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Future warfare, future skills, future professional military education

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Created in 1951 by Gen. Dwight D. Eisenhower to endow NATO Allies' officers with a forum for strategic education and politico-military reflection, this year the NATO Defense College is celebrating its 70th anniversary. In a world of rapid change and growing uncertainty, the best way to honor the past is to prepare for the future. This *Policy Brief* contributes to this goal by looking at the future of Professional Military Education (PME). Based on the recent Conference of Commandants,¹ the discussion is divided into three parts: what the future of warfare is, what skills future warfighters will need to possess, and how professional military education will have to change accordingly.

Drivers of change

To understand how future warfare will look, three major sources of disruption deserve attention: technology, demographics and climate change.

Technology. Technological change is not only enabling machines to operate way beyond human speed, but is affecting almost every area of activity. Technology is also spreading: not every country can build space shuttles, but some technological capabilities – like explosives, communication or computing – are becoming more and more widely available. At the same time, however, the spread of technology entails dependencies and, ultimately, vulnerabilities: from cyber to the security of supply chains. Technology is thus altering the balance of power, making some actors stronger, endowing others with relevant military capabilities and,

finally, increasing the risks for most.²

Demographics. Demographic trends are changing the composition of our societies, their internal dynamics as well as their mutual relations, directly and indirectly. The developed world is aging. In the West, immigrant communities generally have higher fertility rates. In other parts of the world, like China or Japan, where immigration is limited, the population growth curve is flat or flattening. The developing world, in contrast, is experiencing rapid population growth, which is predicted to continue further.³ Such growth is, however, difficult to handle because of a lack of infrastructure (healthcare, education, and communications) and structural weaknesses (like malnutrition and illiteracy). As a result, pressure on natural resources and on the borders with the developed world will inevitably increase: this will create security and integration challenges, not least because readiness to use force correlates with age.⁴

Climate change. Technological change and demographic growth promote economic growth. Economic growth

Keywords

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1 On 12-14 October 2021, the NDC co-organized the annual Conference of Commandants (of PME institutions) with the Royal Danish Defence College in Copenhagen.

2 H. Farrell and A. L. Newman, "Weaponized interdependence: how global economic networks shape state coercion", *International Security*, Vol.44, No.1, Winter 2019, pp.42-79.

3 S. N. Wahba Tadros *et al.*, *Demographic trends and urbanization*, Washington, DC, World Bank, 2021.

4 D. Jordan Brooks, S. G. Brooks, B. D. Greenhill and M. L. Haas, "The demographic transition theory of war: why young societies are conflict prone and old societies are the most peaceful", *International Security*, Vol.43, No.3, 2019, pp.53-95.

In a world where the spectrum of challenges is growing exponentially and decision-making times are becoming shortened at an equally rapid pace, so-called intelligent machines will be assigned a greater number of tasks and responsibilities to manage the sheer breadth and speed of the activities entailed

is, in turn, about transforming inputs (resources) into outputs (products). As societies grow in population and in wealth, they inevitably consume more resources.

However, the amount of resources in the world is finite. Not only are natural gas, oil, raw materials and natural resources (like fish) being consumed; the entire environment is becoming depleted, as pollution from human activities disrupts the natural cycles of the oceans and the atmosphere.⁵ This means that competition for natural resources will likely intensify. In some cases, the lack of natural resources will harm, or even halt, economic

growth. In other cases, such competition may result in confrontations, crises, and even conflict and war. Finally, since war may be about using or conquering territory, change in the natural environment may inherently affect who wages war, how and where: this explains, *inter alia*, the growing attention to the Arctic.

Future warfare

How is the interaction between technological developments, demographics and climate change affecting warfare? Given the inherent difficulty of predicting the future, here I delineate some trends that are already evident and that can reasonably be expected to continue further.

An acceleration towards “unpeace”. The growing importance of the electromagnetic spectrum, cyber warfare, and algorithms suggests that future wars will be waged, at least in some parts or phases, at an accelerating speed well above that of the human brain. Decision and reaction times will hence be compressed. This poses a set of dilemmas for traditional defense posture and force structure: should defenses be put, and kept, at higher alert levels, with the obvious risk of contributing to escalation, instability and even conflict? Similarly, will this growing speed ultimately blur the boundary between peace and war? Lucas Kello speaks of “unpeace”.⁶ Interestingly, this is what we observed in the past: it is thus possible that post-modern cyber and hybrid threats – as well as the role of non-state actors, from

terrorist to private military companies – could bring us back to premodern history.⁷

Contested, multidomain environments. Future military operations will be conducted in contested, multidomain environments. This means that access to the air, sea, cyber, space, and electromagnetic spectrum domains, far from being taken for granted, will not prove easy or constant. Technology spreads, and so do some of the anti-access technologies related to each of these domains. For this reason too, conflict will move seamlessly from one domain to the other as adversaries strike each other’s vulnerabilities or take advantage of their relative capabilities.⁸

Greater mix of conflicts. The variety of challenges, threats, theaters and actors points to different types of war in the future. In contrast to the recent past, where the essentials of ongoing or prospective wars tended to be seen in monochromatic terms (e.g., humanitarian interventions, counter-insurgency, war against terrorism, or great power competition), the years ahead will probably also bring wars based on combinations of these dynamics, in all likelihood complemented by others (like cyber war and ethnic wars).⁹

Future warfighters’ skills

What skills will future warfighters need to possess, in order to anticipate, prevent and eventually win future conflicts? Based on the possible evolution of warfare, three skills stand out.

