Leveraging Private Sector Innovation and MSME Participation in India's Defence Industrial Ecosystem

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India's defence ecosystem has undergone a significant transformation since the sector was opened for private participation in 2001. For decades, defence procurement and production was dominated by Defence Public Sector Undertakings (DPSUs), state-led research institutions, and Ordnance Factories, resulting in limited private sector participation, high import dependence, and comparatively weaker indigenous development. In response, the government introduced reforms such as 'Make in India', iDEX, defence corridors, Defence Procurement Procedures, and indigenous measures under 'Atmanirbhar Bharat' to expand the participation of private firms and micro, small and medium enterprises (MSMEs) to promote self-reliance.

Traditionally, advanced defence capabilities in India have largely been developed through DRDO or acquired through technology transfer and procurement from technologically advanced countries. So defence innovation cannot be treated like innovation in a normal market. There is a fundamental connection between defence procurement and the ability

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to leverage innovation from MSMEs and the private sector. If India seeks to expand the role of private industry and MSMEs in defence innovation, there must also be a mechanism through which innovative technologies and products can progress from conception to testing, production, and eventual absorption into the defence ecosystem.

When a technological gap or requirement is clearly articulated and private industries, MSMEs are provided with an opportunity to develop a solution, a good procurement mechanism can provide the opportunities through which private firms are encouraged to invest in R&D, develop prototypes, undertake testing and ultimately scale successful technologies for defence use. It can also provide an important demand for private firms and MSMEs to invest in R&D, technology development, tooling, and manufacturing capacity. Where successful technologies or indigenous alternatives receive an opportunity for testing and production, the resulting demand can encourage further private sector investment and enable firms to scale from components and sub-systems to higher-value products and complete systems. It can further generate user feedback, contributing to subsequent technological improvement and innovation.

This article does not seek to examine defence procurement in its entirety, including all procurement of proven defence systems. It rather examines how the procurement framework can be leveraged to create more effective approaches for private firms and MSMEs to participate in defence innovation, including the development of new solutions and indigenisation of existing imported products, systems, sub-systems, and components.

The expansion of the role of private industry and MSMEs participation requires mechanisms to innovate, to win contracts, to produce, and to widen absorption. This involves addressing barriers in the procurement system, funding and integration. A well-designed procurement ecosystem can stimulate and leverage private investment in R&D, enable testing and support scale-up.

This article, therefore, examines the evolution of India's defence industrial base and draws comparative analysis between India's model and that of China, United States and Israel. It also recommends a shift from lowest-price procurement to best-value procurement and proposes a data-driven Vendor Performance Rating System integrated with Government e-Marketplace (GeM) and SRIJAN in order to reward performance, reliability and quality. In conclusion, it suggests India adopt a capability-centric approach to mobilise private sector innovation in defence.

Keywords: Defence Industrial Base; MSMEs; Defence Procurement; Defence Innovation Ecosystem; Indigenisation; iDEX; Atmanirbhar Bharat

Introduction: Private Sector Innovation, MSMEs and the Changing Character of Defence Production

The participation of micro, small and medium enterprises (MSMEs) and private sector in defence ecosystem can no longer be a peripheral policy concern, for it has emerged as crucial link to India's economic and strategic transformation. They form the backbone of India's industrial economy, making their participation essential not only to industrial diversification and employment generation but for localisation of supply chains, long-term strategic self-reliance, and innovation. These roles have gained further prominence because modern warfare significantly depends on precision systems, artificial intelligence, communications, electronics, autonomous platforms, and niche manufacturing capacities, which are often taken care of by the agile firms instead of large and traditional public sector structures.

For several decades, India's defence innovation architecture was primarily dominated by state monopoly. Government research institutions and public sector enterprises remained the main manufacturers and integrators of the defence equipment, whereas private enterprises were confined to low-value supply roles such as component support, sub-contracting, and raw material procurement. This didn't allow innovation and development, limited competition, and reduced incentives that could have resulted in the development of a major defence industrial ecosystem. This led to an increase in the dependence over imports, though domestic production that existed operated only through licensed assembly instead of indigenous development and design.

