accommodate and incorporate learning activities, time, and spaces, and sharing of learned experiences as normal components of activity. There is likely to be a strong feedback loop from these activities in terms of organizational resilience, readiness for innovation and adaptation.

Finally, as can be seen from the earlier sections of this chapter, like it, love it, or loathe it, digital technologies (particularly when converged with their nano- bio- and robotic counterparts) are impacting almost every social, economic, and government sector in and between every world region. Yet the learning areas and subject structures of most (but not all) War and Joint College programs continue to focus on traditional subjects such as history, politics, economics, mathematics, engineering, computer sciences, etc. While such educational experiences are always challenged by trying to squeeze a quart of learning into a pint pot of time available, as future strategic leaders, PME and JPME students (and faculty) particularly need to develop their subject matter awareness and understanding of cyberspace writ large in terms of its wide, diverse and exponentially evolving uses, technologies and security.

Notes

1. Many of the trends and practices presented in this chapter are being experienced in many parts of the world. However, to manage its scope, this chapter focuses principally on the US context. I would also like acknowledge and thank Dr. Paulette Robinson, and Dr. Linton Wells II for their review of this chapter and comments all of which have been incorporated.

2. Malcolm Brown, "Trajectories for Digital Technology in Higher Education" *EDUCAUSE Review* July/August 2015, accessed 30 June 2015, http://net.educause.edu/ir/library/pdf/erm1541.pdf), 16.

3. For example, see Clayton M. Christensen, *The Innovative University – Changing the DNA of Higher Education from Inside Out* (San Francisco, Josey-Bass, 2011); and Clayton M. Christensen, Michael B. Horn, Curtis W. Johnson, *Disrupting Class* (New York, McGraw-Hill, 2008).

4. See for example, Moises Naim, *The End of Power – From Boardrooms to Battlefields to Churches and States, Why Being in Charge Isn't What it Used to be* (New York, Basic Books, 2013).

5. Cathy N. Davidson and David Theo Goldberg, *The Future of Learning Institutions in a Digital Age* (Boston, MIT Press, 2009), 8.

6. Tim O'Reilly, "What is Web 2.0 – Designing Patterns and Business Models for the Next Generation of Software" September 30, 2005, accessed 12 June 2015, http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html.

7. See an interesting blog post on this by Andy Mulholland, "Government 2.0 – What Exactly Does this and other 2.0 Terms Mean?" *GovLoop* October 9, 2008, accessed 18 June 2015, https://www.govloop.com/community/blog/government-2-0-what-exactly-does-this-and-other-2-0-terms-mean/.

8. "A Live Look at Activity Across WordPress.Com," accessed 18 June 2015, https://wordpress.com/activity/.

9. Craig Smith, "By the Numbers: 70+ Amazing Tumblr Statistics and Facts," 1 May 2015, accessed 18 June 2015, http://expandedramblings.com/index.php/tumblr-user-stats-fact/.

10. YouTube Statistics, accessed 18 June 2015, https://www.youtube.com/yt/press/statistics.html.

11. Craig Smith, "By the Numbers; 14 Interesting Flickr Facts" 23 May 2015, accessed 18 June 2015, http://expandedramblings.com/index.php/flickr-stats/.

12. 50 Recently Active Wikipedians, accessed 18 June 2015, http://stats.wikimedia.org/EN/TablesWikipediaEN.htm#wikipedians.

13. Randy Milovanic, "The World's 21 most Important Social Media Sites and Apps in 2015" *Social Media Today*, 13 April 2015, accessed 19 June 2015, http://www.socialmediatoday.com/social-networks/2015-04-13/worlds-21-most-important-social-media-sites-and-apps-2015.

14. Don Tapscott, Andy Williams, *Wikinomics – How Mass Collaboration Changes Everything* (New York, Portfolio, 2006), 12-19. The materials defining Web 2.0 are substantial. One reference of particular help is Ron Dawson's Web

2.0 Framework, Web 2.0 Landscape and Web. 20 Definitions, accessed 18 June 2015, http://www.rossdawsonblog.com/Web2_Framework.pdf.

15. Darryl West, *Going Mobile – How Wireless Technology is Reshaping Our Lives* (Washington D.C. Brookings Institution Press, 2014).

16. Benedict Evans, "Mobile is Eating the World," 8 October 2014, accessed 18 June 2015, http://www.slideshare.net/a16z/mobile-is-eating-the-world-40841467.

17. Evans, "Mobile is Eating the World," 2014.

18. Antonio Regalado, "Business Adapts to a New Style of Computer" *MIT Technology Review* July/August 2014, accessed 19 June 2015, http://www.technologyreview.com/news/527356/business-adapts-to-a-new-style-of-computer/.

19. Darryl K. Taft, "Five Trends that will drive Data Storage in 2015" *eWeek*, 28 November 2014, accessed 20 June 2015, http://www.eweek.com/storage/slideshows/five-trends-that-will-drive-data-storage-in-2015.html.

20. For an overview of the Semantic Web, see Hatem Mahmoud, "Web 3.0 The Semantic Web" 14 July 2009, accessed 20 June 2015, http://www.slideshare.net/HatemMahmoud/web-30-the-semantic-web?qid=53fd8829-5ed8-4ff4-ade5-0a5eccac0d6c&v=default&b=&from_search=1.

21. Two caveats in respect of this section: first, the US higher education sector is large and diverse. Inevitably any attempt to summarize defining characteristics and attributes cannot incorporate all exceptions and exceptional models, institutions, practitioners and student groups. Second, a word about "eLearning": unfortunately, "e-Learning" is often too narrowly viewed and defined as "distance" or "distributed" learning. It has led to a false and misleading separation into two divergent and disconnected tracks of education - online and face-to-face, asynchronous and synchronous, resident and online educators, and students. However, emerging, and even mainstream, digital technologies are shaping and enhancing the learning experience in all educational settings, not only those outside the traditional bricks and mortar institution.

22. For example, see the 148-page Chairman, Joint Chiefs of Staff Instruction (2015, 29 May) *Officer Professional Military Education Policy* (CJCSI 1800.01E).

23. Jeff Cobb, *Learning 2.0 for Associations* (Tagoras, 2nd Ed., 2010), accessed 12 June 2015, http://www.tagoras.com/docs/Learning-20-Associations-2ed.pdf, 15-16.

24. See Coursera (https://www.coursera.org/) and EdX (https://www.edx.org/)for example.

25. Don Tapscott, Andy Williams, *Wikinomics – How Mass Collaboration Changes Everything* (New York, Portfolio, 2006).

26. See for example, Ari Bildner, "TV Journalist Rose Imparts Interviewing Tips" *Yale Daily News*, 19 April 2007, accessed 26 June 2015, http://yaledailynews.com/blog/2007/04/19/tv-journalist-rose-imparts-interviewing-tips/.

27. For an overview of the educational theory of social constructivism, from which this idea of social collaborative learning is drawn, see, Kalen M.A. Churcher, Edward Downs, Doug Tewksbury, "Friending" Vygotsky: A Social Constructivist Pedagogy of Knowledge Building Through Classroom Social Media Use" *The Journal of Effective Teaching*, 2014, 14, 1, 33-50.

28. Stephen Downes, "Groups vs. Networks Blog post," 24 November 2007, accessed 26 June 2015, http://www.downes.ca/post/42521.

29. See for example, Koreen Olbrish Pagano, *Immersive Learning – Designing for Authentic Practice* (American Society for Training and Development Press, 2013).

30. Ann Davies, Devin Fidler, Marina Gorbis, Future Workforce Skills 2020 (Institute For the Future, University of Phoenix Research Institute, 2011), accessed 21 June 2015, http://www.iftf.org/uploads/media/SR-1382A_UPRI_future_work_skills_sm.pdf.

31. For an example of an excellent summary of these trends, see Malcom Brown, "Trajectories for Digital Technology in Higher Education" *EDUCAUSE Review*, July/August 2015, accessed 26 June 2015, http://www.educause.edu/ero/article/six-trajectories-digital-technology-higher-education, 50, 4; Mark S. Valenti, "Beyond Active Learning – Transformation of the Learning Space" *EDUCAUSE Review*, 2015, July/August 2015, accessed 26 June 2015, http://www.educause.edu/ero/article/beyond-active-learning-transformation-learning-space, 50, 4; and Malcolm Brown, Joanne Dehoney, Nancy Millichap, "What Next for the LMS?" *EDUCAUSE Review*, 2015 July-August 2015, accessed 26 June 2015, http://www.educause.edu/ero/article/whats-next-lms, 50, 4.

32. See definition of "low-stakes" assessments: *"Low-stakes assignments are forms of evaluation that do not heavily impact students' final grades or other educational outcomes. The purpose of low-stakes assignments is to provide students with an indication of their performance while taking a course and give students an opportunity to improve their performance prior to receiving a final grade, either on an assignment or in a course,"* accessed 29 June 2015, http://teachingcommons.depaul.edu/Feedback_Grading/low-stakes-assignments.html.

33. *The Smartphone Difference: US Smartphone Use in 2015,* Pew Research Center, April 2015, accessed 28 June 2015, http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.

34. For example, see: Angela Murphy, Helen Farley, Helen, Andy Koronios, "Understanding the Use of Smart Mobile Technologies for Learning in Higher Education" (Paper presented to the 30th Ascilite Conference, Sydney, 2013), accessed 28 June 2015, http://www.ascilite.org/conferences/sydney13/program/papers/Murphy.pdf. Also see: McGraw-Hill Education's March 2015 report on its survey of higher education students from undergraduate to doctoral level, reports that of those surveyed 81 percent use mobile devices for educational purposes. This is up 40 percent over their 2013 survey. Accessed 28 June 2015, http://www.mheducation.com/about/news-room/report-new-mcgraw-hill-education-research-finds-more-80-percent-students-use-mobile.

35. Amanda Lenhart, *Teen, Social Media and Technology Overview 2015*, Pew Research Center, April 2015, accessed 2 July 2015, http://www.pewinternet.org/files/2015/04/PI_TeensandTech_Update2015_0409151.pdf. The 2014 Social Media data is recorded in Andrew W. Berning, *Top Ten Current Trends in Educational Technology* 11 June 2015, accessed 25 June 2015, http://www.slideshare.net/andyberning/top-current-trends-in-educational-technology-6-1115?qid=4b74fd37-203b-4bdd-ac9b-13d5dde7b3d8&v=qf1&b=&from_search=7.

36. See for example, John K. Waters, "How Nanodegrees are Disrupting Higher Education" *Campus Technology*, 5 August 2015, accessed on 6 August 2015, http://campustechnology.com/articles/2015/08/05/how-nanodegrees-are-disrupting-higher-education.aspx.

37. Institute For The Future, *From Educational Institutions to Learning Flows – Mapping the Future of Learning* (2013), accessed 30 June 2015, http://www.iftf.org/our-work/global-landscape/learning/from-educational-institutions-to-learning-flows-map/. See the program's Learning Flows Map, http://www.iftf.org/fileadmin/user_upload/images/ourwork/learning_2013map_lg.jpg.

38. Steven Wheeler, "What's so Good about Open Educational Resources?" (Presentation for the UNESCO OER Conference, Windhoek, Namibia, 2010) Slide 11-12, accessed 30 June 2015, http://www.slideshare.net/timbuckteeth/whats-so-good-about-open-educational-resources?qid=7b8415b5-7e26-493b-8bb9-6942ea45a5cb&v=default&b=&from_search=3). Open Educational Resources are defined as "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others."

39. Malcolm Brown, "Trajectories for Digital Technology in Higher Education" *EDUCAUSE Review*, July/August 2015, accessed 30 June 2015, http://net.educause.edu/ir/library/pdf/erm1541.pdf.

40. Marie Bienkowski, Mingyu Feng, Barbara Means, *Enhancing Teaching and Learning Through Educational Data Mining and Learning Analytics: An Issue Brief* (US Department of Education, Office of Educational Technology, 2012), 9, accessed 30 June 2015, http://www.cra.org/ccc/files/docs/learning-analytics-ed.pdf.

41. Peter Smith, "The Coming Era of Personalized Learning Paths" *EDUCAUSE Review* November/December 2014, accessed 29 June 2015, http://www.educause.edu/ero/article/coming-era-personalized-learning-paths, 49, 6.

42. Elaine I. Allen, Jeff Seaman, Jeff, *Grade Level: Tracking Online Education in the United States* (Boston, Babson Survey Research Group and Quahog Research Group LLC, 2015), 15.

43. Lisa M. Lane, "Insidious Pedagogy: How Course Management Systems Impact Teaching" *First Monday* 2009, October 5, 14, 10, http://firstmonday.org/ojs/index.php/fm/article/view/2530/2303.

44. Van Weigel, "From course management to curricular capabilities: A capabilities Approach for the next generation" *EDUCAUSE Review* 2005, 40, 3,

55, accessed 24 June 2015, http://www.educause.edu/ir/library/pdf/ERM0533.pdf.

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47. Kalen M.A. Churcher, Edward Downs, Doug Tewksbury, "Friending" Vygotsky: A Social Constructivist Pedagogy of Knowledge Building Through Classroom Social Media Use" *The Journal of Effective Teaching*, 2014, 14, 1, 35. For example, the "Academic Computing Working Group (with only advisory authority) at National Defense University reports to the IT Investment Committee, rather than sets the priorities for the latter.

48. See for example, the UK JISC Digital Student Program's 50 exemplars of effective digital practice in support of student achievement, accessed 2 July 2015, http://digitalstudent.jiscinvolve.org/wp/exemplars/.

49. Started in 1984 as a conference where Technology, Entertainment and Design converged, TED provides a variety of open platform opportunities for leading thinkers, researchers, practitioners, activists to speak on their ideas across a broad spectrum — from science to business to global issues. These talks are short in length (usually 15-18 minutes), pithy, informative and are characterized by intense preparation, and careful use of graphics, charts, diagrams, and statistics to support argument and reasoning. Talks are curated on the TED Website (https://www.ted.com/). http://2u.com/; Wood, Graeme, "The Future of College?" *The Atlantic Monthly* September 2014, accessed 26 May 2015, http://www.theatlantic.com/features/archive/2014/08/the-future-of-college/375071/. Christine Mercer, "Radical Pop-Up Schools: A new way to reach educationally disadvantaged communities" *Washington Post,* June 16, 2015, accessed 30 June 2015, http://www.washingtonpost.com/blogs/answer-sheet/wp/2015/06/16/radical-pop-up-schools-a-new-way-to-reach-educationally-disadvantaged-communities/.

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51. Elaine I. Allen, Jeff Seaman, *Grade Level: Tracking Online Education in the United States* (Boston, Babson Survey Research Group and Quahog Research Group LLC, 2015), 21-22.

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53. Joan Johnson-Freese, *Educating America's Military* (Cass Military Studies, Routledge, 2012). See also, Book TV: Joan Johnson-Freese, "Educating America's Military," accessed 1 July 2015, https://www.youtube.com/watch?v=lh_SakoTRnU.

54. See the updated Bloom's Taxonomy of Cognitive Skills. Interesting, the update is not only in sync with the shifts from Learning 1.0 to Learning 2.0, but it also acknowledges "Create" as the highest cognitive skill – a skill that is encouraged and facilitated by co-creative and collaborative digitally-enabled learning environments.

55. Higher Education Funding Council of England, *Enhancing Learning and Teaching Through the Use of Technology* (2009), 6. The latest NMC Technology Outlook for the Australian Tertiary Sector also commented that: *"Current organisational promotion structures rarely reward innovation and improvements in teaching and learning. A pervasive aversion to change limits the diffusion of new ideas, and too often discourages experimentation."* L. Johnson, S. Adams Becker, C. Hall, *2015 NMC Technology Outlook for Australian Tertiary Education: A Horizon Project Regional Report* (Austin, Texas: The New Media Consortium, 2015), 8.

56. Marc Prensky, author of Digital Game-Based Learning, remarked in 2005 in his EDUCAUSE Review article "Students certainly don't have short attention spans for these games, movies, music or internet surfing. More and more, they just don't tolerate the old ways and they are enraged we are not doing better by them." Marc Prensky, "Engage me or Enrage Me – What Today's Learners Demand" *EDUCAUSE Review* September 2005, accessed 2 July 2015, https://net.educause.edu/ir/library/pdf/erm0553.pdf.

57. D. Bawden, Chapter One: Origins and Concepts of Digital Literacy, in *Digital Literacies: Concepts, Policies and Practices* (Peter Lang Publishing Inc.), 17-32, as summarized by Judy O'Connell, "Digital Learning Environments – A Multidisciplinary Focus on 21st Century Learning" Presentation to Ascilite 2014 Conference, Dunedin, New Zealand, 23 November 2014. O'Connell quotes Bawden's facets of digital literacy as:

- Knowledge Assembly – building a "reliable information hoard" from diverse sources;
- Retrieval Skills, plus critical thinking for making informed judgements about retrieved information, with wariness about the validity and completeness of internet sources;
- Reading and understanding non-sequential and dynamic material;
- Awareness of the value of traditional tools in conjunction with networked media
- Awareness of "people networks" as sources of advice and help;
- Using filters and agents to manage incoming information; and
- Being comfortable with publishing and communicating information as well as accessing it.

