Military Innovation: Hurdles, Bumps and Jumps

Girish Luthra

Abstract

Military innovation is peculiar and distinctive, and has no direct parallels. The military environment itself, with focus on hierachy, discipline and tradition makes innovation a daunting challenge. The process is further influenced by civil-military relations and metrics used for measuring effectiveness of innovative efforts. Factors influencing the process of military innovation vary when examining innovation at the policy and strategy level, at the doctrinal level, during peacetime and under conditions of war. A deeper examination of the process is also essential since innovation is a prerequisite for any revolution, and thus has a direct bearing on the ongoing debate about RMA.

There is no single source to which success or failure to innovate can be attributed. Innovation in the military is more a cultural than functional issue, and mere exaltation is unlikely to make a military more innovative. It is the creation of a carefully nurtured environment and a suitable framework based on empowerment, adequate risk-acceptance and creation of suitable career paths that can spur innovation.

—*—

If you have built castles in the air, your work need not be lost; that is where they should be. Now put the foundations under them.

— Henry David Thoreau

Militaries the world over have historically recognised the importance of innovation, yet some have succeeded more than others. Indeed, many military defeats have been a direct consequence of lack of innovation. Innovation is also the most dominating theme when examining the vexed question of why weaker nations win wars; and why stronger nations retain or relinquish a decisive edge. Moving in a pre-conceived manner with an

Strategic Analysis, Vol. 27, No.4, Oct-Dec 2003
© Institute for Defence Studies and Analyses
Revised paper received on December 4, 2003

attitude 'don't fix it if it ain't broken' can only lead to complacency and spell doom sooner or later.

The Indian Vedic literature emphasised military dynamism[1], and by implication, military innovation. But despite the emphasis throughout the history of warfare, it is generally recognised that military innovation is more complex and challenging; and though there are many similarities with success stories in the civilian world, the two essentially belong to different realms. Failure, partial success and resounding success at attempts to innovate make any number of case studies feasible, but there appears to be a general consensus on the following aspects of military innovation:

- Discipline and hierarchical structure generally imply hindrance to new ideas.
- Quality of new ideas thrown up and implemented indicates organisational nimbleness.
- Nimbleness is essential for a strong military.
- A strong military must facilitate constant innovation.
- Facilitating and sustaining military innovation implies connecting the real and the abstract in an unfriendly environment.

The general logic related to military innovation is, therefore, circular. But despite serious impediments, militaries have launched numerous successful innovations, many of which became the forerunners of revolutions. Understanding the nature of the environment and the processes to achieve more 'jumps' than 'bumps' is vital for every military.

The Challenge of Military Innovation

Hierarchy

Flat hierarchies are an anathema to the military culture that essentially supports a pyramid like structural organisation. The fact that some militaries have become leaner in comparison to their counterparts many centuries ago has not resulted in any major readjustment of the hierarchical structure. Over the years, the structure has been found to be very useful for achieving efficiency and effectiveness at the operational level. Levels of Command relate well to the Levels of War, and exercise of command through established hierarchical structure has facilitated application and practice of some extraordinary military leadership.

The impact of such a structure on the process of innovation is, however, less than benign. Emphasis on delegation of authority and responsibility mitigates adverse effects to some extent, but is a poor substitute for empowerment. Layers of oversight limit the space available to individuals who may feel overwhelmed by the sheer weight of hierarchy. The structure can trap many ideas in never-ending journeys up and down the ladder. Good ideas can get killed or unduly delayed at any rung of this ladder. Further, stiff bureaucracies usually do not encourage young men and women to be innovative, and they may even be punished for going out of bounds, challenging the status quo, and taking risks.[2] Younger people may be seen as mere executioners and may be denied any say in forward thinking. To be sure, bad ideas should be and must be killed but a hierarchical structure disables many potential innovations even before they are considered for prototyping, experimentation or conceptualisation.

Discipline

Discipline is a key lubricant for the military machine and enables planning and execution in a structured manner. But many virtues of an informal environment, which can co-exist with good discipline, tend to be overlooked in single-minded pursuit of discipline. By itself, discipline is not a constraining force for innovation, but can be used very effectively by those who seek to block any moves towards new and radical, but productive ideas. Innovators can be portrayed as breaching disciplinary framework, as perceived by the majority.

