

War-Gaming as a Living Tool for Professional Military Education

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PROFESSIONAL MILITARY EDUCATION (PME)

A professional military class in the 18th century created a corpus of specialised knowledge of management of violence,² and was followed by academies and staff establishments internalising this knowledge.³ In the beginning, academies focussed on *procedural knowledge*, i.e., the motor, technical, and execution skills in weaponry, with no formal preparation for the *propositional* component of military knowledge, i.e., foresight, planning, and

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1. *All views expressed in this paper are those of the authors alone, and in no way represent the views or policies of the Indian Armed Forces or any other organisation*
2. The leadership of the nobility focussed on flair and grandiosity, rather than the practical skills required for modern warfare. Samuel Huntington, *The Soldier and the State: The Theory and Politics of Civil-Military Relations* (Belknap: New York, 1981), p. 11.
3. Saikat Bose, *Boots, Hooves, and Wheels: The Social Dynamics Behind South Asian Warfare* (Delhi: Vij Books, 2015), p. 428; Martin van Creveld, *The Training of Officers* (New York: The Free Press, 1990), pp. 17-18.

decision-making, all required to apply procedural knowledge.⁴ Rather, the latter was built through a lifetime of hit-and-trials.⁵ Such luxury is not available to modern leaders who must be fully prepared in the abstract skills of planning and decision-making by the time they are tested in battle.

Warfare is a complex adaptive system with little causality, and open to a combinatorial explosion of possibilities.⁶ This is exacerbated by today's multi-domain environment and accelerated changes, making it impossible to predict beyond the immediate future.⁷ In such an environment, leaders cannot overthink and let an opportunity pass, but must be able to take timely albeit sacrificing decisions, shunning the desire for complete information.⁸ The first time a leader is required to do this must not be the battle itself, and militaries aim to develop this capacity at all levels. This is the prime intent of PME.⁹

Traditional methods to develop the above capacity include exercises and field manoeuvres, outdoor Tactical Exercises

4. Nicholas J. Bosio, "Understanding War's Theory: What Military Theory Is, Where It Fits, and Who Influences It?" Australian Army Occasional Paper, *Conflict Theory and Strategy*, no. 001, pp. 11–14, <https://researchcentre.army.gov.au/library/land-power-forum/what-war-defining-war-conflict-and-competition>. Accessed on July 17, 2024.
5. Modern officers rarely receive second chances, unlike figures such as Lord Cornwallis, Shaista Khan, or Kutuzov.
6. Jim Storr, "The Human Face of War," in Gary Sheffield and Don Todman, eds., *Birmingham War Studies Series* (London: Continuum, 2009).
7. These rapid changes make it almost impossible to determine the training needs of even the near future—few could have predicted today's disruptive technologies just a few years ago.
8. Adrian P. Banks, David M. Gamblin and Heather Hutchinson, "Training Fast and Frugal Heuristics in Military Decision-Making", *Applied Cognitive Psychology*, vol. 34, 2020, pp. 699–709, <https://onlinelibrary.wiley.com/doi/abs/10.1002/acp.3658>. Accessed on June 27, 2024..
9. Rakesh Sharma, "Army Officers and Professional Military Education (PME): Need for Focussed, Systemic Change", *CLAWS Focus*, April 17, 2021, <https://www.claws.in/army-officers-and-professional-military-education-need-for-focussed-systemic-change/>; Michael Howard, *The Causes of Wars and Other Essays*, 2nd ed., (Temple Smith, 1983), p. 194.

Without Troops (TEWTs), and indoor sand-model exercises. Exercises and field manoeuvres can never replicate reality, and are beset by increasing conurbation, lack of training space, and competing demands on time and finances. They are forces to adopt expedients such as ‘telescoping’ time and distances, which give wrong ideas of the dispersion, episodic nature of warfare, and tempo of operations. The other means see plans through stages, identify contingencies and responses, but are too focussed on planning. The adversarial component in these is stymied by organisational requirements, and they examine post-H-hour situations only cursorily.

USING WAR-GAMES IN PME

War-gaming has been a potent pedagogical tool of experience-building and “intellectual cross-training” in armies.¹⁰ Well-run games encourage users to examine problems in diverse ways, developing and refining plans as well as decision-making ability. The Prussian Army, forbidden from deploying troops by the 1815 Maastricht Treaty, and the *Wehrmacht* banned from outdoor exercises and raising mechanised forces by the Treaty of Versailles, exploited war-games to develop concepts (like *blitzkrieg*), and groom officers.¹¹ War-gaming was key in Hans von Seeckt’s plan of rejuvenating the *Reichswehr*, centred on Non-Commissioned Officers (NCOs) training its few officers, and exposed them to tasks far above their ranks so that they could easily be promoted when the *Reichswehr* expanded. US Navy war-games under *Plan Orange*¹² proverbially allowed visualisation of all options less the *Kamikaze*, while the fabled

10. Peter Perla, *The Art of Wargaming: A Guide for Professionals and Hobbyists*, (Annapolis, 1990), pp. 231–232.

11. Matthew B. Caffrey Jr., “On Wargaming: How Wargames Have Shaped History and How They may Shape the Future”, *Newport Papers*, 43 (Naval War College Press: Newport, 2019), pp. 17-46.