Bawden's concept of digital literacy was limited to gathering and using digitally-housed information. Over the last seven years, the concept of digital literacies has deepened and widened to include skills in video/audio production, web page design and construction, image adjustment, creating relevant mash-up applications; wiki editing, blogging, tagging which are associated with Web and Learning 2.0. We are currently seeing Web and Learning 3.0 coming up with additional literacies required to fully utilize the emerging technologies.

See also the UK Joint Information Systems Committee, *Developing Digital Capabilities Guide and its Seven Elements of Digital Literacy* (https://www.jisc.ac.uk/full-guide/developing-digital-literacies); and its Digital Student Project and Digital capabilities model (https://www.jisc.ac.uk/blog/thriving-in-a-connected-age-digital-capability-and-digital-wellbeing-25-jun-2015). Accessed on 3 July 2015.

58. Although there are a few years difference between sources, most usually baby boomers are defined as the generation born between 1946 and 1964, Gen Xers – between 1965 and 1984, and Millennials as post 1980. However, we are seeing that perhaps Millennials are being followed by a distinctive generation, dubbed Gen Zee, born after 2004, who will soon be entering their teens.

59. I. Rowlands, et. al., *Information Behaviour of the Researcher of the Future* (CIBR Research Team, University College, London, 2008) 18-20.

Chapter 8
Being in Uncertainty: Cultivating a New Sensibility in Military Education

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Abstract

We consider the question: Is military education keeping pace with the task of preparing military people for effective leadership in the emerging highly networked, highly unpredictable world? We examine the nature of the changing environment for military operations. We speculate about leadership identity needed in this environment, possible ways to cultivate the required sensibilities, and the possible role of technology in achieving it. We call for a conversation about how military leadership education might be redesigned and how we might get a new design in place.

Today's global security environment is the most unpredictable that I have seen in 40 years of service.

– General Martin Dempsey, US Army
Chairman, Joint Chiefs of Staff[1]

If we were the best of the best, why were such attacks not disappearing but in fact increasing? Why were we unable to defeat an under-resourced insurgency? Why were we losing?

– General Stanley McChrystal, US Army[2]

We are in the midst of a transformation from a machine age to a network age. The machine age taught us to aspire to predictability, control, and efficiency; the network age confronts us with massive, ever-increasing, intractable uncertainties. Possibilities change rapidly and outcomes are unpredictable. Our military leaders were brought up in a machine age of operations planned and executed in a strongly hierarchical, rule-based, and technology-dominated tradition. The network age breaks the old rules and demands new ones: it integrates billions of humans and machines into an ever-shifting, semi-intelligent organic system. Effective leadership is challenging because there are no fixed rule sets in the network age. Our education systems, designed in the machine age, do not adequately prepare our military for the emerging new world. Our adversaries, who are not subject to our institutional constraints, are moving into the new age faster than we are. It is time for a new conversation about the design of military education.

The now-famous story of Lieutenant Colonel Christopher Hughes in Iraq in April 2003 gives a glimmer of thinking that should become the norm of the Network Age.[3] He was leading a battalion from the US Army's 101st Airborne Division toward the Shia mosque in Islamic holy city of Najaf, Iraq. Suddenly they were surrounded by an angry mob, increasingly agitated as the rumor spread that the Americans were there to forcibly take the mosque. Hughes' military training gave him clear rules – protect his men by raising their firearms toward the crowd, fire a warning shot, and be prepared to fire to kill if needed. Hughes recalled later "If somebody shot a round in the air, there was going to be some sort of massacre."[4] Instead, Hughes bucked his training. He ordered his men to drop to one knee, lower their weapons, and smile. Then he ordered them to back away. The crowd parted and he and his men left. No shots were fired on that street that day. Not only did he duck disaster, Hughes won a strategic victory by building trust that the Americans were not trying to take over mosques.

Our Naval Postgraduate School colleague Commander Zachary Staples had an assignment in Iraq in which he got to observe first-hand the devastating effects of Improvised Explosive Devices (IEDs). Up to that point, the military had tried a variety of technology fixes including improved vehicle armor, early detection of explosive chemical residues, and jamming of radio signals that detonated IEDs. These technologies had an effect on reducing IED casualties, but the troops still sustained major injuries because many were not wearing their helmets when an IED hit. Staples asked the men why they did not wear their helmets or the headsets that protected their eardrums from blast overpressure effects. They told him that most convoys were long, hot, and boring – taking off their helmets and their headsets enabled them to listen to their iPods and remain a little cooler. As an engineer he built a small adapter that gated iPod signals into the helmet headphones so that soldiers could listen to their music with helmet and headsets on, but it automatically switched to the radio channel when needed. Men who used the adapter wore their helmets and sustained far fewer IED injuries. Staples travelled across Iraq offering an IED training seminar in which the graduation token was a free adapter. In the seminar he showed how to avoid injuries by wearing helmets and using the adapter. He said, "I was able to achieve this innovation and get the buy-in by understanding what was important to them in their everyday culture, and giving them a protective technology that blended into their worlds."[5]

What made Hughes and Staples buck their training? We think they had a sensibility about the social cultures they came in contact with, enabling them to anticipate people's assessments and moods, and find better

alternatives than permitted by the existing rules. They followed their sensibilities instead of the published procedures and coped with unexpected contingencies. We think that such sensibility can be cultivated within a new approach to military education. We will speculate about the shape of that approach in this chapter.

Mindful of Albert Einstein's saying, "We cannot solve our problems with the same thinking we used when we created them," we might ask how we can change our thinking for the new age.[6] This is the wrong question for our situation because it implicitly assumes thinking will solve the problems that thinking caused. Instead we will examine here what kind of human beings we need to become so that we will be effective in the new age. Certainly, we need to think differently, see the world through new perspectives, and make new interpretations. But that is far from enough. We also need to embody new practices of sensibilities toward history, culture, moods, emotions, power, and possibilities – for this is how we will be able to act effectively even when there is no time to think. We will examine in depth what this new way of being looks like and how we might cultivate it.

We use the term "network" frequently in this chapter. We are not referring to a machine-age view of a large network of connected computers, but rather to a network-age view of billions of people and machines interacting with each other. The emerging network is both social and technological. The network age brings together computing networks and human networks in a way unseen at any time in history, creating the ever shifting, semi-intelligent organic system we now experience as "the network." The network age has the computational power of the machine age, plus publishing, information sharing, global communications, coordinating, social networking, sharing economies, crowdsourcing, mobility, cheap cloud computing, and more. And it includes a new dark side of cyber crime, identity theft, cyber attacks, dark networks, and black-market "network exploits."

Role of Computing Technology

Computing technology is a transformative influence behind the changes in our world. We have developed machines of vast computational power and connected them into a vast network. Today's computers are a million times faster and a thousand times smaller than those of fifty years ago. Today's Internet has grown to over fifteen billion machines and four billion people. The network of machines and people has acquired a sort of intelligence – the collective amplified intelligence of all the people

participating in it. The semi-intelligent network functions more like a biological ecosystem than a huge supercomputer.

The first of the two accompanying images (Figure 5) illustrates the computing power we have achieved so far. It is the IBM Blue Gene supercomputer at Argonne Labs. It houses 250,000 processors in 72 cabinets connected by an optical network. It can perform around 10^{15} operations per second – a million times faster than the chip in your smartphone. The second image (Figure 6 on the following page) is a beautiful graph of connections between Internet sites collected from data on packet traffic in the Internet.

Figure 5. IBM Blue Gene Supercomputer at Argonne Labs. Photo courtesy of Argonne National Laboratory. Image available at http://flickr.com/photos/35734278@N05/3323018571, Wikimedia Creative Commons license.

The Internet is an organic system of humans and machines in a never-ending dance of interaction altering and amplifying each other's capabilities. We are constantly changing the system's structure. Our collective behavior is unpredictable because there is no way to know how interactions among so many people and machines will turn out. This is the context in which military operations are being conducted.

Reinaldo Normand, a Silicon Valley entrepreneur, writes a provocative book about the speed at which digitalization of almost everything combined with exponential growth of digital technologies in almost every sector, defies our abilities to project what will happen next.[7] He calls attention to

15 digital technology trends, each growing exponentially, that are causing major disruptions in economies and governments – the cloud, mobility, sharing economy, Internet of things, big data, virtual reality, 3D printing, bionic implants, biotech, nanotech, artificial intelligence, alternative energies, bitcoin, and digital crime. Exponential trends foster avalanches that sweep away entire industries, long familiar ways of doing business, and identities. Exponential trends and avalanches, rare in the machine age, are increasingly common in the network age.

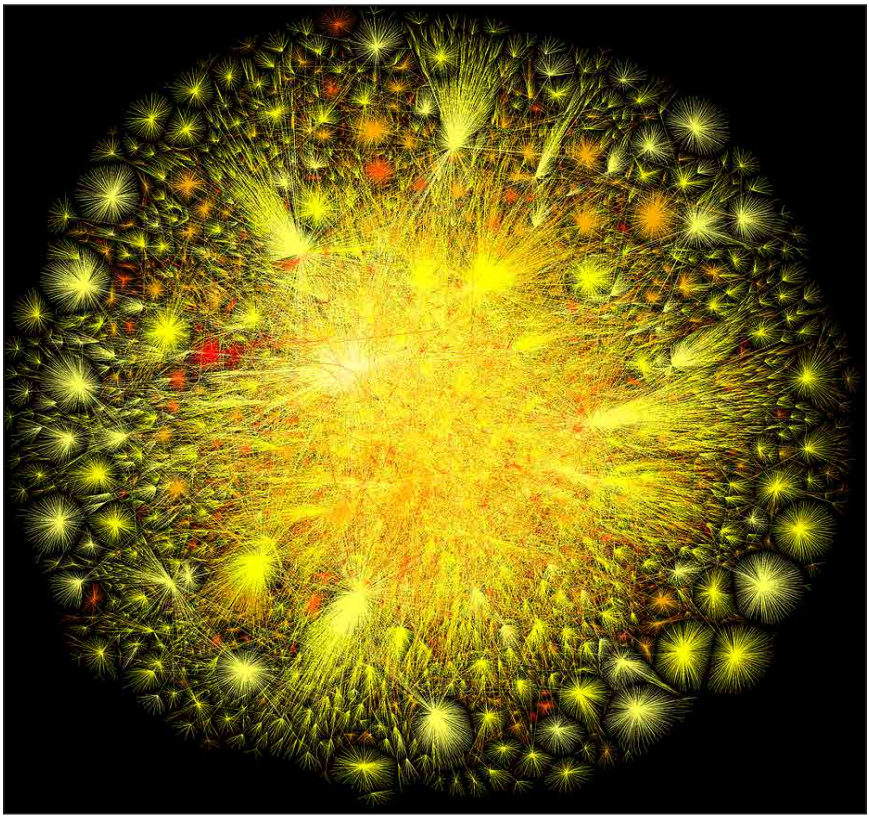

Figure 6. Internet connection graph from border gateway protocol data. Photo courtesy of Barrett Lyon / The Opte Project.

Military leaders today are trying to come to terms with new realities of warfare enabled by the network context. Here are examples of problems induced by computing technology, but for which there is no technological solution (see Table 3 on the following page).

Large scale sensor networks and situational awareness	Massive sensory data easily push operators into information overwhelm and present them with a "situation" too complex for their understanding. The large number of people interacting and making their own choices makes prediction impossible.
Command and control of huge networks	Operators are easily pushed into overload. Great uncertainties are caused by incomplete information and lack of control over adversary actions.
Encryption hides content but not actions	Strong encryption hides content of messages behind unbreakable ciphers. But metadata, including event records of packet movements, allows inferring plans and intentions of those sending secret messages.
Finding dark networks	Adversaries take extraordinary steps beyond encryption to hide their communications and networks. But their actions leave "footprints" in the physical world. Can the footprints be correlated and analyzed to infer the contents of hidden communications, locate hidden actors, and even map their social networks?
Automated weapon control	It seems that the only choice with a very complex system is to develop weapon controllers that decide how and when to use the weapon faster than humans can determine and respond. This is problematic because taking humans out of the loop leaves decision making to machine intelligence that does not understand political and diplomatic nuances. Can we keep humans in the loop?
Cyber attacks	The attacker's intent ranges from nondestructive theft of information without being detected, to disabling our ability to communicate and coordinate. Should we have backup systems? What might they be?
Swarming operations	Drone technology is making swarm tactics cheap, feasible, and effective. An aircraft carrier cannot defend itself against a swarm of autonomous bombardier drones. But we may be able to defend with our own swarms of defensive drones.

Table 3. Examples of problems induced by computing technology. Created by authors.

Contrasting Perspectives

There are many contrasts between our machine-age interpretations of our world and the emerging network-age interpretations. We have listed nine examples in Table 4, and we will comment on them next.

1	Innovation as idea creation	Innovation as emergence
2	Knowing more	Exponential uncertainty
3	Diffusion	Mobilization
4	Deterministic	Unpredictable
5	No intelligence	Intelligence
6	Efficiency	Effectiveness
7	Managing toward goals	Navigating
8	Rule sets and end-states	Commitments, moods, power
9	Sustaining innovation, brands	Shifting identities, disruption, avalanches

Table 4. Contrasts between machine age and network age perspectives. Created by authors.

(1) The first contrast concerns the origins of innovation. Our innovation process models assume that innovation begins with an idea that is then processed through a series of steps until it is embodied into a technology artifact that diffuses through a population. These models make it seem that ideas drive innovation and without ideas there is no innovation; therefore we put great emphasis on creativity and imagination. Yet even with charismatic leadership, our success with creative thinking, strategic plans, and careful process management is dismal – under four percent of innovation projects make a positive return on their investment.[8] This has been a scourge for the military, which depends on constant innovation to stay ahead of nimble adversaries.

Through our studies of innovation, we are learning that much innovation does not begin with an idea – it emerges in the practices of communities as people respond to concerns using whatever tools and technologies they find around them.[9] Whatever we call the "idea" is often a story invented in hindsight to explain the practice that has already emerged. We are also learning that 90 percent of the work to achieve innovation is involved in adoption of the new practice rather than creating ideas. We are likely to become much more successful at innovation if we let go of the "idea idea" and learn how to foster adoption.

(2) The second contrast concerns the promise of "big data." On the one hand, big data offers vast knowledge of events everywhere in the network and the computational power to locate patterns and causes. On the other hand, the more information we have and the more connected we are, the less we are able to predict. It seems that the increasing numbers of connections and increasing sophistication of automation generate uncertainty faster than they resolve uncertainty.

(3) The third contrast concerns technology adoption. Our machine-age interpretation is that adoption results from information diffusion: people making conscious decisions to use a new technology after receiving information about it through their communication channels and social connections.[10] In the network age, however, we see people unconsciously falling into new practices that attract them by appearing more effective, admirable, or fashionable; leaders foster adoption by mobilizing people in a network to commit to the new practice.

(4) The fourth contrast concerns deep differences between a network of machines and a network of people. Machines are deterministic: they follow definite steps, in definite orders, producing definite outcomes. The network of people and machines on the other hand is non-deterministic: no

outcome is certain and it is often difficult even to enumerate all the possibilities available at a given time. Our deterministic rule sets, developed in the machine age, do not work well in the uncertain network age.

(5) The fifth contrast concerns our notions of intelligence. Machines are not intelligent. All you see inside a machine is electronic circuits made of transistors and wires. Whatever we call intelligent behavior of a machine is simply an assessment provoked in us by the machine's designer. When we connect huge numbers of people and machines, the resulting network behaves with intelligence – the collective amplified intelligence of the people using it. The network can aggregate data about our individual movements and make inferences about our future movements. How do we navigate in such an environment?

(6) The sixth contrast concerns the role of efficiency. With machines we are concerned to minimize waste of time and energy. In the network age, we often have more computing power and bandwidth than we need and our concern shifts to effectiveness. How do we foster the effective outcomes when the tools we find around us are cheap?

(7) The seventh contrast is that in the uncertain, unpredictable environment of the network age we often cannot describe the end-states we seek. We can speak only of possibilities and we wonder how to move in the network closer to the possibilities that interest us. We cannot readily define a path from where we are to where we want to be. Instead, we must find our way amidst the uncertainty, much the same as navigators have historically found their way across uncertain seas to destinations well over the horizon. Instead of defining a path and managing it every step of the way, we explore and navigate through an ocean of uncertainties. We alter course when we encounter unexpected contingencies.

(8) The eighth contrast is the focus on what is most important for achieving outcomes. The machine-age view is that the world is a complex system and the desired outcome (end) is a state of the system. In this view, we define rule sets for how to move in the system and get to the end state. The network-age view is that the desired outcomes depend on commitments that people make. Their willingness to make commitments depends on their moods. The capacity to induce others to make commitments depends on whether they have personal and social power in the network. Clarity in making speech acts such as requests, promises, declarations, assertions, and assessment is essential for developing personal and social power.