Discipline favours alignment whereas innovation requires diversity and variety. Achievement of an appropriate balance between continuity (discipline and alignment) and rapid improvement of the competitive advantage (innovation) is a major challenge for every military.

Tradition

Military cultures are heavily steeped in tradition, leading to a peculiar way of war for every country. Civil organisations including corporate houses too have traditional biases, but these do not go way back into history and they offer lesser resistance to change. In the military, a non-traditional approach challenging some basic assumptions, is bound to meet a wall of resistance. Conventional wisdom holds a powerful sway, forcing conduct of business as per established norms. When used for its emotional appeal, tradition can dampen efforts for creative solutions. Those who wish to

propose new ways stand the risk of being isolated, and many prefer caution and conformity to raising uncomfortable questions about traditional biases.

Obsession with protocol is often attributed to tradition in a military, which adds to barriers to innovation created by the hierarchical structure. The dividing line between professional disagreements and dissent is increasingly blurred by such an approach, and concerns to avoid hurting sensitivities can assume unduly higher emphasis.

Career Progression

Performance within defined boundaries and norms relates well with career progression in the military. Excessive control and influence on the careers of subordinates can encourage a risk-averse culture. Since organisational risk-taking is strongly linked to individual risk-taking, facilitating innovation without putting careers on the block is a major challenge for any military.

Since a hierarchical system allows a smaller percentage of personnel to rise, many perceive themselves to be in perpetual competition and seek recognition for ideas and short-term wins. This can lead to a tendency to play down good ideas from others. The competition may not be restricted to peers, and many a time, subordinates with good ideas may seem threatening. Jockeying for recognition can lead to such proposals being kept dormant.

Metrics

Measures of effectiveness for military innovations vary between the ends of the scale and do not always lend themselves well to established analytical tools. In the absence of market and economic indicators, the formulation of such measures itself becomes a key determinant of success or failure of any innovation. For some innovations, metrics cannot be effectively gauged in times of peace. Even during a war, a clear determination may not be possible until the impact is clearly understood and appreciated, which may be well after the war is over.

Measurement metrics also tends to focus on linearity, whereas many innovations are non-linear in nature. Periodic progress reports need to show tangible results for ensuring organisational commitment, and incrementalism has greater acceptability.

Civil-Military Relations

Military innovation is not a single domain phenomenon, and is influenced heavily by many external factors. The predominant influence is that of civil-military relations and interface. Views differ on the extent of impact on externally sponsored military innovation, but civilian support to many military innovations is critical regardless of the source of origin or trigger. Divergence in contextual frameworks, approach and methodology can create numerous impediments in the initiation and subsequent pursuance of new ideas. Military bureaucracies (both uniformed and civil) also derive power from claims, true or false, of having 'correct information.' Restrictions thus imposed on information-sharing bring in attendant difficulties for the process of innovation, particularly when in the present-day environment, there is a plethora of information.

Innovation at Policy and Strategy Level

At the policy and strategy level, the broad context and environment get defined within which opportunities for the pursuit of innovation can be exploited. Strategic expertise among the civil-military elite, continuous assessment of the emerging environment, resources and technological pursuits, all impinge on innovations at this level. The usefulness of 'checks and balances' as against their constraining influence on innovative thinking, requires constant re-evaluation. Since uncertainty is ever present while developing any military strategy, enunciation and communication of the overall thrust leads to innovation in special areas related to doctrine or capability. Development of tactical aviation in the Second World War, despite a heavy constraining influence imposed by the concept of strategic bombing, was primarily due to re-evaluation in Britain of the context in which air power was to be used. A mismatch between policy and strategy was recognised, and the senior leadership was keen to provide a framework in which new concepts could be evolved and employed. As Gary Hamel has noted, the role of top leadership is to design the context rather than invent the content.[3] An organisational climate that facilitates a deeper understanding of strategic alternatives is more important than the process of strategy development itself. In an environment conducive to innovation, the process of strategy development is bound to take shape with increased participation and commitment.