The liberalisation of defence industry in May 2001 brought in private engagement and allowed foreign direct investment (FDI) up to 26 per cent, heralding a fundamental change to existing structures monopolised by the state. Since then, India has significantly consolidated the liberalisation of the sector with successive policy reforms. The changes altered defence procurement rules, increased FDI limits, launched iDEX (Innovations for Defence Excellence), laid emphasis on the broader Atmanirbhar framework, created defence industrial corridors, and brought in indigenisation lists. These reforms have brought start-ups, MSMEs, and established private firms into a sector that was historically closed. However, despite this opening, serious bottlenecks still remain. It maybe noted that India undertook drone-related R&D and indigenous UAV programmes prior to Operation Sindoor.[1]

Following Operation Sindoor, then Chief of Defence Staff, General Anil Chauhan, specifically called for increased spending and focus on defence

research and development (R&D), modular and upgradable architecture, dedicated testbeds for start-ups and the Defence Research and Development Organisation (DRDO), and full-spectrum indigenisation of unmanned aerial vehicles (UAV) and Counter-Unmanned Aircraft System (C-UAS) critical components. He warned that dependence on imported niche technologies limits scalability and creates vulnerabilities in sustained operations. His observations suggest that although DRDO programmes, private firms, start-ups, and MSMEs developed UAV and counter-UAS before Op Sindoor, their impact remained poor. The inability to achieve this earlier can, therefore, be viewed less as a failure of technological competence and more as a weakness in testing, procurement, and production. The post-Operation Sindoor emphasis on dedicated test infrastructure and collaboration between the Armed Forces, DRDO and industry indicates the need to bring private players and MSMEs into the development cycle much earlier and more systematically. In this context, defence procurement procedures also require streamlining and optimisation.

After Operation Sindoor, the Ministry of Defence-led deliberations placed renewed emphasis on increased investment in R&D for next-generation unmanned systems; dedicated testbeds for start-ups and DRDO; and a long-term technological roadmap covering swarm drones, drone carriers and AI-enabled unmanned systems[2].

Did private industry, start-ups, and MSMEs have adequate opportunities to participate in their development? Once prototypes or indigenous technologies became available, were there sufficient ways for testing, procurement, production and large-scale induction? Whether India was able to absorb and scale innovation in accordance with emerging war strategy requirements and new technologies.

A defence technology should not be considered successful merely because a prototype was developed, a patent was obtained, or a product was demonstrated. Its real value is established when the technology solves an operational problem, is validated by the user, can be manufactured at scale, and is actually absorbed into the force.

The structural lacunae remain in procurement systems, research incentives, industrial scaling, and the absorption of innovation into the defence ecosystem. Procurement systems continue to favour the lowest bidder; uncertain order volumes reduce private investment incentives; R&D remains underfunded and weakly incentivised; and the translation of prototypes into large-scale deployment remains inconsistent.[3]

This article argues that India's defence industrial transformation requires more than policy announcements or isolated innovation schemes. It requires an ecosystem in which innovation is discoverable, absorbable, scalable and commercially feasible. The challenge is not merely to 'allow' private participation, but to redesign defence governance so that private firms and MSMEs can become dependable contributors to strategic capability. This means integrating innovation platforms with procurement pathways, introducing vendor performance-based evaluation systems, expanding credible source development, strengthening R&D incentives, and creating institutional mechanisms for advanced technology projects. Only then can India convert industrial participation into real defence preparedness.

Evolution of India's Defence Industrial Base: From State Monopoly to Controlled Liberalisation

Prior to 2001, the defence procurement in India was characterised by import dependence, state dominance and limited indigenous technological development. Defence production was dominated by Ordnance Factories and Defence Public Sector Undertakings (DPSUs), while private participation remained minimal. Following the 1965 war with Pakistan and the 1962 war with China, India majorly depended on foreign military supplies, especially from the Soviet Union. By around 1980, a major proportion of defence hardware in India was being imported from the Soviet bloc.[4] Domestic production primarily focused on licensed manufacture and assembly rather than systems integration and original design.