12. It was conducted as part of a larger series of games called the *Rainbow Plan*.

German directive style of command was developed through war-games where missions could be attained only by violating one or the other of the terms of references. It could be said that forces that used war-games fairly, like the Germans and Americans, had great advantage over adversaries who did not use war-games (the British in the inter-war years), or used them wrongly (the Japanese who 'cheated' to uphold their plans).¹³

War-gaming plays important roles in most militaries today, its plan optimisation role surpassing training and capacity-building. War-gaming for PME specifically in the aerospace domain was first suggested by the 1975 Clement Blue Ribbon Panel on Excellence in PME in the US, whose suggestions were followed by the establishment of the US Air Force Wargaming Institute (AFWI), based on the 1976 Air Force Course of Actions' (COS') Constant Readiness Tasking Order. In the land forces, the field formations use plan optimisation games at higher levels, but training games are limited to PME institutions. Even there, war-gaming is often beset by organisational issues, including paucity of expertise. Plan optimisation games often tend to reiterate established ideas, proving rather than exploring,¹⁴ whereas the military penchant for scientising and reification,¹⁵ which leads to overburdened PME syllabi with activities, monitored with quantitative metrics, tends to script and choreograph war-games. War-games are often marked by endless plan presentations and theoretical staff-work, which lead to a general suspicion of war-games.¹⁶

13. Nicholas Bosio, "Gaming to Win: Enhancing Military Decision-Making", *Australian Army Journal*, vol. XVIII, no 1, 2022, pp. 37–68, https://researchcentre.army.gov.au/sites/default/files/aaj_vol_xviii_1-22.pdf. Accessed on June 28, 2024.

14. Christon I Archer, et. al., *World History of Warfare* (Nebraska: University of Nebraska Press, 2002), p. 521; Caffrey, Jr. n.11, pp. 37–68,

15. Karl E. Weick, *The Social Psychology of Organizations*, 2nd ed., (New York: McGraw-Hill, 1979), p. 34.

16. Eric M. Walters, "Wargaming in Professional Military Education: Challenges and Solutions", *Journal of Advanced Military Studies*, vol. 12, no. 2, 2021, pp.

DEVELOPMENT AND TYPES OF MODERN WAR-GAMING

In addition to the sociological issues alluded to above, war-game design and technology determine the way they are exploited. An examination of the history of war-game development suggests that early experimentations which culminated in the manual war-game *Kriegsspiel*¹⁷ in the 1820s, were really products of the *Enlightenment Era* thinking which assumed that social phenomena, including warfare, were also predictable, like physical phenomena. This myth broke with the Napoleonic Wars, which supplanted small, regular, and highly trained armies in West Europe; the passion, friction, and uncertainty of warfare had needed to be underlined by Clausewitz. Such warfare could no longer be modelled with the rigid rules of *Kriegsspiel*, and many, less rigid variants appeared by the 1870s which could handle larger forces and less predictable behaviour.

War-game usage and exploitation remained in military hands till World War II,¹⁸ after which, due to several reasons, not the least of which were the prevalent positivist atmosphere and the removal of the immediacy of warfare, war-gaming turned towards the mathematical genre of Operations Research and Systems Analysis (OR&SA).¹⁹ Soon, this was reinforced by the availability of computers. Lien of military officers reduced,²⁰ and manual

81–114, <https://muse.jhu.edu/pub/419/article/805919>. Accessed on July 18, 2024.

17. Before that, there were several experiments with chess.

18. Caffrey Jr., n. 11, pp. 11–17; Ed McGrady, “Getting the Story Right about Wargaming”, *War on the Rocks*, November 8, 2019, <https://warontherocks.com/2019/11/getting-the-story-right-about-wargaming/>. Accessed on July 10, 2024.

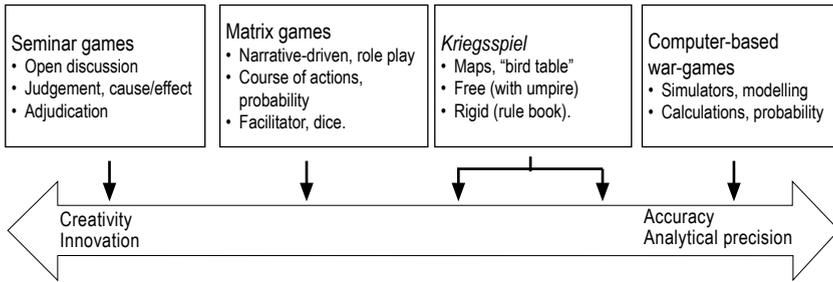
19. Operations Research uses real data for tactical problem-solving, while Systems Analysis creates data-less models to predict outcomes, but these predictions are inherent to the models themselves. Thomas B. Allen, *War Games: Inside the Secret World of the Men Who Play at World War III* (London: Heineman, 1986).