Strategic judgement. In a world where the spectrum of challenges is growing exponentially and decision-making times are becoming shortened at an equally rapid pace, so-called intelligent machines will be assigned a greater number of tasks and responsibilities to manage the sheer breadth and speed of the activities entailed. In this context, the role of human beings will become *more*, not *less*, important: they will have to decide what to automate, how to automate, what data to look for, how to interpret predictive analytics and what decisions to take, including whether and how an entire business model needs to be changed.¹⁰ When war is waged at machine speed, from Carl Von Clausewitz’s emphasis on strategic genius we will need to transition to strategic judgement. This entails deriving strategic implications from technical, tactical and operational developments, and acting accordingly. For instance, human-machine interaction requires trust, and trust requires data. But

5 D. J.C. MacKay, *Sustainable energy – without the hot air*, Cambridge, Uit Cambridge Ltd, 2009.

6 L. Kello, *The virtual weapon and the international order*, New Haven, CT, Yale University Press, 2017.

7 J. Grygiel, “The primacy of premodern history”, *Security Studies*, Vol.22, No.1, 2013, pp.1-32.

8 S. Townsend, “Accelerating multi-domain operations: evolution of an idea”, *Military Review Online Exclusive*, August 2018.

9 L. Freedman, *The future of war: a history*, New York, Public Affairs, 2017.

10 A. Agrawal, J. Gans and A. Goldfarb, *Prediction machines: the simple economics of artificial intelligence*, Cambridge, Harvard Business School Press, 2018.

what data are necessary? This is for human beings to decide. Strategic judgement does not just concern technology, however; it is also about prioritizing challenges, tasks and goals, understanding ethical dilemmas, as well as striking trade-offs among conflicting requirements. This is particularly true as a plurality of threats (domains) emerge in a multiplicity of areas (theaters).

Technological Literacy. Strategic judgement will not be sufficient, however. As technology becomes pervasive, future warfighters will have to understand it better, and in greater depth. This does not mean that everyone will need an engineering or computer science degree. What it does mean is that future warfighters will need to possess familiarity with the underlying logic, implications and challenges of technology. Predictive analytics make it possible to improve performance through probabilistic reasoning. However, such reasoning must be mastered in depth, since faulty decisions can lead to major failures. Machine learning can tell us that the risk of an attack against a convoy on a specific route is 10%. However, the decision to assign higher or lower protection depends on the importance of the convoy, as well as the frequency of the journey over that specific route.

Adaptive problem-solving skills. Future warfighters will have to fight in different domains and against different enemies, who can adapt quickly in different types of wars, using different technologies. Since it is impossible to prepare for each and every possible situation or contingency, the only viable solution is to possess adaptive problem-solving skills. This will entail, in turn, sociability and team-working abilities, logical reasoning and multidisciplinary – all prerequisites for identifying the pathway to effective solutions.¹¹ Consider, for instance, the importance of listening to others, so as to understand and appreciate challenges, risks and novel solutions: in a world of distributed knowledge, this is not just important: it is fundamental. Similarly, consider the importance of innovation in the face of a constantly adapting adversary, capable of exploiting new technologies to deny multiple domains.

Future professional military education

Modern education emerged in the late 19th century, with the Second Industrial Revolution, when industries were hierarchical, knowledge relatively limited and narrow, while processes were standardized and repetitive. Modern education has long mimicked this system, with hierarchical relations between professors and students, standardized lectures aimed at transferring knowledge, and different homogenizing procedures. Since then, however, the world has moved on to the Third Industrial Revolution and is now entering the Fourth. Orga-

nizations are more horizontal, the number and depth of disciplinary fields have grown beyond recognition, and technology has opened the way for multiple creative tasks and processes. Modern education has not, however, fully coped with this transition. To some extent, this is true also true for PME. Some trends in education are nevertheless emerging, and point exactly in the direction needed to endow future warfighters with the skills described in the previous section.

Less (and different) frontal teaching. Frontal lectures are generally less effective than other teaching activities, like those focused on experiential learning. There are several reasons for this, including the way our brain works. However, this is particularly true when students need to acquire broad, complex and deep knowledge spanning several fields – which is exactly what PME is about. Single, frontal lectures simply cannot transfer all the relevant information. In contrast, lecturers must provide an overarching perspective and, also through interactive approaches, stimulate students' interest. Future PME will thus likely reduce the amount of frontal lectures: various digital platforms – like TED Talks, YouTube, Coursera, or Udemy – already grant access to this product, often free of charge and even qualitatively better. Within click range, anyone can access the expertise of Nobel Prize Laureates or A.M. Turing Awardees. Lectures, through whatever channel they are delivered, will also be more interactive and dynamic, including not only slides but also videos and other visual resources.