Although India gradually established major DPSUs such as Bharat Dynamics Limited, MIDHANI, and institutions like DRDO that undertook important programmes such as the Light Combat Aircraft project, indigenous R&D remained limited in terms of end-to-end design capability and the Integrated Guided Missile Development Programme (IGMDP). By mid-1995, India's self-reliance in defence production hovered around only 30 per cent.[5] This reflected deep structural dependence on foreign suppliers, the inability of the industrial ecosystem, and inadequate technology absorption to transition from manufacturing under license to essential developments and innovations.

One of the major defining moments in the history of industrial ecosystem development was the Kargil War, which exposed significant gaps in intelligence, procurement readiness, surveillance, artillery modernisation and responsiveness. The conflict demonstrated that delays, fragmentation

and overdependence on imports could impose severe strategic costs. The Kargil Review Committee and the subsequent Group of Ministers Report on National Security both stressed the need for systemic reforms in higher defence management, modern technology adoption and more effective procurement structures. The Kargil Review Committee noted limitations in surveillance and communications capabilities, deficiencies in the timely availability of critical equipment, constraints in access to advanced foreign technologies, and the continuing dilemma between indigenous development and acquisition from abroad. It emphasised the need to develop greater self-reliance in defence-related technology and military hardware. The Committee discussed DRDO's responsibility for indigenising and upgrading weapons and equipment, and explicitly identified the continuing 'make or buy' dilemma, constraints in accessing state-of-the-art foreign technology, and the need to develop self-reliance in defence technology and military hardware. The post-Kargil reform process subsequently sought to address weaknesses in defence procurement, including deficiencies relating to emergency procurement and technology transfer under the existing procurement framework.[6]

The structural shift began from May 2001 when the defence industry was laid open for private sector participation with FDI permitted up to 26 per cent. This led to the acknowledgement that state-led manufacturing would not be sufficient to meet the demands of modern equipment required in warfare. This reflected upon the major understanding that the defence production must be connected to economic competitiveness, innovation and industrial policy intervention.

There was a major shift in reforms after 2001. The Defence Procurement Procedure of 2002 and further revisions and modifications in 2005, 2008, 2013, and thereafter DAP-2020 sought to increase the share of domestic industry and streamline acquisition process. The 'Make in India' initiative gave a major push in the favour of domestic industrial participation and indigenisation. The government further increased the FDI limit in defence to 74 per cent under the automatic route, which enumerated efforts to integrate Indian industry and attract technology inflows with multiplicity of the global defence value chains. The defence corridors in Tamil Nadu and Uttar Pradesh were launched to boost indigenisation measures such as SRIJAN and cluster-based industrial innovation which aimed at identifying items that could be designed and produced domestically.

This transition has also been shaped by the changing character of warfare. Earlier defence planning was dominated by platform-centric thinking, focused on tanks, aircraft, artillery and ships. Several contemporary operations have

highlighted loitering munitions, electronic warfare, sensors, the centrality of drones, secure communication systems, space-based support and AI-enabled reconnaissance. Warfare is increasingly networked, technology-intensive and system-centric. In this context, innovation can no longer come only from traditional defence manufacturers. It must also come from start-ups, electronics firms, software companies, component manufacturers and advanced MSMEs.

Defence Innovation Ecosystems in Comparative Perspective: Lessons from the United States, Israel and China

A useful way to understand India's current position is to compare its defence innovation ecosystem with those of other major powers. Defence innovation systems are not distinguished only by the amount of money spent on R&D; they differ in how states generate, absorb, test, scale and deploy technology. The key lesson from global models is that innovation succeeds when research, procurement, operational feedback and industrial capacity form a connected loop.