20. Paul K. Davis and Don Blumenthal, “The Base of Sand Problem: A White Paper on the State of Military Combat Modeling”, RAND Corporation, 1991

games barely survived.²¹ However, the culture of recreational war-gaming in Western societies²² continued to yield military advantages which were denied to other armies.

The repertoire of war-games that exists today can be classified as per criteria of modelling, closure, control, or purpose (which has been seen in plan optimisation and potential development). Based on the playing format, they can be classed as in Fig 1 below.

Fig 1: Categorisation of War-Games²³



and as part of the pedagogical toolkit of PME institutions, is easy to design and use, and can handle most complex, ill-defined scenarios. However, unless expertly run, these can get scripted or degenerate to unstructured discussions. Computerised war-games, usually designed at great expense on bespoke facilities, are used periodically by formations, and PME institutions. Their designers are not always likely to have military experience, rendering their rules opaque to military personnel.²⁴ These games are difficult to modify, and tend to get obsolete soon. First-person shooter games are extreme, high-graphics real-time games, such as *Call of Duty*, and its People's Liberation Army (PLA) copy *Glorious Mission*, that can be used to improve combat skills and technical learning. A large segment of air force games also borders on such first-person fighter simulations, which enhance the thinking, and motor skills and reflexes of pilots against a determined enemy.

Matrix gaming is a formalised version of the seminar game, and with potential to handle multiple sides, hidden agendas and cross-purposes, is well-suited to geopolitical games.²⁵ It requires greater expertise to run. The *Kriegsspiel*-type manual games are most comprehensible to military users, but have faded out of most armies. The advantages of Western societies using recreational war-games are also eroding, as these tend towards computers, with captivating graphics but concealed rules.

HOW WAR-GAMES HELP HANDLE THE MODERN BATTLESPACE

The two main foci of PME are comprehension of the modern battlespace, and decision-making, both of which can be aided by gamification, i.e., applying game mechanics to non-game

24. Davis and Blumenthal, n. 20.

25. Rex Brynen, "Engle: A Short History of Matrix Games", *PAXsims*, July 26, 2016, <https://paxsims.wordpress.com/2016/07/26/engle-a-short-history-of-matrix-games/>. Accessed on June 29, 2024.

situations. War-games can create synthetic decision-making environments marked by incomplete information, paucity of time, a determined adversary and friction, wherein players constantly facing decision dilemmas test ideas, gain experience, and build confidence,²⁶ and with repeated practice, get inoculated against failure.

Understanding the Modern Battlespace

A war-game places students in adversarial situations where they 'learn by doing', suffering for violating logic, and facing dilemmas of choice between equally bad options. War-gaming forces them to think by demolishing their logic every time,²⁷ fostering a *learning-to-learn culture*.²⁸ Such a Socratic approach succeeds better than narrative teaching in giving students an understanding 'in the round'. Well-designed war-games for current, hypothetical, and future situations contextualise the timeless and fundamental principles of warfare. This extends to 'mundane' aspects such as logistics, which is often overlooked in classrooms and exercises due to the enthusiasm for operations—by bringing operations grinding to a halt if logistics fails, a war-game can force players to experience the tyranny of distance.

Many military and non-military assets like ballistic missile launchers, police, voluntary aid agencies, or electronic warfare, are not easily available in exercises either due to the high cost, sensitive signature, or organisational issues. In fact, most aerospace operations are so high-impact that launching frequent exercises on them can be extraordinarily expensive and cause

26. Nick Bosio, "Moulding War's Thinking: Using Wargaming to Broaden Military Minds", *Australian Army Journal*, vol. XVI, no. 2, 2020, pp. 25–48, https://researchcentre.army.gov.au/sites/default/files/20780_Army-Journal-internal_WEB.pdf. Accessed on June 30, 2024.

27. Dietrich Dörner, *The Logic of Failure. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 1990, pp. 463–473, <http://10.1093/acprof:oso/9780198521914.003.0002>. Accessed on June 27, 2024.

28. Caffrey Jr., n.11, pp. 282–283.

diplomatic concerns. Such massive deployments, and decisions as to prioritising targets and missions, designing packages, trying different Command and Control (C2) arrangements, and managing logistics, all aspects of application of aerospace power in the joint and multi-domain planning and operations, can be played out repeatedly on war-games at a fraction of the cost, forcing players to comprehend all issues, think pragmatically, and identify contingencies. Similarly, for the land forces, the limited opportunity to train with such high-signature forces should focus on procedural knowledge (interaction and coordination methods) and not squandered in planning issues, for which war-games must be used. Evidently, while plan-optimisation games can be restricted to the higher formations, the above benefits of capacity-building war-games should be available to the relevant levels of all leaders for their continued PME.