(9) The ninth contrast concerns how organizations, industries, and identities evolve. In the machine age, conditions are relatively stable and predictable; organizations have many years to develop brands and earn trust of generations of customers. In the network age, disruptions of brand and identity are increasingly common; avalanches sweep away entire job sectors in just a few years. How do we rebuild if we are disrupted? Manage our moods?

In these contrasts, we have emphasized that the machine-age framework is heavily technological. It looks for technological and rule-based solutions to problems. It seeks to define rule sets for dealing with recurrent problems. Bureaucracies, which achieve machine-like behavior from human organizations, fall in this category and are notoriously slow to change. The military services are deeply bureaucratic. They have extensive rule sets and instructions to cover almost any imaginable contingency and are constantly producing new instructions to cover new contingencies.

In the network age, leaders must become aware of the social context in which technology is used; its history, stakeholders, culture, dispositions, moods, and power exercised by various groups. Vice Admiral Arthur Cebrowski, a network-age thinker par excellence, frequently gave speeches arguing that the two approaches can be brought together through the military doctrine of "commander's intent." He advocated that commanding officers enable forces to organize from the bottom up – or to self-synchronize – to meet the commander's intent.[11] This is similar to McChrystal's principle to delegate decisions on specific actions to the lowest possible level.[12] The Cebrowski and McChrystal interpretations of command are controversial.[13] Too many junior officers fear their careers will be ruined if they break the rules or violate their chains of command. It will be a real challenge to develop organizational rewards that incentivize the development of network age leaders.

Deeper Reflection on the Ideation-Emergence Contrast

Let us examine in more detail the first of the contrasts in the list. This is the contrast between the machine age notion that ideas cause or initiate innovation and the network age notion that innovations emerge in the practices of people in the domain. Our success at innovation and staying ahead of adversaries will depend not on idea creation, but on how well we master emergence.

Ideation means imagining and creating new ideas for solving problems. The result is a description of the idea, a prototype, and a plan to implement it. The main work of innovation is seen as invention; the

work of gaining adoption is buried beneath the lesser term "implement." This notion is attractive because our main models of innovation – pipeline, funnel, diffusion, and innovation cell – all show innovation being initiated and driven by ideas. Moreover these four models are formulated as technologies – an assembly line, a series of funnels, a communication network, a spinning wheel throwing off sparks. The models themselves exemplify machine age thinking and terminology.

The flaws in this framework can be seen in two major breakdowns mentioned earlier: the four percent success rate of innovation proposals and the 90 percent adoption work factor. We need to spend less time on ideation and more on fostering emergence. Many adversaries are using approaches consistent with emergence (discussed next) and are overtaking us in the novelty of their attacks.[14]

The fundamental problem with the machine-age framework for innovation is that it views the world as constituted of objects to be described and controlled; innovation looks like a process of manipulating and controlling objects. In this framework innovators must be skilled at planning, selling, executing, managing, and spinning off.

In contrast, the network age brings the interpretation that the world is constituted by practices. Innovation is the emergence of new practices that displace existing practices. Practices are rooted in human interactions, history, conversations, and skills; objects and technologies are tools and equipment to enable and facilitate practices. Emergence means a marginal practice shows up in a community and spreads as people imitate and improve it. They come to embody the new practice, which means they do it without conscious thought.

In the network-age framework, innovators facilitate emergences by exercising by the skills of appropriating, navigating, offering, and mobilizing.[15] If you are not sure what these terms mean, you are not alone. To innovate in the network age, we need to understand and cultivate these skills – and include them in our education of military officers.

Leadership Identity

McChrystal, *et al.* favor the metaphor of leaders as gardeners, helping people grow their organic networks by tending, caring, watering, fertilizing, and pruning as needed.[16] This metaphor is consistent with our view of network age leaders. Is there a curriculum that teaches in this metaphor? We think it is premature to try to specify a whole curriculum. Let us begin with simple steps, starting with conversations about skills and practices of leaders who will thrive in the network age. Let us also

design experiments that help us learn more, as Vice Admiral Cebrowski advised when changing world conditions create new military challenges.[17] We think a good place to start is with a conversation on the identity of a network age leader.[18]

Leader as Innovator – The leader understands that missions are accomplished and battles won through innovation. The leader understands innovation as emergence of practices and makes new proposals by responding to concerns and contingencies with new combinations of existing practices and technologies. The leader mobilizes members of the social community to commit to the new practice and bring others along. The leader understands that some pockets of the network will support and others will oppose the proposed change, and helps the team ride with the supporters and seek a turn of mind among the opposers.

Leader as Navigator – The leader helps the group find its way through oceans of uncertainties and fogs of war, without having a map of the territory or knowing a clear path to the goal. The leader is prepared to respond and adapt to unexpected contingencies and has prepared the team with the right competencies and commitment to stick together and support each other. The leader sets the direction, provides necessary context, and allows the individual members to make choices based on local conditions while moving in the general direction. The leader expects them to exercise good judgment and ask for help when they do not know. The leader is constantly open to new contingencies and adapts around them.[19]

Leader as Historical Agent – The leader respects that all people grow up in different communities that are parts of different cultures, from which they acquired concerns, practices, interpretations, and distinctions. The leader is constantly entering into community conversations that were going on before the leader came along. The leader is interested in other people's histories and their communities, not only to see what concerns them, but also to build trust and credibility with them.

Leader as Opener of Possibilities – The leader realizes the importance of orchestrating moods to create openings for action toward new possibilities. The leader opens new possibilities by making well-grounded assessments of current conditions and on the basis of those assessments offers new possibilities and ways to make them happen. The leader produces a commitment in the group to move toward a possibility.[20]

Leader as Appropriator – The leader understands that every new mission is likely to encounter new communities. An experienced and capable person confronting a new situation must be willing to be a

"beginning learner" in the new context. Finding and listening to the "voices" of a community helps to accelerate understanding. Continuous learning practices help a leader "appropriate" a holistic familiarity of a changing world. [21]

The leader's identity is a story that blends attitudes, dispositions, commitments, credibility, and skills in these five areas. Network age leaders must be willing to accept rapid change and adapt to emerging new realities. In other words, the leader's identity is not fixed, but is always changing. The leader looks for opportunities in the ever-changing environment and adapts with them. The messiness of this process of adaption may feel uncomfortable. McChrystal notes, "for an engineer educated at West Point, the idea that a problem has different solutions on different days was fundamentally disturbing. Yet, that was the case."[22]

Toward a New Learning Environment

Designing new learning environments that support the cultivation of network age leaders needs an iterative approach that includes both explorative conversations and experimentation. This should begin with a broad conversation about the breakdowns currently experienced by military leaders, the nature of the world in which they will be leading future military operations, and the aspects of a leader's identity that our education programs should cultivate. At best we have glimmers and intuitions about these issues.

We might consider speculating about a complete redesign of military schools. Recent examples of redesigned engineering schools are encouraging.[23] The enthusiasm of their graduates is a signal that a bottom-up redesign of engineering curricula might win support and be successful. Given the military's strong focus on engineering, the military service academies at West Point, Annapolis, and Colorado Springs might well explore experiments in a similarly holistic redesign of their engineering curricula.

However, proposals for complete redesign are likely to meet considerable resistance. We favor the less disruptive approach of experiments with modules on transformative practices that can be added to existing programs. One such possibility comes from Frank Barrett who describes how to teach the skill of improvisation to business and executive students using lessons from jazz masters.[24] He proposes an "improvising organization" in which leadership tasks are approached as experiments, routine is deliberately broken in order to encourage serendipity, and everyone has a chance to solo. He suggests that minimal structure and control might maximize autonomy and flow. The WEST program, described in the next section, is

another example of a simple educational experiment in cultivating new leadership sensibilities.

The WEST Experiment

Working Effectively in Small Teams (WEST) is a four-month course offered by Pluralistic Networks, Inc. It focuses on effective leadership of small teams. Using a Skype-like group communication tool called Zoom, students participate from global locations, spending approximately three to four hours each week on coursework. The success of this program flows from its careful attention to how students use language and how that affects their moods and willingness to trust each other. The WEST course was designed by Dr. Fernando Flores, who earned a PhD in Philosophy at University of California, Berkeley, and in a long career became an international business leader, entrepreneur, former senator in Chile, and world-recognized leader in language as a means for communication, coordination, and action. WEST applies education principles developed by Flores and his colleagues in Chile to the issues of small teams.[25]

Flores designed WEST to help people develop and practice skills needed to work in "pluralistic networks" – participants from different backgrounds and cultures must coordinate as members of diverse teams to create meaningful action.[26]A recent WEST class included participants from public and private organizations in the United States, Canada, Mexico, Argentina, Chile, Germany, Australia, Singapore, and Nigeria. They were public school administrators and teachers, artists, personal coaches, military officers, financial executives, cyber experts, and professors. Several held senior positions in their organizations as Presidents, CEOs and Vice Presidents; others were mid-level managers and individual entrepreneurs. This emphasis on pluralistic networks intrigued us because military joint international operations aspire to be effective in exactly that type of environment.

In this experiment, we sponsored a team consisting of six US military officers – a Navy and a Coast Guard Lieutenant Commander, a Marine Captain, a retired Navy Captain and retired Navy Commander, and an Army reserve Major as an observer. They were part of a 30-person class led by Flores. They were initially randomly divided into teams of five. For the first two months each military member was part of a mostly civilian team; for the second two months the military members formed their own team.

In weekly assignments teams read and discussed articles and received initial guidance for planning team operations to be conducted inside the

platform of the commercial virtual fantasy game World of Warcraft (WoW). WoW is accessible internationally for under $15 per month and has about 12 million subscribers worldwide. Much like a flight simulator, the WoW virtual world places teams of participants in "quests" that provoke the same moods and reactions as in the real world. WEST uses WoW as a virtual laboratory in which teams experienced challenges with coordination and communication in fast-paced "battles" needed to complete quests. When the challenge was done, each team debriefed in an after-action session and followed up with short written reflections on what they experienced and learned. A coach accompanied them to observe their in-game actions and conversations and to help them make effective use of the language distinctions in their group debriefings.

An important part of their work together was coordination, not only for in-game operations but also for the team meetings. The basic language element for coordination is Conversations for Action (CFA).[27] Team members were guided through weekly exercises in which they practiced CFAs with explicit declarations, requests, offers and commitments.

A key part of team coordination consists of making assertions (verifiable facts) and exchanging grounded assessments (opinions backed by relevant assertions) about each teammate's performance. The coaches repeatedly emphasized that the assessments should be aimed to help the team achieve its goals – not as personal criticisms or attacks. Many found this honesty tough at first and diluted their assessments with unnecessary verbal filters. Yet it soon became apparent to all teams that their effectiveness depended on each member's skill in making and receiving these honest assessments. The challenge of doing this well was compounded when team members were from different cultures and backgrounds.

In addition to providing an inexpensive platform for conducting team operations without a physical meeting, WoW evokes participant experience of "being a beginner." Almost all of them are beginners in WoW. Senior people in organizations have often forgotten what it is like to be a beginner. Allowing oneself to be a beginner in an unfamiliar environment and learn how to act effectively is an asset in unpredictable environments. Practicing being a beginner also helps develop a sense of empathy for others, useful as leaders build diverse teams that include members with fresh perspectives.

The participants also joined 90-minute, bi-weekly sessions with Flores held via Zoom. These sessions featured short conversations with

each participant about their experiences and provided just-in-time learning opportunities based on participants' questions and concerns.

Preliminary findings include:

- The challenges and quests within the game of WoW elicit various moods and emotions, which can be discussed in terms of how they promoted or hindered working together.
- Core skills for teams working in new, uncertain and emerging environments can be developed and practiced in virtual environments.
- Leadership skills can develop across distance. A common belief is that meeting "in-person" is the only way to develop leadership skills. Developing leadership practices in virtual environments is valuable, especially for organizations where geographically dispersed teams are the norm.
- Participants re-experienced what it is like to be a beginner – an unusual opportunity for developing empathy among seasoned professionals.
- Participants practiced building trust in teams. Many realized they often talk about the importance of trust but have little sense of what conversations actually contribute to creating a sense of trust.
- Participants built relationships with each other. This helped develop a sense of commitment among team members to provide honest assessments and stick with the course.
- Participants created shared understanding by practicing new skills together, further contributing to their mutual trust and team effectiveness.
- Participants had fun. Their enjoyment of their teams and projects kept them engaged week by week for the full four months.
- Participants saw broader value for the course as they considered opportunities to provide the course within their own military services and communities.
- Participants learned to operate across organizational and cultural boundaries.
- Commercial virtual games can be a very cost effective method for training and is much cheaper than organization-specific games.
- The course effectively cultivated several aspects of network age leadership including innovation, navigation, and appropriation.

Based on the students' positive recommendations, we set up a second experimental team for WEST sponsored by the Marine Reserve Forces

Command. This group had to blend two different cultures – full time, active duty Marines and reservists who serve one active weekend a month.

Roles of Technology in Cultivating Leadership Sensibilities

In the past five years there has been a marked increase of discussion about technology advances in learning environments. For example, Massive Open Online Courses (MOOCs) use Internet-based platforms to make university lecture courses available free around the world and to employ machine learning to customize its responses to each individual student. They are completely automated learning environments (ALEs). An up-and-coming technology is the Online Competency Based Module (OCBM), which focuses on teaching and testing students for specific skills that make up a domain, and then issuing a certificate of competency when the student passes all required demonstrations. The Clayton Christensen Institute promotes this technology and tracks dozens of private companies offering it as an alternative to a university degree for those seeking employment.[28] The OCBM idea is older than MOOCs – it traces back to prediction by Lewis Perelman that a new mode of nonlinear learning, which he called hyperlearning, would gradually become more dominant than the linear syllabi of traditional courses.[29]

What might the role of automated learning environments be in the kind of education we are discussing here? The philosophy of Hubert Dreyfus gives good guidance. Dreyfus is well known for introducing a learning hierarchy in which people grow through the stages beginner, advanced beginner, competent, proficient, expert, and master in their domains. In *On the Internet*, Dreyfus inquired how far up the hierarchy an ALE can take a student.[30] He argued that ALEs are in effect education expert systems aiming to automate the work of master teachers – and no expert system has ever helped students become more than competent in their fields. The reason is that ALEs are rule-based systems that train conformity to the rule sets in which they were conceived. They are extremely good at training people to become advanced beginners and entry-level competent because those skill levels are highly dependent on rules.

Thus, ALEs could be very useful at teaching the basics of the leadership traits listed earlier. For example, they could provide videos, reading materials, and exercises to help beginners learn basics of coordination. Coordination results from people making commitments to each other. There are only five kinds of commitments – requests, promises, assertions, assessments, and declarations. We have found that most students are not aware of these basic distinctions. When they practice working with

them they develop a competence that enables them to bring more projects to completion, detect why projects are falling behind and take corrective action, and develop credibility and trust. We have found that a learning module on coordination is transformative: it helps people in all aspects of their lives, not just in their leadership. We believe it is possible to design ALE technology for a coordination basics module. We suspect that there are modules of basics for supporting leadership development in each of the leadership identities listed earlier.

However, the military asks its senior leaders to go beyond basics and develop a skill level of proficiency or higher. Dreyfus advises that ALEs are not up to the task of bringing people to proficient, expert, or master skill levels. Senior leaders work in environments where the rule sets are constantly changing, whereas an ALE is designed within a given rule set. Master teachers foster learning environments with traditional practices of apprenticeship, conversation, immersion, mentoring, and coaching – practices that cannot be automated. Our challenge in military education is to go beyond technologies when seeking the higher skill levels of leadership.

With a team of colleagues, Dreyfus is featured in a movie, *Being in the World*, which shows six masters from diverse fields and proposes language that allows us to talk about what they do and how they became masters.[31] It is hard to go away from this movie with any impression that any automated learning environment can possibly cultivate mastery.

Conclusions

The spread of digital technology is transforming jobs, the world, the way we see the world, and the way we interact effectively in the world. The emerging world is more like a constantly-changing ecosystem than a distributed supercomputer built from the network of machines. When a new practice spreads through the system in exponential growth, the disruptions often seem like avalanches to the large groups of the network whose identities are swept away.

Our future leaders will need to engage and resolve exceedingly complex and unpredictable security challenges. General Dempsey has warned:

> Global disorder has significantly increased while some of our comparative military advantage has begun to erode. We now face multiple, simultaneous security challenges from traditional state actors and trans-regional networks of sub-state groups – all taking advantage of rapid technological change.[32]

Complexity and rapid change, he says,

> characterize a strategic environment in which individuals and groups have access to more information than entire governments once possessed, and can swiftly organize and act on what they learn, sometimes leading to violent change.[33]

The National Military Strategy calls for learning environments that can "build creative, adaptive professionals who are skilled at leading organizational change while operating in environments of great complexity and uncertainty."[34]

In this chapter we described the skills needed to move effectively in this emerging, shifting, unpredictable world. The skills encompass new ways of thinking and interpreting. They embody new sensibilities about people's moods and possibilities in fast-changing networks. They cultivate moods that facilitate actions. They define a new way of being in and navigating an uncertain and unpredictable world. The new way is not obvious from the machine age in which we grew up and designed our education systems.