The United States represents the most integrated defence innovation ecosystem. Numerous institutions such as Defence Innovation Unit (DIU), Defense Advanced Research Projects Agency (DARPA), and Army Futures Command result in a close connection amidst military requirement generation, advanced research, commercial technology and rapid operational deployment. The US system is notable for its 'spin-in' model, where technologies originally developed for civilian markets, particularly in software, AI, semiconductors, robotics and autonomous systems, are quickly adapted for defence use. Private sector participation is dominant and not treated as supplementary to the state; rather, the private sector is often the source of the most advanced technologies. Importantly, procurement systems in the United States do not rely solely on price. They take into consideration lifecycle costs, past performance, strategic value and innovation capacity. This allows technically-sound organisations to compete meaningfully even when their initial price is not the lowest.

Israel offers a different but equally important model. The defence innovation ecosystem of Israel is operationally integrated and highly adaptive. Their defence forces work in close coordination with defence firms, academic institutions and start-ups, ensuring that battlefield lessons feed back instantly into refinement and technological design. Israel's security environment has encouraged real-time operational learning, rapid prototyping, and a strong

focus on exportable dual-use technology. Government support, venture capital and military–user integration together create an ecosystem in which innovation is tightly connected with operational need. Rather than separating research, production and deployment, the Israeli system embeds innovation into the national security structure itself. One of the key features of Israel's system is the co-location of procurement officers with operational units and R&D hubs. For instance, the development of the Iron Dome missile defence system was fast-tracked through iterative collaboration between the Israel Defense Forces (IDF), Rafael Advanced Defense Systems, and Directorate of Defense Research and Development (DDR&D).

China presents yet another model, defined by centralised planning, strategic coordination and large-scale industrial mobilisation. The state indicates innovation priorities across private organisations, state-owned enterprises and universities. The strength of China lies in electronics, rapid scaling, artificial intelligence, drone manufacturing and industrial manufacturing capacity allowing it to move rapidly from concept to volume production with remarkable speed. However, the Chinese model does not rely much on bottom-up innovation and open competition than the Israeli or US systems. Its major strength is coordination and state-backed industrial depth.[7]

India has some foundational elements of a modern innovation ecosystem. It has launched platforms such as iDEX, Technology Development Fund and SRIJAN; it has policy support for indigenisation; it has a growing base of start-ups and MSMEs; and digital procurement systems such as GeM have increased transparency and accessibility. These developments have helped open a traditionally closed sector. Yet, India's system remains fragmented. Unlike the US, innovation does not move seamlessly from research to deployment. Unlike Israel, operational feedback is not always integrated with start-up or industrial development. India lacks a similar level of coordinated scaling capacity when compared to China.[8]

Three structural gaps stand out. *First*, procurement remains largely price-sensitive rather than performance-oriented as long as acquisition continues to prioritise the lowest bidder over the best-performing or most capable vendor. Therefore, innovation will remain commercially disadvantaged. Also, officials often operate under the apprehension that even well-intentioned decisions may later be questioned by vigilance and audit authorities, leading to post-retirement inquiries or reputational harm. One of the major concerns is the widespread apprehension of vigilance scrutiny amongst the decision-makers. This produces a culture of excessive procedural caution, in which

strict adherence to process is often preferred over outcome-oriented decision-making. In effect, procurement officials may choose the lowest bidder not because it offers the best value, but because it appears to be the safest defensible choice on file. This accountability paradox weakens initiative, discourages innovation and undermines mission-oriented procurement in the defence sector.[9]

Second, coordination between stakeholders remains weak. NITI Aayog's recent report titled 'Pathways to Progress: Analysis and Insights into India's Innovation Story' states that India's innovation efforts are fragmented, with resources dispersed across isolated entities having limited cross-communication and collaboration.[10]

Third, order visibility and scaling remain uncertain. Firms are often expected to invest in design, compliance and specialised manufacturing without any assurance of follow-on orders or sustained procurement volumes. This discourages risk-taking and reduces industry incentives to invest in high-end capability.