Grooming in Decision-Making

Functioning in today's battlespace, marked by a mass of headquarters all performing Observe, Orient, Decide, Act (OODA) loops, with endless cross-linkages and intermeshed feedback channels, all exacerbated by the patchy introduction of digitised C2 systems, requires decision-making based on information that is never either complete or accurate. In fact, systematised planning procedures such as the Military Appreciation Process (MAP) or variants of the Military Decision-Making Process (MDMP) have become rigidised,²⁹ with little clarity on how they are to be applied in the frenzy of battle. This makes independent and directive command styles, and the proverbial *coup d'oeuil* of heuristic

29. The processes of information gathering, problem framing, developing mental models, and assessing risks before making decisions align with the intelligence preparation of the battlespace, mission analysis, and the development and analysis of Courses of Action (COAs).

thinking,³⁰ an imperative. And yet, militaries tend to weed out officers with initiative, readiness to experiment, and greater tolerance for ambiguity,³¹ promoting instead many who, unable to get the larger picture or bird's eye view, try to compensate with over-detailed worm's eye views, themselves distrusting subordinates comfortable with ambiguity and heuristics.

However, decision-making is a cultural aspect. It is seen that the so-called *science-of-war* forces, such as the Soviets, give little autonomy to their officers; the same Soviet officers found themselves frustrated with the even slower and hesitant decision-making by the Arabs that they were mentoring. Arab officers seldom grabbed opportunities, terrified of doing anything not expressly sanctioned by higher headquarters.³² And yet, Arabs have always demonstrated remarkable initiative in traditional *razziyah* raids, showing that command style is really a cultural, and not organisational, phenomenon—the Arabs were culturally alien to regular armies. In contrast, command styles have been freer and more creative in the *art-of-war* forces of the West, which desire directive command styles. Such command style is most vividly demonstrated in the *Wehrmacht*, belying the idea that autocratic states stymie officers' initiative.

Developing the decision-making skill is easier said than done, especially when it has to contend with an adverse culture. Use of *fast-and-frugal heuristics*³³ has been criticised on several grounds: that they yield second-best results, that they are used by minds with cognitive limitations, and that they are suited

30. Clausewitz called this *coup d'oeuil*; Aristotle called it *phronesis*. Azar Gat, *A History of Military Thought: From the Enlightenment to the Cold War* (Oxford: Oxford University Press, 2001), p. 256.

31. Storr, n. 6, pp. 168–169.

32. Benny Morris, *1948: A History of the Arab-Israeli War* (Yale: Yale University Press, 2009).

33. Peter E. D. Love, Lavagnon A. Ika, Jeff K. Pinto, 'Fast-and-frugal Heuristics for Decision-making in Uncertain and Complex Settings in Construction', *Developments in the Built Environment*, vol. 14, 2023.

only for routine decisions. However, military history shows that it is the satisficing but timely decisions that are optimal:³⁴ sharper minds are better at using heuristics, which have always been used in battle.³⁵ And yet, one has to be careful in using heuristics—just as leaders must not overthink, their decisions should not be too hasty. In Kahnemann’s model, while System 1 thinking aids rapid decision-making by abstracting the problem and matching with memory patterns,³⁶ System 2 must ensure discernment.³⁷

It is here that war-gaming, whose role in developing the German *auftragstaktik* has been alluded to above, can be invaluable. There is no strict taxonomy of heuristics and biases, but the common ones used for pattern matching are *availability*, *representativeness*, and *anchoring* heuristics.³⁸ Evidently, the broader the repository of patterns, the better can *availability heuristics* be employed without the bias of recalling only patterns with greater salience or vividity [Rommel was lulled by the repeated British announcement and rescindment of Auchinlek’s offensive in Libya (Operation Crusader,

34. Patton said, ‘a good solution applied with vigour now is better than a perfect solution ten minutes later’. See Storr, n.6, pp. 132–34.

35. As outlined in the US Army FM 3-0, *Operations*, it is described as “arriving at a conclusion through pattern recognition, drawing on knowledge, judgment, experience, education, intelligence, boldness, perception, and character.” Arthur L. Costa, Bena Kallick, “Habits of the Mind: Strategies for Disciplined Choice Making”, *System Thinker*, <https://thesystemsthinker.com/habits-of-mind-strategies-for-disciplined-choice-making/>. Accessed on July 1, 2024.

36. Gerd Gigerenzer, “Why Heuristics Works”, *Perspectives on Psychological Science*, vol. 3, no. 1, 2008, pp. 20–29, <https://www.semanticscholar.org/paper/Why-Heuristics-Work-Gigerenzer/e04909f16530a20e98528727535fadf605a8639f>. Accessed on July 1, 2024.