We outlined six essential aspects of a leadership identity we think are needed in the new world. We are learning and refining these distinctions through ongoing conversations with an international group and are extracting the ideas that are most relevant for our situation in military education. The need for these skills stems from a change in human dynamics as our world transforms with the help of dramatic advances in digital technology.

At the Naval Postgraduate School's Cebrowski Institute, we have been exploring how to create new learning experiences to meet these needs. We are encouraged by an experiment with WEST that immerses students into practice for effective small teams using virtual worlds. We speculate that by adding a few well-designed WEST-like modules to existing military curricula, we could take significant steps toward the desired transformative effect.

The emerging network age presents profound implications for global security and for the sensibilities that we can cultivate as we design new approaches to military education. We welcome collaborators in our explorations and experiments as we seek to better understand the unfolding of a new era.

Acknowledgements

We are grateful to John Arquilla, Frank Barrett, Douglas Bissonette, Fred Disque, Hubert Dreyfus, Fernando Flores, Pablo Flores, David Goldberg, Stanley McChrystal, Scot Miller, B Rousse, and Mitzi Wertheim for conversations and inspirations that helped shape the framework and proposals discussed here.

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Chapter 9
Technology and its Impact on Defense/Security Thinking and Learning Intervention Issues

Derrick J. Neal

Abstract

This chapter highlights the significance of the rapid advances in technology in general and that of digital technology in particular. The rate of change presents a range of challenges that have impact on individuals as well as organizations.

Within the Defense and Security sectors, this presents particular issues where digital technology is the name of the game and yet the decision making cycles tend to be relatively long and the development of major capabilities can be measured in decades. Keeping pace with digital developments is one issue, but equally, the very technology itself is an enabler for the spread and adoption of new capabilities, a factor that has been experienced in recent military operations in Iraq and Afghanistan. In effect, this is a double edged sword that requires significant attention if nations are going to be able to be effective in areas of conflict and turmoil.

The fact that most innovation now takes place in the private sector is particularly important, and this combines with the fact that for most developed nations, the idea of a growing defense budget is a thing of the past. Increasingly Ministries of Defense are having to look long and hard at the most economical way to gain access to technologies and capabilities while recognizing that today's solutions are likely to provide a technical edge for a relatively short period. Such considerations must be viewed against a backdrop of the changing nature of conflict and the challenges that presents, not only in the way operations are conducted but also in how we prepare the officer of the future.

This raises the challenge of how we educate our young both in terms of curricula content and the very use of digital technology in the delivery of learning interventions. The author surfaces some of the problems that flow from the advances in digital technology and tries to develop some solutions that may be applied to dampen the impact that they may have. The point is made that this is something that needs to be addressed in the early years of education such that it can evolve as an individual progresses through their career. Particular emphasis is placed on the training and education of military officers, and makes the case that course designers for the likes of Command and Staff courses need to see the value in addressing

these issues even if it has to come at the expense of some of the more traditional topics commonly covered in such courses of study.

Introduction

Technology impacts on everyone's life in a multitude of ways, ranging from how we communicate with each other to the availability of information via the web. It also impacts how we conduct business, either as individuals or as organizations, through to the development of new materials that make the impossible challenge of yesterday a reality today. The advances in medical science alone are dramatic and have clearly had life-changing impact for millions of patients in terms of their treatments, quality of life and prospects of a longer life.

When considering technological advances, one of the great achievements of the last 50 years was putting man on the moon. In fact, the computing power that was present on board Apollo 11 was equivalent to that found in a very basic calculator of the early 1980s and far less powerful than the sorts of chip you're likely to find inside a child's electronic toy or indeed your digital wrist watch. The computer on the moon lander had 64 Kb of memory and the computer on the lunar vehicle weighed a relatively massive 30 kilos and used 55 Watts.

The one fact that needs to be recognized is that the rate of advance in a wide range of technologies is exponential, and this is particularly true within the domain of digital technology. As noted by Hailes and Geis the consequence of this fact is that linear extrapolation in thinking is no longer valid. They argue that,

> The essential issue is that the human brain works in a linear fashion. This means that the more predictable the future is, the better the brain can deal with the issues presented. Because technology is on an exponential curve, the rate of change caused by new systems will be increasing, increasing the uncertainty of the future.[1]

The consequence of this is that linear decision-making today is likely to lead to large errors in outcomes, since the technology environment will have moved forward to a point that did not feature in the linear thinking at the time of the decision.

While there are many aspects of technology that improve the quality of lives, there are aspects of technological advances that can be thought of as negative, either in the present or in having a longer term negative impact. For example, some would argue that social media has a positive influence on the ability to draw together those with like minds or shared

interests. However, it has also opened the door to those that want to groom or prey on the young in a variety of inappropriate ways, and this has presented major challenges for governments around the world both today and into the future. The immediacy of access to people means that many can only achieve *down time* by switching the mobile phone off.

One only needs to walk down a street or sit on a train to recognize that most individuals are connected to their Internet Service Provider (ISP) for one form of communication or another. This seems to have fed into a culture that says "if you are not connected you don't count." The author takes the view that this is not a positive social development and individuals actually need time away to think and reflect. A longer term concern is about what this medium is doing to the social skill development of today's and tomorrow's youth. For example, a simple face-to-face interaction is far more complex than the words that are exchanged. If youngsters are increasingly being social through an electronic medium, what aspects of social development and enrichment are they missing? The growth of gaming (whether individual versus machine or in a group activity on-line) sees youngsters sitting in their bedrooms driving keystrokes rather than being outside in the fresh air actually taking part in physical (and social) activity; what does this mean for their development physically, emotionally, and socially?

Some would also make the case that with the ready access to answers via the internet, individuals are less likely to devote time and effort to study, as in using their brains. For example, only a few decades ago the notion of being able to do mental arithmetic was a part of the education system, and yet today it is not uncommon to find that if you ask a teenager to tell you what 25 percent of 60 is, they must resort to pulling out a calculator (or more likely use their mobile phone). In a recent move in the UK, schools have been directed to re-introduce children to having to know their times tables through to the 13 times table, and even if this is initially delivered through rote learning, it does at least mean that they are in a stronger position to move into mental arithmetic and actually use their brains rather than technology. By way of underpinning the above views expressed by the author, a timely piece of research published in July 2015 serves to provide empirical evidence of these points. According to research conducted by psychologists Barr, Pennycook, Stotz & Fugelsang, there is evidence to suggest that many smartphone users saw them as their "extended mind."[2] They found that hi-tech gadgets, which allow users to access the internet and perform complex tasks, encourage people to look for quick answers rather than use "effortful analytic thinking."

This raises the question about when the education system should start to build recognition of the impact of technology into the taught curricula. The real challenge here is about how an education system can keep pace with the rate of change that is and continues to take place in digital technology. To some extent, it can be argued that today's young (i.e., less than 18 years of age) are indeed the digital generation and are more comfortable with and knowledgeable about digital technology than those that stand in front of them is classes in high schools and colleges. If you ask an average 11-year-old to prepare a PowerPoint presentation with embedded YouTube footage, music, and dynamic graphics, you will probably get a more professional presentation than most high school or college teachers could deliver.

The author argues that this is an intractable problem, since many institutions find themselves using technologies that are at least one or two generations behind what is available in the business world. For example, the author's own institution is only just investing in smart boards, and yet the teaching staffs have little idea of how to use them to best effect. Yet even this technology is behind the curve, as 3-D technologies already exist and are being used by industry. For example, BAE Systems has 3-D capabilities that allow a design such as a ship to be viewed in a way that an individual can move through the ship as if it actually existed when in reality it is only at a design stage. Given that education establishments in general are at least one or two generations behind what is actually available, and even if the funding existed to purchase such capabilities, the teaching staffs possibly constitute the key limiting factor. This is not intended as a criticism of the staff; it is a realistic reflection that it is almost a full-time task to keep pace with what industry has to offer, and then the challenge is one of working out how this can be incorporated into a learning intervention scenario. Is there a solution to this problem? The answer is that there is not a simple solution, and as such this probably borders on being a wicked problem. One approach may be to engage more fully with the likes of research institutes, academies, and agencies that are at the cutting edge of some of the digital technology developments and integrate them into the delivery of some of the academic material. The melding of the academic and the practitioner/researcher may be a way of exposing students and faculty to the art of the possible and to highlight how the curriculum and the delivery mechanisms can be shown to represent the direction of travel of the digital revolution.

At an organizational level, technology has, over several decades, impacted on systems and processes associated with the conduct of business.

For example, the advent of the fax machine resulted in an expectation that issues would be dealt with much faster than had been the case prior to the development of that technology, and moved turnaround time expectations from days to hours. Continuing technology developments have now reached the point where transactions take place within seconds (or less), hence systems and processes have evolved to take advantage of the speed and ease of processing. A potential downside of this is that decisions may be taken without time for a richer consideration of the possibilities. An example of this was in the share market, where transaction automation operating at milliseconds (or faster) created chaos as far back as 1987 with the stock-market crash of 19 October known as "Black Monday." At this time, there were still some elements of people in the loop, and when the market fell about 200 points in an hour, it was deemed fast; eventually systems were switched off to halt the crash. However, by way of demonstrating how much faster and automated the stock market has evolved, the "Crash of 2:45 PM" was far more dramatic.[3] On 6 May 2010, the Dow Industrial Average fell 1,000 points in 15 minutes.[4]

Advances in technology provide the potential to create new paradigms such that current thinking is fundamentally challenged. According to FitzGerald & Sayler, there are a number of causes of "Creative Disruption," firstly, the very nature of the rapid expansion of digital technology itself presents a need for a change in thinking. Secondly, and to some extent related to the impact that digital technology has had on communications, it is the case that new breakthroughs can be diffused into society far more rapidly than was the case in earlier decades and also to a global audience.[5] They argue that the combination of these two factors has relevance in all facets of a society; for example, can a commercial organization now reasonably expect to protect itself from its invention or breakthrough being copied by a competitor anywhere on the planet? The very process of protection afforded by patents can take longer to process than it may take a competitor to copy the product and move on to the next generation. It comes as no great shock to see that China has an aircraft that looks remarkably similar to the F-35 or a copy of the C-17 heavy transport aircraft.

Whilst it is clear that advances in technology have primarily had beneficial impacts on individuals and business alike, it is also true that the case within a defense and security context is less clear and that there are more negative impacts than positive as will be explored in the next section.

Technology and its Impact on Defense and Security Thinking

The focus of this chapter is to take the issues and concerns that have been highlighted in a more general context and then explore them more fully within the specific context of defense and security, as this has and continues to be a particularly difficult context.

It should be acknowledged that in the defense and security sectors, as with other aspects of life, the advances in digital technology have had and continue to have a major role to play in our thinking of how we do things and the art of the possible as a result of future advances. According to Cukier & Mayer-Schoenberger, more information is being digitized and "datafied" than ever before, with digital information now representing 98 percent of all stored information, up from 25 percent in the year 2000.[6] Enabled by other developments, FitzGerald & Sayler highlight that "cloud computing, data integration and analytic suites are also advancing rapidly. Together, these developments in information technology are revolutionizing approaches to national security and military operations."[7]

The combination of increased processing power, ability to communicate remotely, and miniaturization has led to a large number of new capabilities over the last decade and it is fully expected that this trend will not only continue but will accelerate. This point is highlighted in the rapid growth in the number of unmanned systems that now exist globally covering all domains (air, sea [above and below surface] and land), and although they were initially used for intelligence gathering, they are increasingly being used to deliver kinetic effect. This of course introduces other dimensions, such as rules of engagement, the need for "man in the loop," and the legal implications that flow from the use of such technology. In an article by Rogers, he states that in the air domain alone it is conservatively estimated that as of 2012 more than 800 drones of varying types and capabilities exist, and this is based on data from just 11 countries and notably, due to lack of data, this excludes China and Russia.[8] Some have argued that when China starts actively exporting drones it will be the case that within the next decade, any country will not only be able to purchase them but by that time they will also be a lethal weapon. The Stockholm International Peace Research Institute (SIPRI) estimates China became the second country in the world to openly export armed drones when it delivered five of them to Nigeria in 2014. Nigeria, which had vainly sought unmanned aerial vehicles (UAVs) from the US, has used them against the militant group Boko Haram.

Analysis by Rajagopalan notes that China has previously had limited success exporting manned military aircraft, but is hoping to do better with UAVs given that they are cheaper and easier to manufacture. He quotes a retired major general,

> "Research and development on drones in our country has now entered a phase of high-speed progress," said Xu Guangyu, a retired Major General in the People's Liberation Army. "We have some distance to catch up with developed countries – that's certain – but the export market is growing."[9]

Given that more recent figures for drone numbers are not readily available, a sense of the growth in this industry is evident from market research by Forecast International which pegged the value of production for military drones worldwide at $942 million last year. It predicts that it will grow to $2.3 billion by 2023.

China's biggest drone maker, Aviation Industry Corp of China (Avic), is predicted by Forecast to become the world's largest maker of military drones by 2023. Its Wing Loong drone sells for just $1 million, according to Chinese media reports. The US-made MQ-9 Reaper, to which it has sometimes been compared, is priced at around $30 million.

This aspect becomes significant when such capabilities are in the hands of terrorist groups where the notion of rules of engagement or humanitarian issues do not feature in their thinking or actions. Although this technology started life being described as UAVs they are now generically called unmanned aerial systems (UAS) and they are increasingly playing a much greater role than that associated with the military.

Cyber is another dimension of digitization that has become more prominent in recent years where we have seen attacks on businesses and even on a nation, as was the case of the attack on Estonia. Such attacks can give the perpetrators access to sensitive information, which can harm or even destroy the company. It is one thing when the attack is obvious, but even more sinister when the hacker can be present within the system without being detected and use the fact to their advantage. The cyber issue is one of the biggest threats to nations today, and it has the potential to become even more significant in the coming decades from a defense and security perspective.

The implications of such developments need to be reflected in the learning interventions that pertain to the development of military staff. Although it applies to ALL ranks, it is particularly relevant to the Officer corps. The author believes that it is fair to say that most Command and

Staff courses in Western nations are intensive and little scope exists for the addition of new material or perspectives. In order to add new material, something has to be removed, and this has proved to be both difficult and painful. Recent experience suggests that rather than remove existing material, the course designers are more likely to take a softer approach of adding some key words over a range of topics and call it a thread, or if done extensively, a "golden thread." A most recent example of this was the recognition that cyber was a growing concern, and so a raft of lectures on Information, Communications and Knowledge Management (to name a few areas) suddenly included the word "cyber." However, this certainly did not represent the breadth and depth of coverage that the subject deserves. In addition to this, one finds that specific training courses through to Masters level are also available to those whose role is cyber-specific. This rather misses the point that the cyber issue is relevant to everyone in the military and indeed everyone in society.

Many Command and Staff courses contain a significant amount of military history, and while it is accepted that such material can be of great interest and lessons that are relevant to current and future operations may exist, the author would argue that their value is diminishing. The military readily accepts that preparation based on the last war means defeat in the next. The West's Cold War thinking was a major contributing factor in the difficulties faced by Western nations in the conflicts in both Iraq and Afghanistan.

Consequently, the author would argue that in preparing our military leaders of the future, there needs to be a change in thinking about the curricula covered in learning interventions such as Command and Staff courses and that this needs to feed back through the general university system and into the secondary school curriculum at our high schools. The challenge of technology advances is so fundamental to all in a society that it needs to have a much higher profile and feature in education systems at an early stage.

Drivers for Technology Development

Many of the technological advances that can be found in the average household today have a history based in the R&D activity that took place in the defense and/or space industry of three or more decades ago. For example, materials development that has resulted in stronger and lighter materials that feature in many everyday products, and were spin-offs from years of investment in defense/aerospace and space projects. However, this situation is changing dramatically and today it is the defense industry

that is looking to the commercial sector for innovation and solutions to its challenges. There are at least two reasons for this situation; firstly in the areas of telecommunications the greatest demand for new products/services arise from the general population and this is a highly competitive market. As a consequence, companies have to be agile and innovative simply to survive, and there are many examples of companies that have not been able to keep up with the pace of change and as a result have failed. The appetite for innovation is huge and this has clearly been the backbone of the success of companies such as Apple with their development of the iPhones and iPads and their latest invention – the smart watch. In addition in the area of applications, there are relatively few barriers to entry, so a company can become established, develop a product, and either promote it themselves, or sell it to a required host such as Apple or Samsung or any of the other network and search engine providers such as Google. A lack of barriers to entry is a recipe for innovation, and defense companies that fail to recognize this are probably going to suffer in the long run. The number of defense companies (in North America and Europe) has reduced considerably as a result of consolidation driven by the need to be of a scale to compete in the global market, combined with the recognition that in recent decades and into the future there will be far fewer large contracts being placed.