Changes in perceptions at the policy level can open up new opportunities for innovation. A change in perception does not alter facts but can alter its impact. Innovation is both conceptual and perceptual,[4] and its nature depends upon the higher-level guidance. Strategic calculations related to national security and the depth of endeavour associated with such calculations can form the basis for doing new things or doing things in a radically different manner. Such calculations need to be specific to a country's security environment rather than being based on strategic assessments and processes that are driven by an entirely different environment. While the degree of success can be judged only by strategic measures of effectiveness, a clear direction brought about by the policy-makers can facilitate innovation in certain regimes and areas. In a study titled 'Military Innovation in the Interwar Period,' the authors have found a clear relationship between strategic net assessment and innovation. The study has noted that:

> The strategic evolution of the inter-war period — from flirtation with collective security in the 1920s to the hostile coalitions of 1939 — influenced military innovation, perhaps more than any other factor….When Adolf Hitler pushed the Third Reich towards war, he placed primary emphasis upon the land forces of the Wehrmacht; when Franklin Roosevelt and the Congress collaborated to modernise and enlarge the US armed forces, they invested in the navy and in army aviation…fog and friction may have shrouded the international politics of the potential belligerents, but those politics did define strategic planning and force structure.[5]

In the Cold War period, the asymmetry generated by the atom bomb was largely reduced among the Superpowers by the end of the 1970s. A nuclear stalemate prompted a new spurt in innovation in conventional wars, leading to many new doctrines and new types of equipment that paved the way for a new revolution in military affairs.

While strategic calculations determine the direction, the process of innovation can gain momentum only through organisational facilitation. A new vision may well remain dormant for years if steps are not initiated to encourage and experiment with ideas that have the potential to translate that vision into reality. Nobody wants a miscalculation at the strategic level, and examination of competing concepts may need to be more rigorous. But curtailing the development of such concepts for examination,

merely because the status quo offers a path of least risk, is to ensure the decline of a military due to lack of innovation.

Doctrinal Innovation

Doctrinal innovation has more to do with the way militaries plan and prepare for peacetime missions as well as for combat. While external influences are relatively limited in doctrine development, the fact that increased autonomy is available for providing internal triggers may not necessarily imply a greater level of innovation. It is true that many major innovations may come in small doses, but it is important to keep in mind the distinction between innovation and reform. Cosmetic changes are easier to execute at the operational level, and a new concept of operations can be a real hard sell, particularly in peacetime. Doctrinal innovation deals primarily with the way militaries seek to fight the likely future wars and involves identification of new tasks or a significant alteration in the way existing tasks are undertaken. It redefines accepted offence-defence relationships in terms of posture, exercises and conduct of actual battle. The old military adage of 'preparing for the last war' essentially underscores the importance of innovation in doctrine development. Asymmetries need to be converted in one's favour to frustrate an adversary's designs.

Once again organisational facilitation holds the key in taking the process of doctrinal innovation forward. Major innovations are unlikely to come about if apprehensions prevail in attempting new methods during concept definition, evaluation, wargaming and exercises. How a military handles failure while experimenting new concepts determines to a large extent the overall space in which innovation can proceed.

Carrier-borne aviation has been one of the major doctrinal innovations of the last century. Among the major world powers of post-First World War, only the United States and Japan capitalised the potential of naval aviation fully. It is true that Britain, the maritime superpower at that time, had a different strategic focus and therefore did not see naval aviation in the same light as the Americans and the Japanese. But it is also true that this innovation, which became central to the war in the Pacific, came about largely through organisational facilitation. In the United States, the navy created a culture of relationship between fleet exercises, professional military education and wargaming at the Naval War College, Newport.[6] The British, on the other hand, could not exploit their early lead in carrier aviation

since they lacked similarly structured processes for evaluation of concepts related to carrier-based aviation.

Militaries with good synergy among all levels of warfare (strategic, operational and tactical), in the organisational dimension, are better positioned to initiate and pursue doctrinal innovations. Development of Operational Art as a discipline became a necessity when complexities of modern warfare required an excellent linkage between strategic and tactical levels. A robust linkage leads to better comprehension of doctrinal inadequacies, particularly for future warfare, which in turn spurs new concepts and ideas for the method of its conduct. Success or failure of many new doctrinal concepts has often been due to limitations in the interface between these levels of warfare. The best route to strategic success can be evaluated through mechanisms like enlightened experimentation, simulations, gaming and qualitative assessments of the security environment. These mechanisms cannot be assumed as 'given' and a concerted effort is required to create and nurture them in order to take doctrinal innovation beyond rhetoric.