India does not suffer from an absolute absence of innovation. Rather, it suffers from inadequate systemic absorption and scaling mechanisms. A start-up may develop a capable prototype, but without testing access, procurement linkage, production planning and sustained demand, the innovation remains stranded. India's challenge, therefore, lies not only in supporting invention, but in building an ecosystem that converts invention into deployable power.

Strategic Direction for India: From Lowest-Price Procurement to Capability-centric Acquisition

India's defence industrial reforms since the Kargil era—including the recommendations of multiple committees and the evolution of Defence Procurement Procedure (DPP) 2016 and subsequent frameworks—collectively point to one broad conclusion: innovation in defence cannot remain state-led alone. It must be organised as an ecosystem in which private firms and MSMEs are central actors. This requires a strategic shift from procurement as a narrow transactional exercise to procurement as a capability-building measure.[11]

If the strategic objective is to leverage private sector/MSME innovation to ensure that India possesses the best available and strategically relevant capabilities, then procurement cannot evaluate firms/products primarily through the lens of lowest-awarded price with minimum technical compliance.

The procurement mechanism itself has to identify and reward technological capability, development capacity, reliability and the ability to scale.

The present system continues to be heavily process-driven and price-oriented. In many cases, the L1 or lowest-bidder principle dominates bid evaluation. While cost efficiency is important in public procurement, excessive dependence on L1 has adverse consequences for a vital sector such as the defence.[12]

It discourages quality differentiation, reduces incentives for innovation, and allows vendors to compete only in terms of pricing rather than capability. In technologically intensive sectors such as AI, sensors, cyber systems, drones, advanced materials, or precision sub-systems, innovation often requires upfront investment, specialised manpower and higher development cost. A pure or dominant L1 model, therefore, penalises the very firms the state wants to attract.

Operational experience also shows that the lowest bidder does not always translate into reliable execution. A recurring challenge in supply contracts arises when a vendor, after emerging as the L1 bidder, begins raising repeated technical queries or post-award clarifications that were not raised during the tender stage. In some cases, the vendor attempts to dilute or re-negotiate technical conditions, shift responsibility for delays to the buyer, or create a written record of ambiguity in the specifications. This may be accompanied by delays in performance security deposit submission or attempts to re-interpret technical drawings and obligations after the purchase order has been placed. Such conduct is not merely a contract management issue; it reveals a structural flaw in procurement design. When price is the decisive factor, vendors may enter contracts aggressively and then attempt to manage the consequences later through technical correspondence and delay tactics.

This problem is especially relevant in the context of MSME participation. MSMEs are essential for innovation and supply chain diversification, but a system that treats all bidders alike without evaluating reliability, quality history, or execution capacity can produce adverse outcomes for both buyers and genuine innovators. India, therefore, needs a procurement framework that distinguishes between low price and best value. A capability-centric model would assess vendors based on broad grounds such as quality history, compliance, innovation potential, timely delivery and technical performance.

This transition does not essentially mean eradicating transparency or abandoning competition. Instead, it redefines competition so that vendors compete on the parameters of capability and performance *vis-à-vis* price. The advanced defence systems rely on best-value models since strategic

procurement cannot be treated like ordinary commodity purchasing. If India looks forward to developing a quantum leap in defence innovation—especially in the arena of emerging technologies—it needs to adopt procurement methods that encourage the dynamism of technologically capable MSMEs, serious domestic manufacturers and private start-ups.

An L-1 bidding can create a mismatch between the objective of acquiring a strategically superior capability and the criterion used to select the supplier, particularly where technological performance, development capacity, manufacturing depth, and scalability are difficult to capture through price alone. The issue is, therefore, not whether an L1 vendor can occasionally offer an innovative product; it is whether the procurement outcome ultimately translates that innovation into a reliable, scalable and sustainable defence capability. An innovative solution that is selected at the lowest price but cannot subsequently be manufactured consistently, scaled to the required quantities, sustained through its lifecycle or further developed in response to operational needs may represent a successful procurement transaction without necessarily representing a successful capability outcome. Thus, the 'winning' of a contract by the lowest bidder should not, by itself, be equated with the achievement of the strategic objective. For a defence acquisition system seeking to leverage MSME and private sector innovation, the more relevant measure of success is whether procurement identifies and enables firms that can convert technological innovation into a dependable and scalable defence capability.