37. Daniel Kahneman and Amos Tversky, “Judgment under Uncertainty: Heuristics and Biases”, *Science*, vol. 185, 1974, pp. 1124–1131; Kahneman and Tversky, “Prospect Theory: An Analysis of Decision under Risk”, *Econometrica*, vol. 47, no. 2, 1979, pp. 263–292.

38. Blair S. William, “Heuristics and Biases in Military Decision-Making”, *Military Review*, September–October 2010, pp. 40–52.

1941)].³⁹ War-games can progressively populate the library of patterns,⁴⁰ especially as these cannot be created in peace-time, diffusing salience so that none appear too striking. Gaming also indicates where careless use of representative heuristics, based on limited input or sample size, can stereotype, or confirm what one fears or desires, or of anchoring heuristics which causes fixation with certain ideas. Repeated war-gaming develops ‘mental muscle memory’ of heuristics, inoculating players against biases,⁴¹ teaching them where to stop heuristics and use rigid tools.⁴² After-action reviews can reveal how players’ decisions were influenced by imagined situations. In short, war-gaming builds the ability to apply heuristics and also realise where heuristics is vulnerable to mental snares, and where System 2 thinking, which itself is open to biases and must be guarded against,⁴³ must take over.

CAVEATS

The advantages of war-gaming in aiding comprehension and developing decision-making styles by exposing fallacious assumptions and comfort-zones, have been discussed. War-

39. Thaddeus Holt, *The Deceivers: Allied Military Deception in the Second World War* (New York: Scribner, 2004), p. 39-40,

40. Sara I de Freitas, “Using Games and Simulations for Supporting Learning”, *Learning, Media and Technology*, vol. 31, 2006, p. 344; John Lillard, *Playing War: Wargaming and U.S. Navy Preparations for World War II* (Lincoln, Nebraska: Potomac Books, 2016), p. 137.

41. Philip Sabin, *Simulating War: Studying Conflicts Through Simulation Games* (London: Continuum, 2012), p. 62; John Lillard, *Playing War: Wargaming and U.S. Navy Preparations for World War II* (Potomac Books: Nebraska, 2016), p. 137.

42. Dörner, n. 27.

43. Colin Camerer and Dan Lovallo, “Overconfidence and Excess Entry: An Experimental Approach”, *American Economic Review*, vol. 89, no. 1, March 1999, <https://econweb.ucsd.edu/~jandreon/Econ264/papers/Camerer%20Lovallo%20AER%201999.pdf>; Hugh Courtney, *20/20 Foresight: Crafting Strategy in an Uncertain World* (Boston, MA.: Harvard Business Review Press, 2001).”

gaming also encourages team-building by breaking branch and status parochialism. Primarily, it develops pluralist habits of mind,⁴⁴ and a learning-to-learn culture.⁴⁵ Nevertheless, war-gaming is misunderstood⁴⁶ and often maligned,⁴⁷ some reasons being individually correct, making it essential to remember the following caveats.

The following caveats must be kept in mind:

Realistic Modelling

All war-games are abstraction, and, thus, wrong. This, however, should not be a deterrent, and training and capacity-building war-games must reasonably recreate the uncertain environment of combat,⁴⁸ and need not focus on excessively detailed accuracy. The design must also allow the rules, made with *anchoring heuristics*, to be continually refined with more data and observation.

44. A pluralist mindset embraces diverse perspectives, considers alternative views, and integrates various schools of thought. In military theory, pluralism involves using multiple paradigms, theories, and methodologies to address problems. Nick Bosio, *Relationship between Contemporary Western Military Theory, Systems Thinking*, PhD Thesis. Australian National University, 2022, pp. 56, 58–60, 223–227.

45. John A. Nagl, *Knife Fights: A Memoir of Modern War in Theory and Practice* (New York: Penguin, 2014), p. 37; Major General Robert Scales, *Too Busy to Learn*, <http://www.usni.org/magazines/proceedings/2010-02/too-busy-learn>; Michael Howard, “Jomini and the Classical Tradition in Military Thought”, in Michael Howard, ed., *The Theory and Practice of War: Essays Presented to Captain B.H. Liddell Hart* (London: The Camelot Press, 1965), p. 8; n. 33, pp. 255–256.

46. Ed McGrady, “Getting the Story Right About Wargaming,” *Real Clear Defence*, November 8, 2019, https://www.realcleardefense.com/2019/11/08/getting_the_story_right_about_wargaming_310698.html. Accessed on July 2, 2024.

47. Sebastian J. Bae, ed., *Forging Wargamers: A Framework for Wargaming Education* (Quantico, VA: Marine Corps University Press, 2022), p. 7.