Mere introduction of new equipment is not innovation, although it opens up some new options due to specific enhancement of capabilities. Innovations can flourish in the process of doctrine development if a military is able to provide an appropriate framework and focus. The German success in conceptualising and later operationalising armoured warfare in clear doctrinal statements, was a direct result of mechanisms that were in place for evolving such concepts. The German Army's *Die Truppenfuhrung* provided a framework for thinking about the future battles. As a consequence, armoured warfare could be integrated into fighting mobile and decentralised battles.[7]

Doctrine development is usually more evolutionary in nature and individual services tend to claim some form of exclusive ownership of the process. Once a doctrine is promulgated, support and advocacy are expected from all members of the organisation. In a way, promulgation of doctrine can therefore stifle innovation. It seeks to freeze new ideas whereas innovation is just the opposite.[8] Very often, doctrine becomes dogma, particularly when it has led to victory in war.[9] Constant re-evaluation of accepted doctrines, no matter how recent, can keep the process of innovation moving forward. Militaries that can balance advocacy and implementation of doctrines with new ideas that challenge the same

doctrines can achieve a higher degree of doctrinal innovation.

Peacetime Innovation

Since time is not a constraining factor, peacetime innovations can focus on strategic, doctrinal as well as technological innovations. Capturing good ideas, imagining new uses for old ideas and putting promising concepts to test can create an ongoing cycle that seeks to enhance curiosity and can capitalise on its results.[10] A very high degree of intellectual rigour in the likely nature of future wars and consequent theory of victory can keep this cycle in motion. Since speculation about future wars can only stand the test in a war itself, an absence of real-world experience imposes an additional burden on the organisation to trigger and maintain such rigour and experimentation. Low-intensity conflicts and terrorism are, however, threats and challenges that need innovative solutions in periods of 'uneasy peace', irrespective of whether or not an official war has been declared.

Long periods of peace can bring in considerable complacency, which alongwith diminished political and public support makes innovation increasingly difficult. Further, there is a significant impact of the probability of next war and its likely nature. France in the late 18th century, Prussia in the mid 19th century and allied as well as axis powers between 1919 and 1939 could innovate in their respective ways since a fragile peace existed during those periods. It is true that the degree of innovation achieved was different in each case, but the general impact of inevitability of war was to promote innovation rather than stall it.

During peacetime, a key determinant of the level and pace of innovative efforts is, however, the environment and culture of innovation. A quest for better solutions can be sustained only if failed attempts are seen in a positive light. Fear of failure or inadequate confidence in likely responses to new proposals ensures premature termination of many potential innovations even before they are born. If a military is able to draw a distinction between project risk and career risk, the environment for innovation is far less threatening.

Budgetary support is an important element in sustaining peacetime innovations but is not essential. Many innovations have been achieved at comparatively low costs and through suitable redirection of resources. Suitable utilisation of human resources through appropriate facilitation has been more important than mere provision of finances. There is no

direct relationship between budgetary support and innovation, and bringing innovations to fruition has been often achieved under tight fiscal constraints.[11]

Military innovations during times of peace impact events far beyond the contours of 'conduct of war,' and significantly shape the foreign and security policies of states. The nature of peacetime competition among countries is also influenced by the type and quantum of benefits that are absorbed by states as an outcome of such innovations. In a study about systemic effects and diffusion of military innovation, it has been highlighted that whether and how states emulate new innovations depends on the compatibility between the innovation and the organisation, society, and culture. It adds that the practice of emulation of capabilities and strategies of countries with successful innovations fits well with the neo-realist theory of competition.[12] How uniform or uneven is such diffusion can be examined from different theoretical perspectives but the importance of achieving and sustaining a lead in international affairs through military innovation is well established. Governments and military societies that recognise the potential of military innovation in times of peace and create a suitable climate for the same, are able to stay ahead, irrespective of the level and speed of diffusion.

Peacetime innovation is highly dependent upon a military organisation's ability to identify and support potential innovators. A number of innovations require considerable work outside the 'accepted' work profile, and can thus be seen as non-rewarding, leading to limited enthusiasm for participation. Innovators are also prone to challenge of a different kind from those who find them threatening and thus lead resistance through regular questions about relevance of the effort underway. Subordinates can be encouraged to think about and propose changes, and can be convinced that joining innovative efforts will not blight careers.[13] Protection and encouragement of such individuals as well as creation of rewarding career paths are essential for peacetime innovation to flourish.

