DUAL USE TECHNOLOGIES NEED FOR A PARADIGM SHIFT

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Abstract

Technology today is global, flowing with relative freedom across national boundaries. The new elements of the innovation paradigm are production centred and not R&D driven. Production processes and systems are dictating the technical strategy for low cost and high quality products. Factory centred R&D and incremental product improvements are being led by manufacturing and process engineers rather than by design and R&D personnel. National efforts in R&D are no longer adequate in order to keep pace with the explosion of commercial technologies in sectors like electronics, informatics or communications. In such a scenario, dual use concept has lost its static meaning of "control over the diffusion of military technology" and has taken a dynamic meaning viz. "development of technologies designed to fulfill both civilian and military needs". In today's "flat world" ,technology integration must occur on all three levels viz. facility, firm and sector.

Facilities can share personnel, equipment and material and even manufacture Defence and Civilian goods side by side, which is particularly relevant in the Naval context, where it is often difficult to meet Metaphysics of Quality (MOQ) values due to the diversity of Naval equipment and the Navy ends up paying a higher cost per item. Firm level integration involves separate production lines but joint military - civilian use of corporate resources (management, labour and equipment). Finally integrated sectors(such as aerospace and shipbuilding) can draw from a pool of research and development activities, technologies and production processes. This article gives an insight into the need for this paradigm shift in looking at dual use technologies through the prism of techno globalism rather than the current tunnel vision of techno nationalism, because today the world is flat.

Background. Technological infrastructure is rising in importance as a source of industrial vitality. While Defence and commercial products may continue to diverge from one another, the supporting technologies will become more and more dual use. Increasingly dependent on technology developed commercially, the Integrated Headquarters of Ministry of Defence will need to change its acquisition policies in order to gain access to the commercial technology base. The new elements of the innovation paradigm are production centred and not R&D driven. They must be described by an interactive innovation model and not just by the pipeline from science to the market. The paradigm shift in the approach to earlier theories of dual use technology in today's changing world is of essence to both Defence R&D in PSU and the still fledgling indigenous private sector Defence companies.

Defining Dual Use Technology. Dual use technology refers to fields of R&D that have potential application to both Defence and commercial production. In fact, at the generic level most of today's important technologies can be considered dual use.

Why Dual Use. The implementation of a dual use strategy raises a fundamental issue of reforming the overall system of military specifications and procurement regulations. However in the present context it is particularly relevant for the following reasons:-

- Increasing availability of cheaper high tech commercial components, often more advanced than the military ones.

- Opportunities offered by innovative systems of production, particularly the flexible manufacturing system in order to integrate several production lines in the same plant.

- High level of commonality currently existing in high tech sectors and civilian needs as well as the larger number of experiences of "spin-on" (technology transfers from commercial to military fields) which can be increasingly observed in the most advanced industries.

- Affordability in a dual use oriented industrial and R &D base.

- An accelerated transition pace from the development phase to the insertion of new technologies in military systems.

Dual Use in the Indian Context. Technology denial over the years has been implemented through several instruments such as Wassenar Arrangement, Nuclear Suppliers Group, etc. India's technology denial share ranged from a high performance super computers to cryogenic engines used in space launch vehicles. When technology was not available, the only option for India was to start developing technology on its own. India had to follow the path of this techno nationalism. Nations like South Africa had to adapt to techno nationalism, since the apartheid regime, as wide ranging sanctions were imposed on it. In today's scenario there is however a need for a paradigm shift to techno globalism, which does away with the top down approach implicit in techno nationalism.