Another factor that is underpinning this argument is the fact that most nations are facing economic pressures that have (and continue) to put pressure on public expenditure and hence departmental budgets. Defense is no exception to this, and the United Kingdom is the classic case of a nation that had aspirations well beyond its means when it allowed its defense equipment procurement program to become unaffordable to the tune of a £38bn black hole. The consequence of the financial pressure is that defense in general and defense companies in particular need to look for solutions to capability requirements that are available and affordable. This has led to a focus on the use of Commercial Off The Shelf (COTS) and Modified Off The Shelf (MOTS) [sometimes also referred to as Military Off The Shelf] and that bespoke first principle solutions should be a last resort. By definition, the use of COTS has also resulted in new entrants coming into the defense and security sectors providing innovative solutions to today's and tomorrow's challenges. In support of this, the UK MOD has been proactive in finding ways to engage with a wider stakeholder audience in the pursuit of innovation, and in the USA the DoD is also pursuing similar thinking with its Defense Innovation Initiative (DII).

For example, in November 2014 US Secretary of Defense Chuck Hagel made the DII announcement and in excerpts he made a number of key observations that support the thrust of the points covered in the preceding sections. "Continued fiscal pressure will likely limit our military's ability to respond to long-term challenges … so to overcome challenges to our military superiority we must change the way we innovate, operate and do business," the secretary explained.[10]

As part of the initiative, Hagel said, a new Long-Range Research and Development Planning Program will help identify, develop, and field breakthroughs from the most cutting-edge technologies and systems, especially in robotics, autonomous systems, miniaturization, big data, and advanced manufacturing, including 3-D printing. "We all know that DoD no longer has exclusive access to the most cutting-edge technology or the ability to spur or control the development of new technologies the way we once did," the defense secretary said. "So we will actively seek proposals from the private sector, including firms and academic institutions outside DoD's traditional orbit."[11]

These considerations lead to the conclusion that military staff need to have a much greater appreciation of industry to include:

- How it works.
- Where and how to seek innovation.
- Forms of partnership.
- Pathways to develop for mutual benefit.

This aspect needs to be reflected in the content of military learning interventions and perhaps a much greater use of secondments so that the classroom content can be grounded in "hands-on experience" to fully understand how businesses operate.[12]

In the same way that technological innovation exists in our personal and professional lives, it is also true that technological advances have a role to play in how we train and educate individuals. In reality, we have a generational problem in the domain of education, as those military officers being taught are increasingly of the digital generation and those doing the teaching are not. Taking the point raised earlier about teachers at the high school and college levels, it can also be applied to the delivery of learning interventions to our officer corps which may take place at Defense Academies, Command and Staff Colleges or indeed at universities. For some training interventions, especially in the area of becoming familiar with new equipment, there has been an increased use of simulators over and above the more traditional uses with flight simulators. Many of these

simulators also involve 3-D systems that provide a realistic experience and can be most effective in training interventions. However, in the education domain, thought must be given to where these technologies will be effective and where they will not. There are subjects that can benefit from use of digital technology (financial modelling, risk profiling, decision making models or business simulation by way of examples) and other subjects that do not lend themselves in such an obvious way. For example, the subjects of doctrine or policy making or military history are typically presented by way of lectures with discussion and debate. Hence it would be wrong to try to force the use of digital advances across the board, and a judgement needs to be made as to where and how these modes of delivery should be applied.

Implications for Defense and Security

The issues highlighted so far have centered on what the rate of change in technological advances (in particular digital technology) means for a nation state in terms of being able to meet the challenges associated with defense and security, and the connection this has with education/training interventions. The other side of this argument concerns the changing nature of the threats being faced and the opportunities that this presents for potential adversaries.

For the last few decades, it has been recognized that state-on-state conflict, while always a possibility, has not been the focus of military interventions and that terrorist groups of a variety of persuasions have been the opposition. Some take action for political reasons and a desire to function within a more democratic society, some groups have felt disadvantaged and want previous wrongs to be corrected, while others are basing their activities on religious grounds and ideology of one form or another.[13] Whatever way you look at it, the point to note is that the enemy does not mirror Western military constructs, does not acknowledge things like rules of engagement, and most importantly does not behave in the predictable ways that Western militaries have trained for and to which they know how to respond.

Irregular warfare against terrorist groups presents a number of major challenges for Western organizations charged with providing defense and security at a time when many parts of the world are in turmoil and tension. In particular it has drawn into question the true value of having a military in a form that many Western nations have come to trust and value. As noted by Kinzer,

> For much of history, power has been won on the battlefield. Victory depended on your army. If it was bigger, stronger, and better led than the enemy, you would probably win. That charmingly simple equation is now evaporating. In the emerging new world, cultural forces and webs of global politics and economics bind nations together in ways that make the exercise of military power more difficult. The idea that a big power can easily stop, win, or decisively intervene in an overseas conflict by applying massive force is a relic of past centuries. Potent armies are less valuable than they once were.[14]

The use of Improvised Explosive Devices (IEDs), whilst very simple and cheap, has again had a disproportionate impact on Western militaries. This is one example where technology has had an impact since it is no longer necessary to rely on mechanical elements such as a trip mechanism. Terrorists can, through innovative approaches, use digital technology such that they can detonate IEDs at a time of their choosing from a safe distance. Use of such approaches had an impact on doctrine associated with soldiers going on patrol and created the need for side protection on vehicles such as Land Rovers or the need for shaped hulls on personnel carriers. Such issues are captured in the term asymmetric warfare, and it represents a mismatch in the military capabilities that need to be deployed to counter a threat.

One of the most notable examples of asymmetric confrontation is within the security sector and the growth of piracy in international waters such as those off the coast of Somalia. The consequence of attacks on commercial shipping by pirates in inflatable boats, armed only with machine guns and RPGs, is that nations such as the UK have to deploy a £1bn Type 45 destroyer to defend ships.

The other dimension of technology and its role in the actions of terrorist groups is that played by digital communications. In the same way that nation states had to be aware of the CNN factor with military actions being broadcast live around the world and the impact that had on public opinion, today's terrorist groups are adept at using global communications to their advantage. For example, the cell structures used by Al-Qaeda combined with simple use of open public networks such as email, SMS, and mobile phones meant that they could keep in contact very easily, but it also made it difficult for Western militaries to track them down.

Other examples of the use of digital technology to coordinate activities can be seen in the Arab Spring uprising, where social media was used

to very good effect to organize rallies against the government and force through change. It also meant that they could bring their case to the world via a variety of mediums. While this might be argued as a force for good, it should also be noted that the likes of Islamic State (IS) are today using social media to reach out to recruits both male and female. The case of three teenage girls who recently travelled to Syria from the UK to support/join IS is a case in point, as they were influenced via social media and this has raised grave concerns in the UK government about the scope to be able to screen and protect against such forms of recruitment.

Digital technologies have been used by activists and terrorists to make their case, to facilitate their operations, and to recruit new members, and although this is a major concern today, one can only conclude that the technologies of tomorrow will make this a more difficult challenge to overcome.

The points being made are two-fold: firstly, digital technology has enabled terrorist groups such as Al-Qaeda, IS, and the Taliban to leverage some relatively simple technology capabilities (such as IEDs) to deliver a disproportionate effect. They have also been able to use this technology to enable them to communicate in ways that gives them agility while at the same time making it difficult to track them down. Secondly, such groups have been able to use social media in such a way to help them spread their message, and while many are disgusted by things like public executions, it also serves as a recruitment mechanism to present messages that appeal to some sections of society.

The nature of the threats being confronted today (and in the immediate future) are of an asymmetric nature, and Western militaries are not well-equipped to deal with the challenges they present. This is because the equipment used by militaries that have been involved in recent theaters of operation have been born out of the Cold War and the thinking of that era, and as such have been found wanting in the conflicts of the last two decades in the Middle East.

Recent changes in the structures, roles and responsibilities within the UK MOD that are intended to devolve budgets and responsibilities to the commands are, in part, intended to make the military really think hard about what it needs and can afford to be able to deliver their component to the defense of the UK, and support the aspirations and commitments of government.

The final element from a defense perspective is that while recent conflicts have (and continue to be) against terrorist groups, it would be a great

mistake to abandon a requirement for major platforms and big military effect by tailoring current acquisitions to meet asymmetric threats. A nation has to remember that it needs to be in a position to defend itself (or make a valid contribution to a coalition operation) in the context of a state-on-state conflict. This is a particularly challenging time for Ministries of Defense around the world in view of the recent actions taken by Russia in the annexation of the Crimean peninsula from Ukraine in 2014. Tensions have increased significantly since then due to Russia undertaking a range of activities close to national borders, conducting patrols close to other nations, and significant investments in the modernization of its military assets. The consequence of this is that nations (in particular NATO members) need to ensure that they can meet the needs of asymmetric *and* state-on-state warfare at a time when defense budgets are under greater pressure than ever before.

Conclusions

The essence of this chapter can be captured under a few headings that highlight the key points.

A nation needs a military that is fit for purpose to defend the nation (and its interests) and contribute to wider actions as part of a coalition. However, the nature of current threats is such that many of the capabilities held by Western nations do not sit well in an asymmetric conflict situation when having to deal with terrorism that is often based on ideology and operates in ways that are not consistent with historical military operations. At the same time, a nation needs to have appropriate capabilities that would be suitable for a possible future nation-on-nation conflict, and they have to achieve both dimensions within an environment of reducing defense budgets. One consequence of this situation is that the military needs to have a faster, more agile defense acquisition process given that much of its capability is now tied to digital technologies and their development is moving forward at an exponential rate.

Security and defense now need to be seen as a joined up effort and where possible, military intervention needs to be seen as the last resort; potential threats should be captured early through comprehensive security services identifying risks before they become a potent threat. This idea presents many challenges in terms of the access that security services would need to personal data and the potential of infringing what might be commonly held as civil liberties and the rights that every citizen should have in freedom of speech and action.

As much as the advances in technology (in particular digital technology) can help those involved in defense and security, they are equally available to those that wish to do harm to a nation, not only against its civilians but also against the nation itself through cyber-attacks on its economy.

An appreciation of the rapid changes in technology, in particular digital technology, is so fundamental to all societies because it impacts on citizens at all levels and in all aspects of life. In light of this, the author proposes that a nation's education system needs to recognize the importance of this dimension from an early stage. Such an approach should capture two aspects: namely, what is taught (the curricula), and how it is taught (technology enhanced learning – [TEL]). Having laid the foundations in schools, this should be consolidated through the higher education system, bearing in mind that within a period of three to five years many digital technologies will have advanced.

From a defense and security perspective, the author challenges the designers of learning interventions such as Command and Staff courses to ensure that both the curricula and the TEL is relevant and reflective of the digital world in which military staff have to operate. In order to achieve this, it may be necessary to remove topics that can be described as interesting and replace them with topics that should be considered as essential.

The author is of the view that the advances in digital technology are such that for training and educational establishments, the challenge borders on being a wicked problem in that those charged with exploiting the advances in the delivery of learning interventions are themselves behind the curve. Educators need to discriminate in terms of subjects where the use of TEL has application and then determine the content of the curricula together with the scope for the use of TEL in the delivery of the intervention. This is no simple task, but educators like a challenge if nothing else.

Notes

1. Ted Hailes and John Geis, "Observer Warrior: An Unwanted Necessity," in *Crosscutting Issues in International Transformation*, eds. D. Neal, H. Friman and L. Wells (Washington, DC: Center for Technology and National Security Policy, National Defense University, 2009), 152.

2. Nathaniel Barr, et al., "The Brain in your Pocket: Evidence that Smartphones are Used to Supplant Thinking," *Computers in Human Behavior* 48 (2015): 473-480.

3. Also known as the "Flash Crash."

4. Silla Brush, Tom Schoenberg, and Suzi Ring, "How a Mystery Trader With an Algorithm May Have Caused the Flash Crash," *Bloomberg News*, 21 April 2015, accessed 25 April 2015, http://www.bloomberg.com/news/articles/2015-04-22/mystery-trader-armed-with-algorithms-rewrites-flash-crash-story.

5. Ben FitzGerald and Kelley Sayler, *Creative Disruption: Technology, Strategy and the Future of the Global Defense Industry* (Washington, DC: Centre for a New American Security, 2014), 41.

6. Kenneth Neil Cukier and Viktor Mayer-Schoenberger, "The Rise of Big Data," *Foreign Affairs*, 92(3) (2013).

7. Cukier and Mayer-Schoenberger, "The Rise of Big Data," 9.

8. Simon Rogers, "Drones by Country: Who Has All the UAVs?" Datablog on *TheGuardian.com*, 3 August 2012, accessed 16 May 2015, http://www.theguardian.com/news/datablog/2012/aug/03/drone-stocks-by-country/.

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10. Chuck Hagel, "Hagel Announces New Defense Innovation, Reform Efforts," *DOD News*, 15 November 2014, accessed 3 May 2015, http://www.defense.gov/news/newsarticle.aspx?id=123651.

11. Chuck Hagel, "Hagel Announces New Defense Innovation, Reform Efforts," *DOD News*, 15 November 2014, accessed 3 May 2015, http://www.defense.gov/news/newsarticle.aspx?id=123651.

12. A secondment is when one organization places a staff member into another organization for a defined period of time at their own cost in order to develop skill and knowledge that is transferable back to their own organization. An example would be an MOD employee spending time in a Defense industry company.

13. It should be noted that most of these drivers for conflict can also be applied at a national level and result in state-on-state conflict.

14. Stephen Kinzer, "Conventional Military Has Lost Power," *Boston Globe*, 1 August 2014, accessed 12 May 2015, https://www.bostonglobe.com/opinion/2014/08/01/conventional-military-has-lost-power/L2J75AdS4Iu79JSXEYfbYM/story.html.

Chapter 10
Applying Innovative Learning to a National Security Problem: Addressing the Challenges of Job Replacement by Automation and Artificial Intelligence

Linton Wells II and Theodore Hailes

Abstract

This chapter examines the accelerating replacement of jobs by automation and artificial intelligence (AI) and provides thoughts on how innovative approaches to learning can mitigate social unrest that may be generated by new technology.[1] Much valuable work has been published on the impact of automation and artificial intelligence on labor markets and this analysis draws on it to address three areas. The first part of the chapter focuses on the kinds of domestic and international social unrest that could be created by this transition between now and 2030, and the national security implications. The second part explores the concept of a "complexity lens" as a tool to examine intersections and interactions among the many elements of these issues.[2] The third part looks at the role of "innovative" and "adaptive" learning, coupled with approaches such as life-long learning supported by point-of-need content delivery, in reducing the impact of job displacement by technology. A key conclusion is that innovative learning can have significant benefits for individuals and targeted workforces, but scaling it across broad markets, national labor pools, and the growing global youth bulges will need sustained engagement by multi-sector, public-private, and transnational partners. Since many of the issues raised are beyond the planning cycle for government and private sector organizations, the chapter's intent is to inform the debate as it evolves and help develop a research agenda to support policy options that can be implemented when the time is right.

Will there be a Workforce Crisis by 2030, and What National Security Concerns Might it Pose?

Background

The underlying question is: by 2030, will there be a workforce "crisis?" If so, how much social unrest and what security concerns might it cause?

The analysis focuses on 2030, a date chosen because (1) the burden of aging baby boomers on a smaller labor force will be near its peak in many countries, (2) there will be major youth bulges in many parts of the Islamic and developing worlds, which may have trouble finding meaningful work,

(3) AI and automation capabilities will be significantly, and non-linearly, enhanced – driven by exponential increases in technological capabilities, and (4) 2030 is beyond the planning and budgeting horizons for politicians, businesses and even many militaries, so motivating mitigation steps now is hard.

Much valuable analysis has been done on workforce and automation issues, e.g., *The Race Against the Machine,* and its successor, *The Second Machine Age,* as well as other works such as *The Lights in the Tunnel* and *Rise of the Robots*, but views still differ about how much of a problem the workforce question will be.[3] Some people will thrive amidst the accelerating technological change, while others will find it hard to adapt. Some observers argue that productivity and the overall size of the economic pie are likely to grow and that new jobs will be created as they have in the past. Others fear that rapidly improving automation and AI capabilities will displace more jobs than they create, further widening the gap between winners and losers in society. This can exacerbate existing national and international security issues, and create new ones, to include increases in social tensions, radical ideologies, mass migration, virulent nationalism, protectionism and widespread unrest.