More in-person interactive activities. PME will likely reduce the amount of frontal teaching to create space for other in-class interactive activities. Such activities will focus on problems, case studies, or simulations, which will be discussed and solved in groups. Business schools – those training future corporate leaders – have long moved in this direction. Actually, it would not be a major departure for PME either. In the 1930s, the US Naval War College prioritized the strategic challenges the United States was facing and organized a set of wargames to understand how the US Navy should prepare for the future. This resulted, *inter alia*, in the understanding of the critical contribution aircraft carriers could provide in a future campaign in the Pacific (*War Plan Orange*) during World War II.¹² To win together, students in learning settings like this need to reason and learn together, including from each other: this is what group activities are about.

Students' essays? Most PME institutions require course members to write essays. In theory, writing helps analytical thinking. In reality, as we see from changes in traditional academia, there are several reasons to be skeptical. On the one hand, as the number and depth

11 S. Greiff *et al.*, "Adaptive problem solving: moving towards a new assessment domain in the second cycle of PIAAC", *OECD Education Working Papers*, No.156, OECD Publishing, Paris, 2017.

12 E. S. Miller, *War plan orange: the US strategy to defeat Japan, 1897-1945*, Annapolis, US Naval Academy, 2007.

of disciplines has expanded dramatically in recent years, analytical thinking requires enormous time to read and process knowledge. On the other hand, PME course members have limited time to read. It must also be remembered that research, in various disciplines,

has long moved away from single-authored publications to become a collective endeavor.¹³ In fact, only Nobel Laureates in Literature still single-author their works. Future PME will thus probably require students to write fewer essays and do more group projects. The most successful MBA

students do not write award-winning essays, they create successful companies.

A changing curriculum: laboratories, incubators and personal interests. Flexibility in the curriculum will probably increase. The reasons are severalfold, but one deserves special mention here. In a world of rapid technological change and increasingly varied challenges, very few can claim a monopoly of expertise in any particular area. This is why so many start-ups succeed. Twenty, fifteen or even ten years ago, some military officers possibly had an interest in machine learning or Chinese strategic culture: it is reasonable to speculate that, for various reasons, they could only rarely develop this interest in any detail during PME. We cannot know what fields, skills and tools will be important tomorrow, but some officers may: allowing them greater flexibility may prove an effective solution for understanding future strategic challenges.

The way ahead

PME inherently changes along with society, the transformation of the armed forces and the broader strategic threats governments face. Many issues loom on the horizon. Future PME may have to include more

civilians (also to familiarize them with military and defense issues), and may expand beyond traditional strategic questions. Similarly, as our societies change, PME could experience a stronger push towards inclusiveness and diversity. One could also speculate about the very future of PME, as traditional educational institutions change. Digital technologies have in fact disrupted basically every field, with the exception of higher education: many guess that it could be next in line.¹⁴ What does that mean for PME?

In this *Policy Brief*, I have focused on a narrower issue: the change of PME to deliver the key skills of the future. The resulting assessment pretends to be neither comprehensive nor exhaustive. Two broad concluding considerations deserve attention, however. On the one hand, what I have outlined does not represent a major, or even disruptive, departure. Many defense colleges have long relied on online classes, and in any case the pandemic has forced them into a digital transition. Similarly, group exercises, simulations and case studies are also already part of existing curriculum (and the same applies to individualized curricula). I believe, however, that online teaching, interactive activities and individualized curricula will grow in strength, potentially upsetting the current balance in many PME settings. This leads to my second consideration. There will be resistance: from students, who will not like a more interactive environment where they may be forced out of their comfort zones; from teachers and professors, who will have to master new skills and, in some cases, may be unfit to run case studies, exercises and simulations; as well as from administrations, which will be challenged by these changes. However, to render the spirit (if not the letter) of a remark by Steve Jobs, customers often don't know what they need or want. PME is about something bigger.

As Gen. Eisenhower noted, in promoting the setting up of the NATO Defense College, the goal is to: “develop individuals both on the military and on the civilian side who will have a thorough grasp of the many complicated factors which are involved in creating an adequate defense posture (for the North Atlantic Treaty area)”.

13 J. Adams, D. Pendlebury, R. Potter and M. Szomszor, *Global Research Report: Multi-authorship and research analytics*, Chandler, AZ, Institute for Research Information, 2019.

14 G. G. Parker, M. W. Van Alstyne and S. P. Choudary, *Platform revolution: how networked markets are transforming the economy – and how to make them work*, New York, W. W. Norton & Company, 2017.



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