Induction of new warfare technologies in peacetime is another important facet of military innovation. A move from 'technology imitation' to 'technology innovation' requires an organisational culture that recognises limitations of management in terms of innovation. Such innovation can be in sustaining technologies or disruptive technologies. An innovator faces a hard choice between sustaining technologies that are relatively easier but

competitively less important, and disruptive technologies that face uncertainty, but offer first-mover advantages.[14] Militaries that do not invest adequately in disruptive technologies remain imitators by choice and end up playing the 'catching-up' game.

Wartime Innovation

As Carl Von Clausewitz noted, war is in the realm of danger, exertion, uncertainty and chance, where the enquiring mind is more likely to display the qualities associated with military genius.[15]

Management of the unexpected often requires that new or substantially changed methods and techniques be used. Such an environment increases the prospects for innovation. Since time may not be available for evaluation and experimentation, these innovations face higher risk of failure with unacceptable costs. A military that is used to slower decision-making processes in peacetime may find it hard to implement innovations in a relatively compressed time-frame. As modern wars have tended to be of shorter duration, decisiveness in the face of uncertainty forms the basic measure of comparison of the abilities of different militaries to innovate in wartime. Military leadership, often associated with boldness, has been the main driver of many innovations during wars. The environment for leadership to blossom is, however, a result of organisational endeavours in peacetime. Good ideas can also get blocked in wartime in a military that does not develop the art of capitalising on proposals in peacetime.

War is the testbed of all forms of military innovation. Unlike the civil sector, militaries are not forced out of business due to lack of innovation but face a stark choice of victory or defeat during war. Brigadier J. Nazareth has analysed numerous historical examples of application of innovative methods in warfare.[16] These include use of resources (starting with elephants, horses, fire, water etc.), use of sciences (from Greek fires to submarines) and use of methods (deception, surprise, tactics used for capture of impregnable forts in India, etc.). The case studies highlight the common theme of search for innovative solutions, and a move away from set-pattern methods. While the strong need to innovate to ensure a decisive victory, the weak must innovate to deny victory to the opponent or to achieve victory despite inferiority. Innovation to increase effectiveness in wartime involves rapid adaptation of technological changes with operational and organisational transformation.[17]

A distinction needs to be made between two related issues in the context of wartime innovation. The first deals with its occurrence while the second is about its implementation. Occurrence may be because of necessity, driven by a lack of success, though failure alone is not responsible for innovation, as some militaries have faced successive defeats in the absence of innovation. However, if a suitable environment is available, innovation has a better chance of occurring when the going is not good. Implementation of any innovation is equally hard since there is inadequate time for development of related doctrines and concepts of operations. Amphibious landings at Galipoli by the British in 1915 were prompted by a lack of success in France and Belgium, but the implementation of some innovative methods in these landings faced many operational and logistical challenges. Further, the environment required for initiation of innovation in wartime and its implementation, is different. While free exchange of new ideas is required for finding innovative solutions, their speedy execution requires centralised enforcement. Stephen Peter Rosen argues that, hierarchical organisations provide a greater impact of innovation in wartime. The trade-offs between a loose organisation that allows freer exchange of ideas, and a tight one that makes things happen faster, seem to favour organisational tightness in terms of amenability to wartime innovation.[18] Yet, if the balance shifts unduly towards tightness, it could simply prevent wartime innovation, with the military continuing to implement doctrines developed towards meeting missions envisaged in peacetime. The challenge of redefining missions in wartime, which goes far beyond adapting operations to intelligence inputs, becomes harder to surmount.

Since most wartime innovations are based on existing technologies rather than those on the horizon, a very high degree of interface between the fighting forces, industry and decision-makers in the Government is essential for timely implementation. Procedural bottlenecks and detailed reviews are of little help, and bold leadership at the operational level has to be matched by decisive direction at the strategic level. The industry too can make a significant contribution in wartime innovation by understanding operational necessities and suggesting solutions through suitable adaptation of technologies.