Besides workforce questions, other security issues also are likely in the 2030 time frame. Thomas Piketty, in *Capital in the Twenty-First Century,* predicts that capital and income (and political power) increasingly will be centralized in the hands of the few, challenging the underpinnings of democratic governance.[4] Many have criticized Piketty's work, but his views need to be considered. Various other studies, including NASA-sponsored work and Sir John Beddington, the UK government's former chief scientific advisor, warn of shortages in food, water and energy in this time frame, coupled with population pressures.[5] Thomas Friedman, in a forthcoming book notionally titled "Thank You for Being Late," looks at the interlocking impacts of "the Market, Mother Nature (climate change) and Moore's law (the rate of technology change)." He draws on the analogy outlined by Eric Brynjolfsson and Andrew McAfee in *The Second Machine Age* to the story of how the inventor of chess supposedly was compensated – one grain on the 1st square, two on the 2nd, four on the 3rd, etc.[6] The full impact of these changes doesn't become apparent until the "2nd half of the chessboard," which each of these impact areas is now entering.[7] This chapter focuses on one aspect of these interconnected problems – a possible workforce crisis – but the potential dynamism of the 2030 era needs to be kept in mind.

Framing the Problem

Too often planners try to move directly to attempt to solve very complex problems without taking enough time to "frame," or understand them.[8] Several questions can help frame 2030 workforce problems. They also suggest the complexity of potential answers:

- What is the operating environment/problem space for these questions? What are the key drivers of this environment? How will such drivers be affected by the accelerating pace of technological change?
- Who are the stakeholders? What are their equities?
- What authorities/statutes/laws govern US department/agency contributions to the task? How are public and private sector actors likely to respond? What governance methods or policies might be most effective in the emerging operational environment?
- What mechanisms/authorities/incentives/disincentives facilitate (or discourage) collaboration with private sector entities and international partners?
- How might international perspectives differ from those in the US? What perspectives might be common across borders?
- What would be the implications of government and/or private sector actions or inaction?
- Is this likely to develop into a crisis, or not? If yes, what safety valves or mitigation measures might be available? If no, how can the concerns raised in the rest of this chapter be addressed, or discounted?
- Why might this generate a national security threat?

The workforce topic was explored during a recent course on "Wicked Problems" taught at the US National Defense University (NDU) and the above questions were used as part of the "framing" section of the analysis.[9] The students assumed organizational roles (cabinet secretaries, labor advocates, business leaders, etc.) and began discussing how the US government could respond to this problem, in collaboration with the private sector and international partners. The results of these discussions are reflected throughout the chapter.

Rates of Technological Change

A key premise of this analysis is that exceptional increases in science and technology (S&T) capabilities over the next 15 years will have social impacts as well. The rate of technological change is important. If a capability, say computing power per unit cost, doubles every eighteen months,

in five years there will be a 900 percent increase, in ten years 10,000 percent and in 15 years over 100,000 percent. Even if the doubling period is two years, in fifteen years the change is nearly 20,000 percent. Some predict the rate of growth will slow, which it may. On the other hand, dramatic increases in certain types of capabilities may be introduced, such as the wide adoption of quantum cryptography. In any case, linear projections *cannot* work, however comfortable they may be.

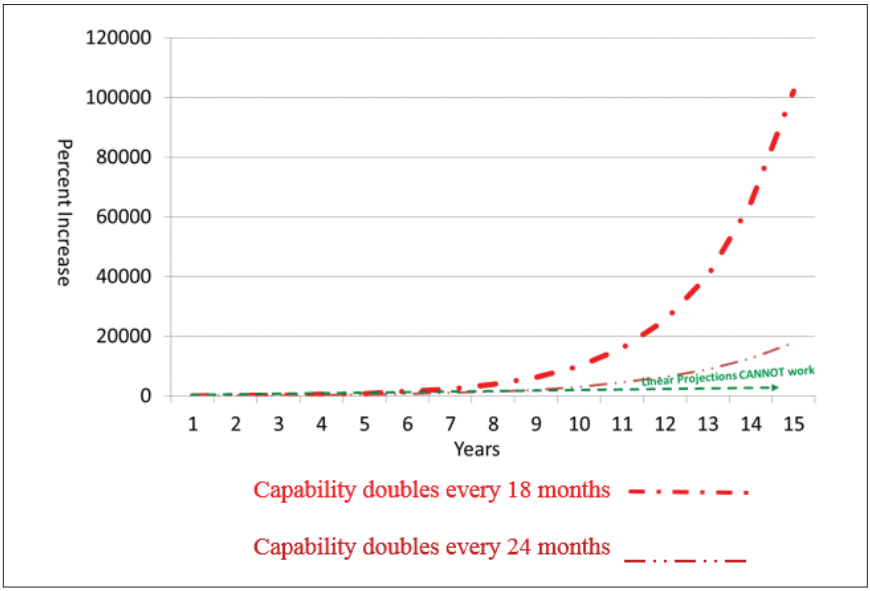

Figure 7. Growth in Computing Power per Unit Cost. Created by authors.

Figure 7 refers only to generic rates of change (doubling every 18 or 24 months). Some, though not all, aspects of information technology seem to be on this path, e.g., computing power per unit cost.[10] At the same time, some elements of biotechnology are changing even faster than computations per dollar (for example, the cost of sequencing a human genome dropped 6 orders of magnitude – a million-fold – in about 10 years); autonomous vehicles soon will be ubiquitous, from driverless cars to many kinds of drones; nanotechnology is entering widespread use, from batteries to medicine to energetic explosives; and the energy that underpins everything is undergoing several different types of transformation. Although this chapter focuses on automation and AI, changes across all these domains: Biotech, Robotics, Information, Nanotech, and Energy (BRINE, for short) need to be considered, along with their interactions.[11] These technological advances, plus others like additive manufacturing,

e.g., 3-D printing, will have significant impacts on future jobs.[12] The resulting complexity also will change the way that decisions are reached, problems solved, and humans interact. These are issues for policy makers, ambassadors, and commanders, not just technical specialists.[13]

The 2030 Workforce

A thoughtful analysis by Rainer Strack considers the state of the German and the global workforce in 2030 by juxtaposing workforce demographics with the differential impacts of technology.[14] He concludes that by 2030 there *will* be a global workforce crisis, with three components: An overall labor shortage, significant mismatches between skills and job requirements, and cultural challenges as labor moves across borders.

There will be a shortage of workers in most of the [developed] world due to the substantial decrease in the birth rate, exacerbated by particular shortages of highly skilled workers. In an aggregate sense, technology is likely to boost productivity, but it also will replace numerous jobs. The impact will be uneven across industries. For example, the auto industry has bought about 40 percent of industrial robots each year.[15] Recent history indicates that while jobs are displaced by robotics and AI capabilities, new positions also are created. The salient difference, however, is that most of these new jobs are highly skilled positions requiring further education and training, making entry into them difficult. But projections suggest that by 2030 more than 50 percent of the production costs of a car will be caused by electronic parts (up from 10 percent in 1980). This will require new jobs, which may not even exist yet, such as a "cognitive systems engineer" for the smart interfaces in a self-driving car.

So technology will create new jobs, but it also will worsen the mismatch with the available skills, forcing people to move in search of jobs. A survey of over 200,000 job seekers in 189 countries found that more than 60 percent were willing to work abroad, with Russian, German, and the US workforces being the least interested in moving overseas.[16] Most of those surveyed would seek jobs in the US, UK and Canada. Interestingly, salary was less important than work relationships and a sense of being appreciated for their work (daily). People are looking for recognition.

The UK Commission for Employment and Skills (UKCES) has produced a valuable report – *The Future of Work: Jobs and Skills in 2030*.[17] The report analyzes:

> Trends that are already shaping the future of UK jobs and skills, and forecasts the most likely disruptions to those trends. It then plots four anticipated scenarios of what the UK's work landscape

> might look like in 2030, and importantly, the skills that will be required under these conditions.[18]

One of the disruptors is: Artificial intelligence (AI) and robots, penetration of AI and automation into highly skilled occupations.

Most countries will face pressures from their own trends and disruptors and will need to formulate sophisticated people strategies. An October 2014 special report by *The Economist* on "Technology and the World Economy" concludes:

> Broadly speaking, there are three ways of dealing with the labor imbalance: raising the productivity of less-skilled workers, turning less skilled workers into more-skilled workers; and providing income support for those who find it hard to earn a living in this new world. [19]

Choosing among these will require answers to hard questions – for example, how to forecast supply and demand; how to attract great workers; how to educate, upskill and retain the best people; and how to provide opportunities for those without access to traditional education systems?[20] Both the public and private sectors will need to change attitudes toward workers, incorporating new ways of thinking about educating, recruiting and training the workforce, which will integrate with migration policies and all the attendant social tensions. Human resource (HR) considerations need to become an integral part of the national security process.

Automation, Artificial Intelligence and Machine Learning

Research into these topics is exploding and there are many excellent references and projections into futures that range from exhilarating to terrifying. Tim Urban provides a comprehensive summary of current research in his fascinating blog *Wait But Why.*[21] He concludes: "what's happening in the world of AI is not just an important topic, but by far THE most important topic for our future."[22] This is outlined in a lengthy, two-part post titled "The AI Revolution: the Road to Superintelligence," which includes a discussion of three *calibers* of AI:

> **AI Caliber 1) Artificial Narrow Intelligence (ANI):** Sometimes referred to as *Weak AI*, Artificial Narrow Intelligence is AI that specializes in *one* area. There's AI that can beat the world chess champion in chess, but that's the only thing it does. Ask it to figure out a better way to store data on a hard drive, and it'll look at you blankly.
>
> **AI Caliber 2) Artificial General Intelligence (AGI):** Sometimes referred to as *Strong AI*, or *Human-Level AI*, Artificial General

Intelligence refers to a computer that is as smart as a human *across the board* – a machine that can perform any intellectual task that a human being can. Creating AGI is a *much* harder task than creating ANI, and we are yet to do it. Professor Linda Gottfredson describes intelligence as "a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience." AGI would be able to do all of those things as easily as you can.

AI Caliber 3) Artificial Superintelligence (ASI): Oxford philosopher and leading AI thinker Nick Bostrom defines superintelligence as "an intellect that is much smarter than the best human brains in practically every field, including scientific creativity, general wisdom and social skills."[23] Artificial Superintelligence ranges from a computer that's just a little smarter than a human to one that's trillions of times smarter – across the board. ASI is the reason the topic of AI is such a spicy meatball and why the words immortality and extinction will both appear in these posts multiple times.[24]

Urban concludes: "As of now, humans have conquered the lowest caliber of AI – ANI – in many ways, and it's everywhere. The AI Revolution is the road from ANI, through AGI, to ASI – a road we may or may not survive but that, either way, will change everything."[25] The blog includes estimates of when we will get to the various categories, with a median expert prediction of 2040 for "having" AGI, and about 2060 for ASI. Since this chapter is focused on 2030, the emphasis will be on the implications for the workforce of spreading ANI and the beginnings of AGI.

Jeremy Howard summarizes recent developments in machine learning in a TED talk, "The Wonderful and Terrifying Implications of Computers that Can Learn," which highlights how fast machines are getting smart today and what this may mean for jobs.[26] A key change from previous "programming" approaches is that present machine learning algorithms like "Deep Learning" have no theoretical limitations. The more data they are fed, the better they typically get. He cites several examples and observes that computers are now at the stage where they can see, hear, read and write.

But computers also are learning to do more abstract, conceptual tasks. For example, they have "discovered that the cells around a cancer are as important as the cancer cells themselves in making a diagnosis, which is the opposite of what pathologists had been taught," and Deep Learning

is improving this performance, especially when working together with people.[27] They also have shown the ability to recognize the concept of a vehicle and "diagnose" types of cars from diverse images after a short period of training.

These developments offer enormous opportunities and reflect the powerful upsides of automation and AI. For example, the developing world needs many times more physicians than are likely to be available through traditional approaches. Now much of this work can be automated or centralized, with diagnosis and direction provided remotely, as is done in the Australian outback today. Another potentially huge upside is AI's growing ability to recognize verbal queries. This may one day let speech/image-recognition apps bring direct internet access to illiterate populations. This could offer exceptional opportunities for innovation and other networked benefits to the some 775 million adults (two thirds of them women) who cannot read or write, in much the same way that cell phones have leapfrogged traditional infrastructures to bring communications to previously unserved areas.[28]

But, on the downside, most service jobs, which represent some 80 percent of employment in the developed world, potentially will be replaceable by machines. A 2013 Oxford study estimated that "around 47 percent of total US employment is [at high risk for being replaced by "computerization"] . . . perhaps over the next decade or two."[29] The futurist Thomas Frey has projected the disappearance of two billion jobs by 2030, with particular changes coming in the power industry, automobile transportation (going driverless), education, 3D printers, and bots.[30]

Many new jobs certainly will be created, but historical precedent may not offer much insight into what these will be. The UKCES report is explicit: "It is not possible to predict the future. 20 years ago, there was widespread belief among commentators that the defining feature of the future UK labour market would be radically reduced working hours and increased leisure time."[31] In the Industrial Age, major innovations often represented a "step function" in capability, which then generally was introduced and improved along an "S-curve." But smart machines are likely to be different, since they are learning and improving exponentially.[32]Nonetheless, important evidence suggests that combinations of people and AI perform better together than either alone. For example, teams of relatively modest chess players with AI support routinely best both grandmasters and exceptional chess computers that act alone.[33] It will be essential to make use of blended approaches where people, automation and AI work together as ANI continues to proliferate and AGI enters the market.

Synthesis

Many of the points from the above references were integrated in *The Economist*'s October 2014 special report on "Technology and the World Economy," noted earlier.[34]

The Economist report focuses on the "3rd Industrial Revolution," the first described as having been in the late 18th century and the second in the late 19th. A key conclusion is that technological change today offers lots of promise for those able to adapt. But the pace of change and the lack of opportunity for those with "modest skills," or lack of motivation, are only likely to widen the have/have-not divide.

The report is not all doom and gloom, and suggests some remedies in several areas. However, given the youth bulge in so many places with "modest skills," and the likely displacement of workers in developed economies (some reports talk of high structural unemployment even in the US by 2030), it also concludes that the potential for domestic unrest, political grandstanding, and scapegoat-finding is high unless governments and the private sector are particularly skillful in managing "new demands for intervention, regulation and support."[35] Recent experiences in many capitals provide few grounds for optimism on this score.

Reinforcing this are recent reports from the World Economic Forum that by 2016, one percent of the world's population will control over 50 percent of global assets and that the richest 85 people will have more wealth than the poorest 3.5 billion. The potential for further radical nationalism and social tension generated by these inequalities – at home, in friendly nations, in competitors and in emerging markets – should be part of the national security debate.

One projection is that, besides the benefits to individuals with motivation and persistence, the increased productivity from these technologies also will generate more goods and services, probably increase wealth overall, and produce entirely new kinds of jobs, as previous technology revolutions have done. Serious observers argue that this increased productivity will allow people across the economy to adjust without major social disruptions, and that there may not be a workforce crisis at all. Catherine Rampell, for example, notes "This track record [of past job replacement by technology] makes today's automation fears look somewhat silly, or at least shortsighted."[36]

However, there also may be significant differences from the past – the accelerating pace of machine learning can complicate technology assimilation. The time frame also is important. Even if alternative

employment can be devised for displaced workers, there are likely to be disruptive periods on the way to the stable end state. In the process, there will be intense public policy debates between those who believe in market forces and those who favor social safety nets. Moreover, many around the world may not be able to benefit personally from such changes, or live where the economies or political systems may not adapt quickly enough. All this could generate significant unrest, and increase the attractiveness of radical responses among those who don't see themselves as having a stake in the global, or local, economic systems.

What can help the workforce? In Howard's view, what does *not* seem to help workers, surprisingly, are solutions like better *traditional* education and more incentives to work, since traditional jobs will not be there. This is an important point that suggests that new approaches to learning and incentives will be needed. Some suggest very unconventional approaches like separating labor from earnings and encouraging more craft-based economies. Many propose resource transfers to provide for basic living standards, including a negative income tax, expansion of initiatives like the US Earned Income Tax Credit, implementing a "basic income" approach, and incorporating more equity into long-term goals such as reducing overall scarcity. [37]

Paul Tudor Jones II describes a related issue – the absence of "justice" in modern capitalism. He is concerned that the corporate world's laser focus on profits is, as he puts it, "threatening the very underpinnings of society," and proposes steps to restore a sense of fairness.[38] In the past something similar has been described as "participatory capitalism." There is a famous story about Henry Ford increasing his workers' pay to $5.00 per day. Explanations differ as to whether this was done to make sure his employees made enough to buy his cars, or whether it was to reduce personnel turnover, but in any case, it acknowledged the value of having adequately compensated workers as part of a corporate strategy. A related, more holistic approach has been proposed by John Fullerton in *Regenerative Capitalism.*[39]

Boiling these diverse topics down to core issues is important. Change has always been a critical component of human life. What is dramatically different today, and accelerating into tomorrow, is less the basic nature of change than the rate at which it is being driven. Change always brings winners and losers but, as reaction times shorten, the potential downside for losers increases and the consequences of backlash from the losing side grow more immediate and potentially more serious. Even if specific policy choices may not yet be clear, it seems wise to start to understand what

might mitigate the worst conditions for the losers and provide opportunities for more rewarding paths, or at least reduce the most incendiary problems for those who feel disenfranchised.