48. James Clear, “All Models Are Wrong, Some Are Useful,” <https://jamesclear.com/all-models-are-wrong>. Accessed on August 2, 2023.

Designing Biases

War-game designing must be free from biases, such as ignoring unexciting (logistics) or difficult aspects (intangibles and behavioural).⁴⁹ Assuming historical events as the truth and building probabilities around them is an anchoring bias, because historical events, including black swan ones, appear predictable only in hindsight. War-games must also avoid confirmation bias, i.e., they should not encourage indoctrination or tell a sponsored story.⁵⁰

Realistic Player Behaviour

Though war-games can approximate to realistic infosphere, they cannot recreate the physical urgency, discomfort, or danger, or the psychological pressure of sending people to their deaths. Player behaviour, as it is, is unrealistic. The rules must prevent aggravation of this by unrealistic 'enemy' behaviour, or allow unrealistic, apathetic, or over-aggressive, player behaviour (if unconvinced by rules and aware of loopholes). In addition to being credible, rules must build in trade-offs that penalise unrealistic behaviour.

War-Games and Winning

It must be remembered that winning in war-games is not the same as being successful in a real war. This is because information is cleansed, filtered and uncluttered in war-games, unlike a war's fuzzy, unabstracted, chaotic, information environment of which only leaders and staff with discernment and experience can make sense.

49. Janice B. Fain, R.C. Anderson, T.N. Dupuy, G.M. Hammerson, and C.F. Hawkins, "Forced Changes of Combat Posture", *Data Memory Systems* (Fairfax, V.A.: Historical Evaluation and Research Organisation, 1988).

50. James F. Dunnigan, *The Complete Wargames Handbook: How to Play, Design, and Find Them*, 2nd. ed., (New York: Quill William Morrow, 1992), pp. 239-240.

Reputation for Oversimplification

Abstraction and oversimplification give war-games a reputation of being childlike, with abstracted rules, flashy interfaces, and devices such as the dice. This leads to a reluctance to consider it a serious academic subject,⁵¹ implying that serious war-gamers are a few gifted amateurs.

War-Game and Knowledge

War-gaming is not a hard science that can be replicated,⁵² as games play out differently each time. They are experimental only in a limited sense, their use lying in assessing situations, possibilities, and decisions, and not in proving anything.

RECOMMENDATIONS

Exploiting the potential of war-gaming in PME, to include an ergonomic ecosystem to develop and exploit war-games, requires a positive attitude towards war-gaming and consideration of the caveats outlined above. The recommendations are discussed in terms of the attitudinal changes, modelling and exploitation methods, and required institutional changes.

Changes in Attitudes

Resilience of plans depends upon the mental agility of decision-makers to handle unforeseen situations. While restricting plan-optimisation war-games to the higher echelons is justified, recognising the relevance of their *capacity-enhancement* role for PME at all levels will bring readiness for deeper exploitation.⁵³

51. Natalia Wojtowicz, "Professional Wargaming: From Competence Model to Qualifying Certification", in Bae, ed., n.46, pp. 9–29; Tom Mouat, "The Use and Misuse of Wargames", *Scandinavian Journal of Military Studies*, vol. 5, issue 1, 2022, pp. 209–220.

52. R. C. Rubel, "The Epistemology of War-Gaming", *Naval War College Review*, vol. 59, no. 2, 2006, pp. 108–128.

53. "Instructor Buy-In" in Johan Erik Elg, *Wargaming and Military Education for Officers and Cadets*, Doctoral Thesis, King's College London, September 2017, pp. 6–11.

PME is a continuous process and must not be confined to PME institutions but extended to field formations also.

War-gaming requires comfort with heuristics, and readiness to accept outcomes uncomfortable for the 'home team'.⁵⁴ Instructors and conductors of PME war-games must move away from the *stage-on-the-stage* format, only controlling the game to generate lessons and not scripting them. Also, to create a *safe-to-fail* environment, assessment and course gradings should not be coaxed with war-game performance.

War-games at PME institutes are major events involving the entire course, but while most students believe they are contributing,⁵⁵ many are really idle. In any case, large groups produce fewer ideas of lower quality.⁵⁶ Thus, PME institutions must consider *swarm-gaming*, wherein offshoots and *roads-not-taken* of the main war-game are played in sub-syndicates by other students and their results compared afterwards.⁵⁷ Also, not all war-games, whether at PME institutions or in formations, need to be played from start to finish—some can start at points of decision where students are faced with major dilemmas or trade-offs.

54. Sebastian J. Bae, "Put Educational Wargaming in the Hands of the Warfighter", *War on the Rocks*, July 13, 2023, <https://warontherocks.com/2023/07/put-educational-wargaming-in-the-hands-of-the-warfighter/>. Accessed on July 3, 2024.

55. B. Nijstad, W. Stroebe, and H. Lodesijkx, "The Illusion of Group Productivity: A Reduction of Failures Explanation", *European Journal of Social Psychology*, vol. 36, 2006, pp. 31-48.