The foundation of techno globalism is based on robust global knowledge and innovation networks. It is built on the imperative of strong interaction between the internationalisation of technology and the globalisation of the economy. India is no exception. Intel's latest chip is being designed in Bangalore, and so is General Electric's latest aero engine. Around 300 multinational companies have setup their R&D centres in India, including GE, IBM, Microsoft, Du Pont, Shell, and General Motors. Over 90% of the US patents filed from Bangalore are for the foreign R&D centres, a case of Indian Intelligence Quotient generating Intellectual Property for these companies. Unfortunately there has not been a strong impetus for techno globalism in India's fledgling private sector Defence industry. Currently the only forward movement has been in the form of Joint Ventures with foreign Defence companies to utilise the benefits of the 30% offset clause in military imports by the Govt of India.

R&D in Indigenous Defence Industry. The R&D role in Defence within India remains limited to the DRDO and a few PSUs. Even though India was the largest importer of arms worldwide in 2012, the private sector is unwilling to make large investments necessary in Defence R&D. Even after six years of implementation of the offset policy, it continues to produce high volume low cost technology assemblies as part of offset contracts with foreign companies. Hence the need for a greater impetus towards R&D in clearly discernible dual use technologies and processes is the need the hour.

Discernible Dual Use Processes and Systems. Clearly discernible areas of dual use technology in which the private Defence industry should focus its R&D efforts are as under:-

- Electronic Manufacturing.
- Microelectromechanical Systems.
- Advance Composites for Aircraft.
- Integrated High Performance Turbine Engine Technology.
- Rotorcraft Technology.
- High Density Data Storage Systems.
- Wireless Communication.

Discernible Dual Use Tools. There is also tremendous scope in following areas of application technology which by nature are dual use and multi-faceted:-

- Computing tools for complex systems integration.
- Modelling and simulation for complex systems integration.
- Artificial intelligence and neural networks.
- Industrial systems of production (including robotics).
- Materials treatment and shaping.
- Ergonomics and neuroscience.
- Methods and technologies for improving the safety of military equipment and weapons systems.

Insertion of Commercially Derived Design Approaches, Technologies and Processes. Dual use in the Indian context need not be limited to development from scratch. There are several case studies available in open literature which suggest that insertion of commercial technologies and processes could lead to significant cost savings in military specific technology. For example, a key cost driver in new generation fire control radars is the high cost of Transmission/Receiving modules for electronically scanned antenna arrays. Raytheon developed a completely new low cost antenna architecture and technology that was originally developed for commercial applications. Raytheon calls its new approach the Continuous Transverse Stub (CTS) Electronically Scanned Array Concept. Commercial uses under consideration for CTS technology include antennas for DTH - TV. For airborne military radar applications, the CTS concept replaces a planar array aluminum antenna with a much less expensive array manufactured from common extruded plastic. No

expensive machining or milling is required to produce the array antenna.

Way Ahead. Once fluid channels for the transfer of technology across applications have been established, technologies can move from military to civilian uses, and vice versa. The existence of shared common technological base between areas of military and civilian production and of elements of technological convergence between military and civilian requirements can help Defence firms to move into civilian markets, as well as civilian companies to move into Defence activities.

Therefore, dual use policies promoting the establishment of dual use technology transfer mechanisms can not only be used to assist in diversification (or even conversion) of Defence related facilities, but also to support military production, making it more efficient in a period of budgetary constraints. Further, if Defence firms are able to diversify and penetrate new markets, they are bound to become more efficient in military production. The final result of a dual-use strategy should be to improve efficiency and effectiveness in the Armed Forces, as well as competitiveness in the commercial industry, with a lower level of overall R&D spending.

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ABOUT THE AUTHOR

Cdr Uday Vijay Natu was commissioned in the Indian Navy on 10 Nov 89.He completed his BTech(Electrical) from the Naval College of Engineering, Lonavla and M.E. (E&TC) from Pune University. He has served on board IN Ships Vindhyagiri, Gomati and Jyoti. His shore appointments include NEMC(MB),INS Tunir, INS Valsura, ND(MB) and as Senior Member Project Team , LRSAM Project. He is currently posted as Staff Officer Planning (Equipment) in DGNP(V).

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INS DRONACHARYA

VBSS Command Link System