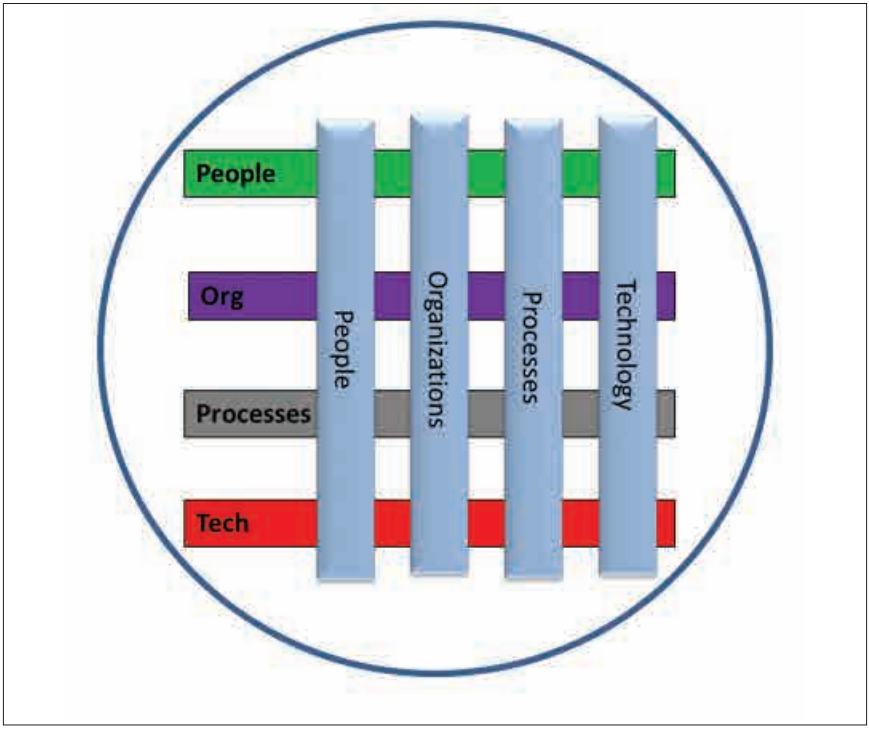

Figure 8. Using the Complexity Lens to Focus on Interactions Among: "People, Organizations, Processes and Technology." Created by authors.

A Complexity Lens

To help cut through large amounts of data, expert opinions, and partisan arguments, Mr. Jan Wouter Vasbinder, of Nanyang Technological University in Singapore, has proposed a "complexity lens" to filter details and amplify links and interactions. He challenges the premise of reductionist science, the idea that

> . . . we can learn the workings of a complex system (like a biological system) by taking it apart and examin[ing] its components in isolation. *We cannot.* We cannot because, if taken apart, complex systems lose precisely the character that makes them complex.[40]

In his view, through the *complexity lens*:

> . . . we can start to see . . . the connections between the parts of the system. And because we can see these interconnections we can search for ways to study the dynamic interactions that take place along those connections . . . [T]he complexity lens might be a way to implement, what already in 1975, Joël de Rosnay, called the macro-scope. In his view . . . the complexity lens within the macro-scope filters details and amplifies that which links things together.[41]

This chapter applies the complexity lens concept to workforce issues in three steps. The first look focuses on the "macro-scopic" intersections and interactions among four areas: "People, Organizations, Processes and Technology" (POPT), in order to establish a baseline for deeper examination. The POPT framework is by no means the only approach, nor the most comprehensive, but it has been used over several years by the International Transformation (ITX) Chairs network and has provided valuable insights, and so provided a way to get started.[42]

In addressing these intersections and interactions using the POPT framework,

- The category of "People" is considered mainly to include the workers in both public and private sectors who would be most affected by the replacement of jobs by automation and AI. This also could include well educated workers whose jobs will be affected, such as radiologists or paralegals. The attitudes and actions of managers, owners of businesses (focused on high tech and manufacturing, in this analysis), and government policy-makers are considered within the organizations of which they are members. The "people" category must take into account demographics – the composition of the 2030 workforce is largely known, with aging populations in most developed nations and China (mitigated in the US by immigration), with the major youth bulges noted above.
- "Organizations" in this analysis include: The US government (especially the Departments of State, Defense, Commerce, Labor, and Education), allied or partner governments, companies in the high tech and manufacturing sectors, labor organizations, institutions of learning (training, experiential learning and education), and humanitarian Non-Governmental Organizations (NGOs).
- "Processes" include: diplomacy, trade promotion, maintenance of alliance relationships, use of force, customs and border protection, promotion of US economic growth, legislation and regulation, labor-management relationships, forecasting of future

labor markets and matching of anticipated worker skill sets to job demands, and the evaluation of the potential of innovative (and adaptive) learning to mitigate social disruptions.
- "Technology" focuses on the trends discussed earlier.

Focusing the Investigation

The POPT taxonomy helped to focus discussions and research during the "Wicked Problems" class noted above. In future studies, big data analytics and AI could be applied to the vast amount of information available on workforce and automation issues to expand the inputs and complement discussion-based analysis.

Insights from the Discussions

The positions taken during the discussions varied widely, from promoting *laissez faire* economics aggressively, to arguing for strong protectionism, from extolling the virtues of capitalism's "creative destruction," to voicing humanitarian concerns, from expressing worries about alliance relationships and the global economic system, to advocating virulent nationalism. The discussion themes grouped themselves into nine areas (in no particular order):

- Labor issues
- Opportunities provided by learning innovation, and their limitations
- Trade and alliance relationships
- The velocity and impact of technological change
- Migration[43]
- Timing of decisions needed to effect meaningful
- Inequality of wealth and possible ways to redistribute it
- Role of government
- Role of the private sector

The complexity lens was then refocused as shown in Figure 3 to combine the POPT rows with a new set of columns based on the discussions.[44]

To focus further on the learning components of the problem, the complexity lens was adapted in a third iteration to examine the intersection of the "People" row in Figure 3 with all the columns, and the "Learning" column with all the rows. The results are integrated throughout the paper. Overall, the complexity lens proved to be a useful analytical tool. The concept was examined in more detail by several speakers during a Complexity Lens Workshop in Singapore in July 2015 and will be refined going forward.[45]

Contributions of Innovative (and Adaptive) Learning

A recurring point throughout the analysis concerned the ability of people to reinvent themselves. The "cost of entry" to learn about new and potentially profitable things to do is now very low and entrepreneurs can act quickly, even without traditional degrees or workforce experience. In many countries the stigma associated with failing and trying again in business is much less than it used to be ("start fast, fail quickly, try again" seems to be a watchword now, even in DOD research). There are credible, free online courses available through organizations like Coursera and EdX to expand one's horizons in just about any area. The comment that "Success is creating your own opportunities" has rarely seemed more appropriate.[46] At the same time, it is important to understand how much difference these emerging educational opportunities really can make, both to individuals and to the workforce as a whole.

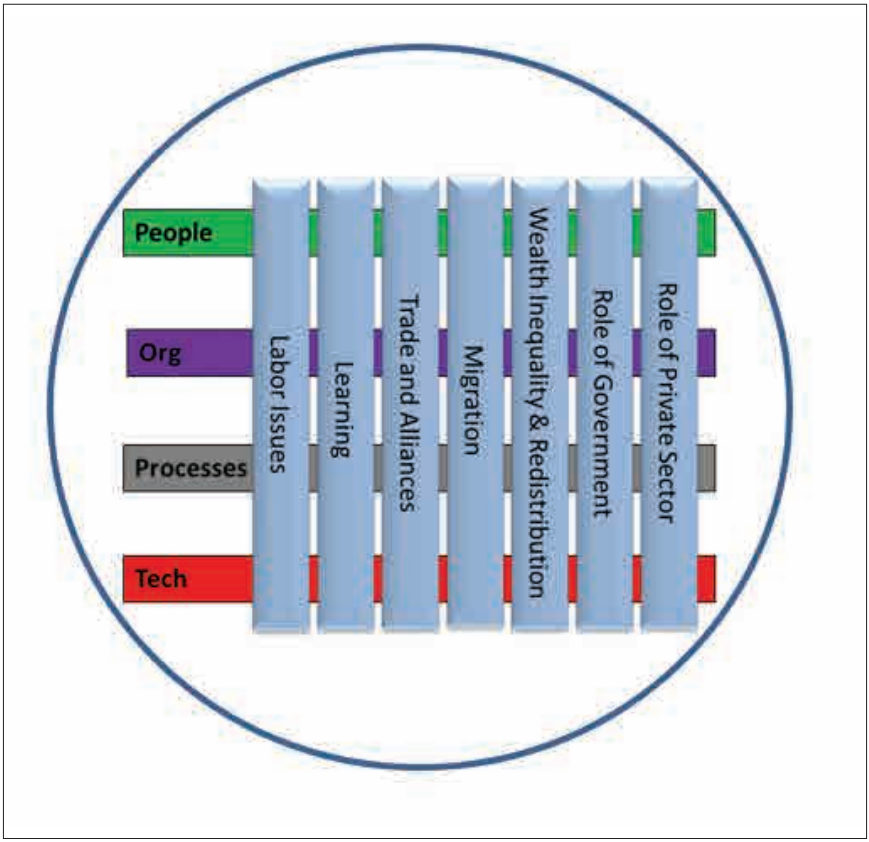

Figure 9. Refocusing the Complexity Lens "Macro-Scope" on Workforce Replacement Issues. Created by authors.

The rest of this paper focuses more on "learning" than just education. "Learning" is considered to be a mix of training, experiential learning, and education, reinforced by appropriate incentives. The goal is to motivate people to learn throughout their lives, and support them with point-of-need content delivery. This can either make them more effective employees, enhance their opportunities should traditional employment opportunities diminish, or open paths that may not have been available before. Some certainly will not take advantage of these opportunities, but the impending changes described above make it important to encourage as many as possible to prepare themselves for evolving work environments.

Innovative and Adaptive Learning

One possible contributor is known as "innovative learning." Many of its characteristics are well known in the education community, but the changing world and work environment now means it must be made broadly available and implemented successfully. The essence of innovative learning "is not job-specific – no one knows what the future economy will demand. Instead, the main goal is to develop self-directed learners, students with "adaptive expertise."[47]

An article prepared for the OECD (Organization for Economic Co-operation and Development) on *The Nature of Learning*, provides a fuller perspective and rationale for innovative learning:

> Over recent years, learning has moved increasingly center stage and for a range of powerful reasons. A primary driver has been the scale of change in our world, the rapid advances in ICT [Information and Communications Technology], the shift to economies based on knowledge, and the emphasis on the skills required to thrive in them. Schools and education systems around the world have to reconsider their design and approach to teaching and learning. What should schooling, teaching and, most especially, learning look like in this rapidly changing world?[48]

New educational approaches that embrace the changing world and prepare students for the unique challenges outlined above are prerequisites for implementing innovative learning. There is no doubt that some individuals will thrive in such learning environments. But it is not clear if these approaches can scale to enhance the number of winners enough and reduce the disruptive impacts of the inevitable losers.

There also is the ever-present danger in transitional periods of overshooting the mark – implementing change for change's sake and, in this case, throwing out many time-proven principles of good learning. To

provide perspective and help control unnecessary excessive swings among approaches, it is worthwhile to look at a few of the emerging learning issues. Two areas stand out. The first is the balance between passive and active learning and the second is the mix of deep specialization (mastery) and broader inter-disciplinary approaches.

Passive versus Active Learning

Education has places for both passive and active learning, just as there is value both in mastering a narrow subject and in taking a broad, cross-disciplinary view of the world. It appears that the future workplace will demand more of the latter than the former, in each case, but the degree and speed of that shift require serious study and policy review.

Passive learning traditionally emphasizes the role of the teacher – conveying information, and hopefully knowledge, to their students who absorb it and feed it back (sometimes referred to as "the sage on the stage"). It provides a relatively structured environment, with fewer distractions. Active learning, by contrast, strives to:

> create a learning environment in which student is engaged and motivated even before the actual learning starts and student can restructure and merge the prior knowledge with the new information and get the new insight and start practicing it, i.e., "active learning". The active learning puts the responsibility on student and encourages them to get and stay engaged in class discussions and exercises and compel them to read, speak, listen and think.[49]

The teacher's role in active learning is more of a coach ("the guide on the side"). In the complex, interactive approaching world, where disparate knowledge must be gathered and mixed in unique and unexpected ways, active learning provides more useful skills than passive. At the same time, not all students are inherently ready for active learning. The challenge is to prepare as many people as possible to deal with impending change and to give them the tools and incentives to learn from available, evolving, resources.

Inter-disciplinary Approaches ("T Skills")

Just as many current jobs did not exist 15 years ago, so there will be many jobs in 15 years that are not imagined today. Workers are almost guaranteed that their work will change fundamentally in the course of their careers. Given this, it may be advantageous for managers to consider not only a potential hire's deep mastery of a particular area, but also their mix of inter-disciplinary and social skills that could help them transition as

new areas emerge. Sometimes these are referred to as "T" skills – being very deep in one area, while also having enough expertise in other fields to reach out to build bridges or become part of teams as needed.

Other Learning-Related Developments

Balancing skills and job opportunities will be very important, but not everyone is cut out to be an entrepreneur, and some will not learn well in unstructured situations. As *The Economist* article notes, "the critical question is just how much of the world's available labor will find productive work in the supercharged new economy."[50] The trick will be how to enable, and encourage, enough people to learn actively to get meaningful jobs to reduce the likelihood of significant unrest. The global scope of markets and the ability of disruptions to cross borders means that solutions must have both national and international components.

In this context, it will be important to understand what emerging learning opportunities might look like and how far they can scale. Between distance learning tools, online courses such as Massively Open Online Courses (MOOCs), virtual reality, and the pending provision of internet coverage to underserved regions, the opportunity to convey information and education support is exploding.[51] This can be reinforced by new means of credentialing, such as oDesk certificates and Udacity nanodegrees, which can give credibility to non-traditional learning approaches, opening new opportunities for employment based on individual initiative. More traditional education venues, such as vocational schools and community colleges, can be re-purposed to address emergent issues.[52] Other innovative approaches, such as efforts by the Cyber Initiative at the Middlebury Institute of International Studies (MIIS) at Monterey to promote "digital fluency" across all the curricula at the Institute can broaden graduates' technical understanding, and probable employability. The peer-to-peer (P2P), or sharing, economy also offers opportunities for people outside the traditional workforce.

Many analyses focus on retraining existing workforces, but attention also must be paid to creating employment opportunities for non-traditional job seekers, like those in the youth bulges, who are just entering the labor force. If these youth bulges are likely to be the source of future unrest or migration pressures, they deserve serious attention. It may be that traditional barter economies will continue to provide essential goods and services, which would make the unavailability of traditional jobs less threatening. At the same time, education and jobs do not preclude radicalization. Two-thirds of the 25 planners and hijackers involved in 9-11 had attended

college.[53] This area needs to be understood better from a national security perspective.

Scenarios

Solutions can't be addressed in a vacuum. They need to be tested against a range of alternative futures (scenarios). The point is not to predict which outcome is most likely, but to choose solutions that can be effective across the widest range of environments. Scenarios are often used in foresight, versus forecasting approaches.[54]

Several scenarios have been developed around workforces. For example, the UKCES Future of Work report outlines 4 scenarios focused on the UK economy:

Forced Flexibility (business-as-usual): Greater business flexibility and incremental innovation lead to moderate growth in the economy, but this flexibility often results in fewer opportunities and weakened job security for the low skilled.

The Great Divide: Despite robust growth driven by strong high-tech industries, a two-tiered, divided society has emerged, reinforcing the economic position of the "haves" and "have nots."

Skills Activism: Technological innovation drives the automation of white-collar work and brings large-scale job losses and political pressure, leading to an extensive government-led skills programme.

Innovation Adaptation: In a stagnant economy, improved productivity is achieved through a rigorous implementation of Information and Communications Technology (ICT) solutions.

Three broader scenarios also might be considered that put the workforce issues in national security contexts:

Scenario 1: The Market Mostly Works It Out. The vision of many high tech businessmen is realized: Innovation generated by automation and AI increases productivity and creates adequate numbers of new jobs, and the economic system is able to absorb the disruptions, much as it has in the past. Little government intervention is needed domestically. Internationally, labor-related unrest does not pose significant cross-border challenges.

Scenario 2: Dystopian Future. The magnitude and velocity of change are greater than many people can absorb. Policy choices are not effective, leading to significant domestic and international tensions and social unrest that become national security issues.