Conclusion

Military innovation is complex and daunting, and there are numerous paradoxes in the military profession that make innovation sound like a

pipe dream. Yet many militaries have succeeded in promoting the same. There is no single source to which this success can be attributed, but its non-existence is almost guaranteed in the absence of a framework that spurs innovation. Military innovation is not just a functional issue, but is as much dependent on development of an appropriate culture.

Innovation has relevance at all levels of war and therefore requires a wider participation. It differs substantively from efficiency and is based on conceptual exploration followed by enlightened experimentation. Failure of an experiment does not necessarily imply failure of an individual(s). It is hard to ensure an innovative military by mere exaltation or orders, and good ideas have to be imparted mobility. A carefully nurtured environment for innovation is essential and can pay rich dividends in peacetime as well as wartime. Strategy and doctrine development are bound to be more robust and adaptive under such conditions. It is true that people make the difference, but military organisations can substantially facilitate a process in which innovative people can flourish.

Within the hierarchical structure, militaries need to create adequate empowerment that allows release of dormant creativity. It is possible for innovation and disciplined execution to co-exist, provided a suitable framework is created and nurtured. While innovation cannot be institutionalised, a deliberately facilitated environment can ensure that it is initiated, sustained and rewarded. As has been the case in the history of warfare, a rich culture of military innovation will continue to be a major driver of military success in future wars.

References/End Notes

1 Mukherjee, T.B., Inter-State Relations in Ancient India. *In* Bharat Karnad, Nuclear Weapons and Indian Security. 2002. Macmillan India Limited; New Delhi. p. 30.

2 Kotter, John P., Leading Change. 1996. Harvard Business School Press; Boston. p. 166. For more details on common errors to execute change and stages in creating major change, see Chapters 1 and 2 of the book.

3 Hamel, Gary, Leading the Revolution. 2000. Harvard Business School Press; Boston. p. 244. In Chapter 8, the author also describes ten design rules for innovation, highlighting the role of top management to operationalize them for creating a deeply innovative organisation.

4 Drucker, Peter F., The Discipline of Innovation. *Harvard Business Review*. November-December 1998. 155-156.

5 Millet, Allan R., Patterns of Military Innovation in the Interwar Period. *In* Wiiliamson Murray and Allan R. Millet *Eds.,* Military Innovation in the Interwar Period. 1996. Cambridge University Press; Cambridge. p. 342.

6 Murray, Williamson, and Allan R. Millet, Innovation: Past and Future. *In* Williamson Murray and Allan R. Millet, no. 5, p. 316.

7 Ibid., p. 315. The author also argues that since German officers took doctrine and doctrinal manuals seriously, they could comprehend the larger picture of combined arms.

8 Hayes, Bradd C., and Douglas V. Smith *Eds*., The Politics of Naval Innovation. 1994. Naval War College Press; Newport. p. 103.

9 Nazareth, J., Creative Thinking in Warfare. 1987. Lancer International; New Delhi. p. 48.

10 Hargadon, Andrew and Robert I. Sutton, Building an Innovation Factory. *Harvard Business Review*. May-June 2000. 159-163.

11 Rosen, Stephen Peter, Winning the Next War: Innovation and the Modern Military. 1991. Cornell University Press. p. 252.

12 Goldman, Emily O. and Richard B. Enders, Systemic Effects of Military Innovation and Diffusion. November 14, 2002. University of California, at http//jciss.Iinl.gov/syst.html.

13 Wilson, James Q., Bureaucracy: What Government Agencies Do and Why They Do It. 1989. Basic Books Inc. p. 231.

14 Christiansen, Clayton, The Innovator's Dilemma. 1996. Harvard Business School Press; Boston. p. 21.

15 Clausewitz, Carl Von, On War (Edited and translated by Michael Howard and Peter Paret). 1984. Princeton University Press; New Jersey. Book 1, Chapter 3, 104-112

16 Nazareth, J., no, 9. pp. 216-245.

17 Kak, Kapil, Revolution in Military Affairs: An Appraisal. *Strategic Analysis*. April 2000, p. 5-16.

Captain Girish Luthra is currently serving as Director Net Assessment in Headquarters, Integrated Defence Staff, New Delhi. A Navigation and Direction specialist, he has held many command and staff appointments. He is an alumnus of the Defence Services Staff College, Wellington, India and the Naval War College, Newport, USA.