56. Peter Perla, "View from the Hobby World", *In-Stride Adjudication*, Working Group Report, Connections US Wargaming Conference 2018, pp. 105-116.

57. James Lacey, "How Does the Next Great Power Conflict Play Out? Lessons from a Wargame", *War on the Rocks*, April 22, 2019, <https://warontherocks.com/2019/04/how-does-the-next-great-power-conflict-play-out-lessons-from-a-wargame/>; Stephen Downes-Martin, "Swarm Gaming: Regaining the Strategic Innovation Initiative", *Wargaming Room*, October 2020, <https://warroom.armywarcollege.edu/wargaming-room/swarm-gaming/>. Accessed on June 23, 2024.

Approaches to Model Design

A positive attitude towards using war-games must be supported by the war-game designing and exploitation approaches. Here, the caveats regarding realistic modelling and biases must be remembered. PME war-games need not be highly technical and mathematically accurate, but be able to capture the complexity of warfare with ‘multiplicity of situations’.⁵⁸ Instead of detailed process-models (like the slow-time *Dunn-Kempf* with a 30 second turn that takes hours to complete a duration of a few minutes), they need to only capture outcomes and effects, including MDO aspects such as stealth, Artificial Intelligence (AI), solid-state lasers, Modern Warfare (MW) attacks and other new generation effects. This would require experimentation with heuristic methods, such as qualitative agent-based models.⁵⁹

A major part of the outcomes and effects of warfare is command friction, i.e., organisational issues beyond communication alone that delay or corrupt orders and information. C2 structures in PME war-games must factor in this, and be flexible to permit experimentation with C2 arrangements. Interfaces, procedures, and languages used in PME war-games must be familiar to users, who should be able to use them with the briefest orientation.

Field formations should continue PME of their officers with *capacity-building* games, leaving field manoeuvres to concentrate on *procedural knowledge*. For this, in addition to periodic games at bespoke facilities housing networked computer games, formations could employ Tactical Decision Gaming (TDG) on sand-tables, selected Commercial off the Shelf (COTS) games (the boardgame

58. Peter Perla, “Wargaming and the Cycle of Research and Learning”, *Scandinavian Journal of Military Studies*, vol. 5, no. 1, 2022, pp. 197–208.

59. Saikat K Bose and SK Gadeock, “Optimisation of Professional Wargaming with Board and Tabletop Wargames which really are Qualitative Agent-based Models”, *USI Occasional Paper*, no. 1-2024, pp. 1-15.

*Axis & Allies: Guadalcanal*⁶⁰ is used by the US Marine Corps), and other forms of war-games. COTS games could also be used in PME institutions to explore decision-dilemmas at their relevant level—GMT Games’s international relations war-game *Twilight Struggle* is suited for senior PME organisations. Use of selected COTS games builds habits of mind⁶¹ without hindrance of security considerations. At the same time, it must be remembered that notwithstanding the effectiveness of board and tabletop games, there is a chance that they may not appeal to the digitally raised generations. COTS computer games (such as *TacOps* and *Combat Mission*) can be used, but have issues of high-resolution models with extra-vivid graphics but unmodifiable interfaces. Also, their absence of intent-based orders causes micro-management, which is counter to the objectives of PME.

Reorientation of Institutional Structures

Most militaries have Central War-Gaming Agencies that coordinate war-game development with technical agencies. The effectiveness of such agencies is often limited due to organisational reasons, possibly exacerbated by a lack of a war-gaming culture. Rather than taking up all war-game design responsibility, such agencies should act as think-tanks and repositories for war-game knowledge, while designs are executed closer to the user. This would necessitate reorganisation of the war-game exploitation institutions.

The Central War-Gaming Agency should coordinate the war-game requirements of directorates, formations, and PME

60. Yvonne Guyette, “Developing Better Decision-Makers Through Wargaming”, *Marines* (website), November 5, 2021, <https://www.marines.mil/News/News-Display/Article/2835410/developing-better-decision-makers-through-wargaming/>. Accessed on June 23, 2024.

61. Nicholas J Bosio, ““Want the Edge? More ‘ME’ in ‘PME’”, *Land Power Forum*, February 27, 2015, <http://www.army.gov.au/Our-future/Blog/Articles/2015/02/Want-the-edge-more-me-in-pme>. Accessed on July 10, 2024.

institutions, and coordinate development of identified war-games by the user agency (directorate/PME institution) and technical developer. The central agency should not only help in selecting the technical developer, but also share knowhow and available expertise. This approach would diversify workload, economise on effort, and ensure availability of expertise. The Central War-Gaming Agency should act as a repository of all developed games, and conduct sponsored war-games on its facilities. This repository should also include selected COTS games, modified to suit the force's interfaces and Tactics, Techniques and Procedures (TTPs). Formats such as *Matrix Games* could also be developed and popularised for appropriate use, as they can handle intangible and incorporeal effects, viz. third columnists, collusion, deep nexus, and hidden agendas. In short, the agency should act as a think-tank and repository for war-game knowledge, and assist in policy-making and resource allocation for war-gaming.