Scenario 3: Mitigation Measures Reduce Some Tensions. A combination of effective policies, adequate governance and collaborative approaches manages the worst of the stresses. Such measures could include: the widespread application of adaptive learning to help workers (and managers) cope with rapidly changing job markets, coordination among alliance partners to keep tensions (like different views on migration questions) from becoming full-fledged national security issues, avoidance of "beggar-my-neighbor" trade policies, and adequate coordination on mass migration challenges.

As noted above, the specific solutions chosen (focused on learning in this case) need to be those that can be bundled effectively with other approaches across the widest possible range of the workforce and national security scenarios.

Way Ahead

Given the uncertainties, the principal objective of this analysis is to help inform the various debates that will emerge around these complex issues – how to "adjust our social structures and economic structures to take advantage of the new reality [of machine learning]?"[55] Since 2030 is beyond the planning horizon of most political leaders, bureaucracies, and businesses, and since the details of the problem are not yet clear, the intent is less to provide answers now than to encourage a research agenda to tee issues up and generate a base of knowledge and data to permit informed decisions when the time is right.

Overall, the results of the examination highlighted four key points:

- First, governments should be cautious about intervening at this stage, given the lack of clarity on which to base policy.
- Second, whichever path is taken, all types of business will have a key stake in having a workforce that is appropriately prepared for the new environment. But, given the trends in workforce replacement by automation and AI outlined above, the protection of workers' interests cannot be left solely to business. Moreover, these issues can't be focused only on one nation.
- Third, individuals will need to take more responsibility for their own futures.
- Fourth, the difficulty of implementing effective education reform, in the United States at least, shows just how hard these changes will be. Success is by no means assured.

Together, these imply the need for a long-term, ecosystem approach, with a strong business component, but engaging government, learning professionals, workers, and international stakeholders.[56]

Given this, four near-term steps can be taken that would be useful under any of the alternative scenarios. These include:

Gather data on which to base future policies. This must be a well-designed, sustained, consistent information gathering program to allow for data-based decisions in the future. Begin now with two questions: (1) How many jobs actually are being lost to, and how many are being created by, automation and artificial intelligence? (2) Given the importance of blended man-machine approaches, how can people learn to work better in conjunction with automation and AI? What are some metrics?

Pursue public-private partnerships on workforce issues. Recognize that governments alone aren't likely to anticipate these changes very well. Neither is business, nor any other single group. Public-private, whole-of-government, transnational partnerships can be a better approach than any one team, but they need to be enabled to do so, e.g., by reducing regulatory impediments to collaboration. Foresight-focused thinking, versus just forecasting, needs to be an integral part of this process.

Understand better the pending impact of income and wealth inequality. Wealth and income inequalities cannot, and actually should not, be eliminated if innovation and entrepreneurship are to be encouraged. However, serious research must consider options to keep such inequities from becoming trigger points for large-scale social unrest. What learning and income redistribution measures show the most promise for mitigating social unrest, and how do these vary by region? What evidence will be needed for policy formulation?

Start teaching children early so they can make informed decisions and take more responsibility for individual actions. K-12 students need to know about the "looming shadow of the future," the importance of becoming adaptive learners, how to develop work skills and the risks if they do not. Research should focus on understanding which segments of the population are likely to learn to adapt well enough through innovative learning and whether this will be large enough to meet the society-wide challenges of automation and AI. How should the concerns of the remaining population segments be addressed?

Notes

1. This chapter is dedicated to the late Bruce van Voorst, whose broad interests, intellectual curiosity, and boundless energy stimulated the authors' interest in this topic.

2. A complexity lens can be considered as a "macro-scope" to focus on intersections and interactions among many variables, rather than the myriad details of the component problems. See Jan Wouter Vasbinder, *The Complexity Lens*, presentation to conference in Alpbach, Austria, 23 August 2014.

3. Erik Brynjolfsson and Andrew McAfee, *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, (ebooks, 2011); and *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies,* (New York: W.W. Norton, 2014); Martin Ford, *The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future*, (Acculant Publishing, October 5, 2009), and *Rise of the Robots: Technology and the Threat of a Jobless Future*, (Basic Books, 2015).

4. Thomas Piketty, *Capital in the Twenty-First Century,* (Belknap Press, 2014).

5. Cited in IK Mullins, *A Critique of Thomas Piketty's Capital in the 21st Century,* (Brief Concise and to the Point Publishing, 2014), 85-87.

6. Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age.*

7. Thomas. L. Friedman, conversations with author, January-May, 2015.

8. A widely repeated quote says *"If I had only one hour to solve a problem, I would spend up to two-thirds of that hour in attempting to define what the problem is."* Attributed by William H. Markle (Vice President, Stainless Processing Company, Chicago, Illinois) to an unnamed head of the Industrial Engineering Department of Yale University, in William H. Markle "The Manufacturing Manager's Skills," in Robert E. Finley and Henry R. Ziobro, *The Manufacturing Man and His Job,* (New York: American Management Association, Inc., 1966), 15-18. A similar quote: "*If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions*," has been attributed to Albert Einstein, but can't be verified. In any case, the point is that significant time needs to be spent on understanding a problem before trying to solve it.

9. A problem can be considered "Wicked" when there is no agreement among many stakeholders on the definition of a problem, much less on the solution. There is an extensive literature on Wicked problems beginning with the seminal work by Horst W. J. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4 (Amsterdam: Elsevier Scientific Publishing Company, 1973), 155-169. One of the best summaries of Wicked Problem issues and references is a paper by Ozzie Mascarenhas SJ, Ph.D. *Innovation as Defining and Resolving Wicked Problems*, May 11, 2009, accessed August 3, 2015, http://weaverjm.faculty.udmercy.edu/MascarenhasLectureNotes/MascarenhasWickedproblems.doc.

10. See Luke Muehlhauser and Lila Rieber, "Exponential and Non-Exponential Trends in Information Technology," Machine Intelligence Research Institute (MIRI), accessed August 3, 2015, https://intelligence.org/2014/05/12/exponential-and-non-exponential/.

11. James Kadtke and Linton Wells II, "Policy Challenges of Accelerating Technological Change: Security Policy and Strategy Implications of Parallel Scientific Revolutions," *Defense and Technology Paper 106*, (Washington, D.C.: National Defense University, Center for Technology and National Security Policy, September 2014), accessed August 6, 2015, http://ctnsp.dodlive.mil/files/2014/09/DTP106.pdf.

12. Connor M. McNulty, Neyla Arnas, and Thomas A. Campbell, "Toward the Printed World: Additive Manufacturing and Implications for National Security," *Defense Horizon* 73, (Washington, D.C.: National Defense University, Center for Technology and National Security Policy, September 2012), accessed August 6, 2015, http://ctnsp.dodlive.mil/files/2013/07/DH-073.pdf.

13. James Kadtke and Linton Wells II, "Technology Is a Strategic National Security Component," *Signal* Magazine, January 2015, accessed August 6, 2015, http://www.afcea.org/content/?q=technology-strategic-national-security-component#sthash.kr1VZJXX.dpuf.

14. Rainer Strack, "The Surprising Workforce Crisis of 2030 and How to Start Solving it Now," TED Talk, accessed August 5, 2015, http://www.ted.com/talks/rainer_strack_the_surprising_workforce_crisis_of_2030_and_how_to_start_solving_it_now.

15. International Federation of Robotics (IFR), "World Robotics 2014 Industrial Robots," accessed August 3, 2015, http://www.ifr.org/industrial-robots/statistics/.

16. However, US workers historically have been very willing to move within the US for work opportunities.

17. UK Commission on Employment and Skills (UKCES), *The Future of Work: Jobs and Skills in 2030*, Evidence Report 84, February 2014, accessed August 5, 2015, www.ukces.org.uk/thefutureofwork.

18. UKCES, *The Future of Work*, xi

19. Ryan Arent, "The Third Great Wave," *The Economist* Special Report, October 4, 2014, accessed August 5, 2015, http://www.economist.com/news/special-report/21621156-first-two-industrial-revolutions-inflicted-plenty-pain-ultimately-benefited.

20. Rainer Strack, TED talk.

21. Tim Urban, "The AI Revolution: The Road to Superintelligence," Part 1, in *Wait But Why,* accessed August 3, 2015, http://waitbutwhy.com/2015/01/artificial-intelligence-revolution-1.html.

22. Urban, plus Part 2, accessed August 3, 2015, http://waitbutwhy.com/2015/01/artificial-intelligence-revolution-2.html.

23. Nick Bostrom, "How Long Before Superintelligence?" (revised with fourth postscript 12 March 2008), accessed August 3, 2015, http://www.nickbostrom.com/superintelligence.html.

24. Urban, plus Part 2, accessed August 3, 2015, http://waitbutwhy.com/2015/01/artificial-intelligence-revolution-2.html.

25. Tim Urban, Part 1.

26. Jeremy Howard, "The Wonderful and Terrifying Implications of Computers that Can Learn," TED Talk, November 2014, accessed August 3, 2015, http://www.ted.com/talks/jeremy_howard_the_wonderful_and_terrifying_implications_of_computers_that_can_learn.

27. Howard, TED talk.

28. Source: UNESCO Statistics on Literacy, accessed July 7, 2015, http://www.unesco.org/new/en/education/themes/education-building-blocks/literacy/resources/statistics.

29. Carl Benedikt Frey, and Michael A. Osborne, "The Future of Employment: How Susceptible Are Jobs to Computerisation?" paper presented to the workshop on *Machines and Employment*, hosted by the Oxford University Engineering Sciences Department and the Oxford Martin Programme on the Impacts of Future Technology, September 17, 2013, accessed July 5, 2015, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf. The highest risk jobs were in transportation and logistics, office and administrative support, and "production occupations" were at highest risk, but that service occupations also were endangered. The study also implies that "as technology races ahead, low-skill workers will reallocate to tasks that are non-susceptible to computerisation – i.e., tasks requiring creative and social intelligence. For workers to win the race, however, they will have to acquire creative and social skills." Other studies suggest that this may be hard for many.

30. Thomas Frey, "2 Billion Jobs to Disappear by 2030," accessed August 3, 2015, http://www.futuristspeaker.com/2012/02/2-billion-jobs-to-disappear-by-2030/.

31. UKCES, *The Future of Work*, vi.

32. Some have suggested that the exponential capability growth should really be considered a very rapid series of "S" curves.

33. "Now called freestyle chess matches, these are like mixed martial arts fights, where players use whatever combat techniques they want. You can play as your unassisted human self, or you can act as the hand for your supersmart chess computer, merely moving its board pieces, or you can play as a "centaur," which is the human/AI cyborg that Kasparov advocated. A centaur player will listen to the moves whispered by the AI but will occasionally override them – much the way we use GPS navigation in our cars. In the championship Freestyle Battle in 2014, open to all modes of players, pure chess AI engines won 42 games, but centaurs won 53 games. Today the best chess player alive is a centaur: Intagrand, a team of humans and several different chess programs." Kevin Kelly, "The Three Breakthroughs That Have Finally Unleashed AI On The World," *Wired* magazine, accessed August 6, 2015, http://www.wired.com/2014/10/future-of-artificial-intelligence.

34. Arent, "The Third Great Wave."

35. Arent, "The Third Great Wave," 4.

36. Catherine Rampell, "The Robots and Your Job," the Washington *Post*, April 10, 2015.

37. Dylan Matthews, "Basic Income: the world's simplest plan to end poverty, explained," accessed August 3, 2015, http://www.basicincome.org/news/2015/05/dylan-matthews-basic-income-the-worlds-simplest-plan-to-end-poverty-explained-2/. A much more optimistic future is postulated by Peter H. Diamandis and Steven Kottler in *Abundance: The Future is Better Than You Think*, (New York: Free Press, 2012 and 2014).

38. Paul Tudor Jones II, "Why We Need to Rethink Capitalism," accessed August 3, 2015, http://www.ted.com/talks/paul_tudor_jones_ii_why_we_need_to_rethink_capitalism?utm_source=newsletter_daily&utm_campaign=daily&utm_medium=email&utm_content=button__2015-04-16).

39. John Fullerton, *Regenerative Capitalism,* Capital Institute, April, 2015, accessed August 3, 2015, http://capitalinstitute.org/wp-content/uploads/2015/04/2015-Regenerative-Capitalism-4-20-15-final.pdf.

40. Jan Wouter Vasbinder, *The Complexity Lens*, presentation to conference in Alpbach, Austria, 23 August 2014.

41. Vasbinder, *The Complexity Lens*.

42. The "People, Organizations, Processes and Technology" analytical framework has been used by the International Transformation (ITX) Chairs Network since 2009. See Derrick Neal, Henrik Friman, Ralph Doughty, and Linton Wells II, eds, *Crosscutting Issues in International Transformation: Interactions and Innovations among People, Organizations, Processes, and Technology,* (Washington: Center for Technology and National Security Policy, December 2009), accessed August 3, 2015, http://ctnsp.dodlive.mil/files/2009/12/Crosscutting-Issues-in-International-Transformation.pdf.

43. The views here are mixed: Senator Jeff Sessions, Chairman of the Senate Judiciary Committee's Immigration Subcommittee, in the April 10, 2015, *Washington Post*, warns of the negative effects of continued high levels of immigration into the US At the same time, others feel that immigration will be essential to future US economic growth in the face of an otherwise aging workforce.

44. There are seven columns in this lens, versus the nine original discussion threads since the "Velocity and Impact of Tech Change" section from the discussion threads was folded into the "Technology" row and the "Timing of Decisions" section was folded into the "Processes" row of the refocused lens.

45. "Workshop on Complexity Lens" held during Singapore Foresight Week 2015, July 9-10, 2015, led by Jan W. Vasbinder, Director, Para Limes, Nanyang Technological University

46. Mr. Fred Israel, comment to author, May 30, 2015.

47. Katrina Schwartz, "7 Essential Principles of Innovative Learning," *KQED News*, February 1, 2013.

48. Instance and Benavides Dumont, "The Nature of Learning," *OECD*, accessed August 3, 2015, http://www.oecd.org/edu/ceri/50300814.pdf.

49. Ajay Upadhyaya, "Active Vs Passive Learning," *EduTrends,* January 24, 2013.

50. Arent, "The Third Great Wave," 14.

51. Mike Elgan, "Why Google and Facebook need balloons, drones and rockets," *COMPUTERWORLD,* December 6, 2014, accessed August 3, 2015, http://www.computerworld.com/article/2855979/why-google-and-facebook-need-balloons-drones-and-rockets.html.

52. Everett Community College in Washington has developed an arrangement with Boeing to train workers to handle composite fibers. See Debra Vaughn, "Everett-built carbon fiber wings key to Boeing's future," *The Herald Business Journal,* January 19, 2015, accessed August 3, 2015, http://www.theheraldbusinessjournal.com/article/20150119/BIZ/150119997.

53. Peter Bergen and Swati Pandey, "The Madrassa Myth," New York *Times*, June 14, 2005, accessed August 3, 2015, http://www.nytimes.com/2005/06/14/opinion/the-madrassa-myth.html?_r=0.

54. Forecasting often focuses on extrapolated predictions, based on already identified trends, while foresight is about anticipating the broader range of possibilities that could emerge from developing strategic conditions.

55. Jeremy Howard TED talk.

56. Richard Riley, Sandra Feldman, Sofie Sa, Bruce S. Cooper, Diana Wyllie Rigden, Ted Kolderie, Hans Decker, G. Alfred Hess, Jr., Allyson Tucker "Educating the Workforce of the Future," *Harvard Business Review,* March-April 1994, accessed August 6, 2015, https://hbr.org/1994/03/educating-the-workforce-of-the-future. The authors included the US Secretary of Education and the President of the United Federation of Teachers in New York. This follows Bernard Avishai's article "What Is Business's Social Compact?" *Harvard Business Review*, January–February 1994, and is part of a discussion on "…the nature of business's social responsibility in a competitive environment that has superseded Adam Smith's division of labor." The authors argue that business must take a much stronger role in education. Although focused mainly on the failings of the US public school system, their key message also applies in other quarters: "Business leaders must apply the lessons of the marketplace to education reform: competition breeds quality; investment without productivity is wasteful; and producers must be accountable to consumers. These principles suggest that markets, rather than bureaucratic monopolies, should deliver the service of education to US students." However, in light of the changing nature of capitalism, will a business-led approach really address the core unemployment and social unrest questions generated by the replacement of labor by automation and AI?

About the Authors

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Colonel (R) Theodore C. Hailes retired from the US Air Force after a 48 year career. The first thirty years in uniform he flew the F-4, 0-2A, F-5 and the F-15 and served in Vietnam as a Forward Air Controller. The second phase of his career was in the academic arena serving as a professor, teaching at the graduate level at the Air War College. In 1997 he co-founded the Center for Strategy and Technology, a research center that studied advanced technologies 20 years in the future, assessing the strategic impact of rapid technological change on the Air Force. His civilian education includes an undergraduate degree in history and a master's degree in International Relations. His principal areas of interest in the academic world have been in International Relations and the strategic implications of accelerating technological change.

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The Army Press
Fort Leavenworth, Kansas