The Central War-Gaming Agency should also coordinate war-gaming activities across the military, including PME institutions, through war-gaming cells at formations and PME institutions. These cells should have dedicated positions, roles, and corresponding responsibilities, primarily centred on identification of war-game exploitation methods in the institution, enhance awareness, ensure that instructors and students view the games as useful, and coordinate bespoke development or select COTS games for modification, with the Central War-Gaming Agency. War-gaming cells must ensure that their war-games address the requirements of theory of warfare, history, political science, international relations, technology and cultural anthropology as pertinent to them.

Various Western armies encourage Fight Clubs for soldiers and junior officers as own-time-work, to help in competitive and creative critical thinking and adaptivity. Like-minded junior officers and soldiers play solitaire or manual games procured

COTS or designed by themselves,⁶² trying to out-think and out-manoeuvre one another through self-driven learning. Such self-teaching at one's own pace⁶³ creates the culture of critical thinking bottom upwards. Such Fight Clubs would also identify and nurture talented individuals, who can then be exploited for better game designing.⁶⁴ The Central War-Gaming Agency, in coordination with formation/institutional War-Gaming Cells, can exploit this apparatus to decentralise the war-gaming culture, wherein they sponsor games online on secure networks. Going ahead, they can operate war-game forums for ex-students.

CONCLUSION

Though plan optimisation war-gaming is not relevant to the lower echelons, denying capacity-building war-games' potential for PME is akin to throwing the proverbial baby out with the bath water. Such inadequate exploitation of war-gaming is due to lack of familiarity,⁶⁵ and the war-game expertise often being restricted to a few talented individuals whose influence is temporary and tenure-based. In contrast, many forces commence war-gaming early in career paths (even in pre-commission training).⁶⁶ Changes in attitude and institutional structure necessary to overcome such blocks have been discussed, as also how the temptation of using

62. "Experimenting with a COTS Wargame as a PME Tool", *The Cove*, April 29, 2017, <https://cove.army.gov.au/article/experimenting-cots-wargame-pme-tool>.

63. Oli Elliott, "UK Fight Club: Iron Sharpens Iron", *Wavell Room*, August 27, 2020, <https://wavellroom.com/2020/08/27/uk-fight-club-iron-sharpens-iron/>. Accessed on July 10, 2024.

64. Scott Jenkinsen and Jo Brick, "Wargaming in PME: Introducing Wargaming to the Australian Defence College", in Bae, ed., n.47, p. 115–138.

65. Caffrey Jr., n. 11, pp. 166–67; Cheng, "People's Liberation Army on Wargaming", *War on the Rocks*, February 17, 2015, <https://warontherocks.com/2015/02/the-peoples-liberation-army-on-wargaming/>. Accessed July 8, 2024.

66. Kyleanne Hunter, "Immerse Early, Immerse Often: Wargaming in Pre-commissioning Education", in Bea, ed., n .46, , pp. 30–50.

war-games to 'indoctrinate' must be avoided. PME war-games must be abstracted and immersive,⁶⁷ focussed on active learning through critical thinking (as individuals) and collective wisdom (in tactical groups). The credibility of the models is essential,⁶⁸ and should extend to exploiting COTS games as also developing awareness of the matrix method of games, and incorporation of AI.

War-gaming nurtures the individuality of leaders, meeting educational objectives of "[maximising] ... *individual differences by discovering and releasing individual potential*".⁶⁹ For this, adequate war-gaming sociology that provides a safe-to-fail arcade to experiment freely, without fear of consequences is necessary. Also, while reinforcing creative leadership, the recommended ecosystem must harness individuals with expertise to improve the war-gaming ecosystem and eliminate designer biases. Exploited creatively, the benefits of war-gaming would accrue while not distracting the limited opportunity of field manoeuvres from procedural learning.

67. B. Suits, "What is a Game?" *Philosophy of Science*, vol. 34, no. 2, 1967, pp. 148–156.

68. Carrie Lee and Bill Lewis, "Wargaming Has a Place, but is No Panacea for Professional Military Education", *War on the Rocks*, August 5, 2019, https://warontherocks.com/2019/08/wargaming-has-a-place-but-is-no-panacea-for-professional-military-education/?fbclid=IwAR0cnmejIHSeDs7FAXXxkw2OccNmPAU3YA9nWctNjr2P8EF8I9DgP7_fcOg. Accessed on June 23, 2024.

69. Ernest R. Hilgard and Gordon H Bower, *Theories of Learning* (New York: Appleton Century Craft, 1966), p. 542.