Accordingly, this article proposes that India's procurement policy must evolve towards a system-centric approach in which private firms and MSMEs are co-developers of national capability rather than merely suppliers of parts. Procurement must support innovation absorption, industrial scaling and capability retention. The most practical mechanism for achieving this transition is the introduction of a robust Vendor Performance Rating System that can generate reliable, comparable and objective performance data across the defence ecosystem.

The Defence Acquisition Procedure (DAP) 2020 has incorporated Enhanced Performance Parameters (EPPs) based evaluation in developmental programmes like IDEX, Technology Development Fund (TDF), etc. However, the conventional procurement by DPSUs, DRDO, Defence services, etc., involves standard Request for Proposals (RFPs) and tendering processes and generally evaluates bidders against the stipulated technical specifications, qualification criteria, and applies L1/L2 methodology. The EPPs were introduced to move procurement beyond a purely L1/lowest-

price approach by giving limited weight to enhanced performance. It is interesting to note that EPPs appear to have been used relatively sparingly.[13] A defence-industry expert writing in *The Economic Times* argued that the EPP mechanism has not been widely embraced and that the maximum 3 per cent credit for an individual attribute can be too small to compensate a vendor for incorporating expensive niche technology. A systematic public dataset on the use and outcomes of EPP provisions in defence RFPs is not readily available, making it difficult to assess empirically how frequently EPP has influenced contract award decisions.

Vendor Performance Rating System (VPRS): A Proposal for Data-driven and Best-Value Procurement

Although DAP provides rules for vendor pre-qualification based on financial, technical and experience-related criteria, these criteria primarily establish eligibility and may not fully capture execution capability. In particular, turnover and prior experience do not necessarily distinguish between vendors that have merely undertaken similar contracts and those that have consistently delivered quality products within timelines and contractual requirements.

This becomes particularly relevant where prior experience and turnover requirements are relaxed for MSMEs and start-ups to facilitate market entry. Relaxation of prior experience and turnover requirements for MSMEs and start-ups is important for widening participation, particularly in defence innovation, where a new entrant may possess a technologically superior product but have limited historical turnover or prior experience in supplying an equivalent system. MSME-friendly procurement should not mean capability-blind process, it should mean capability-tested process. In such cases, greater reliance on objective capacity verification and systematic vendor-performance records could provide a more reliable basis for assessing capability while preserving opportunities for new and innovative entrants.

Capacity verification and VPRS would provide more evidence-based assessment of actual capability. This will enable the participation of innovative MSMEs/start-ups without blindly lowering the capability threshold.

A common, numerical, objective and automated VPRS across the defence ecosystem could significantly improve procurement quality and innovation outcomes. Such a system should be standardised across all DPSUs and relevant defence procurement entities, and should ideally be integrated with digital platforms such as SRIJAN and the Government e-Marketplace.

The objective would be to shift procurement incentives from mere price competition to verified performance competition.

The logic behind such a system is straightforward. Procurement agencies repeatedly deal with the same classes of suppliers over time. Valuable information already exists in the form of delivery histories, rejection rates, quality complaints, compliance records, packaging failures, laboratory test outcomes and incident histories. Yet this information is often dispersed, inconsistently recorded, or not systematically used in future bid evaluations. As a result, procurement decisions are sometimes made without full regard to past execution performance.

A useful international reference is the vendor rating approach developed by the US Defence Logistics Agency. That system was intended to support 'best value' contracting by using historical contractor performance data. The central idea was that buyers should know not only what price a vendor is offering now, but how that vendor has performed over time in terms of supplying conforming material on schedule and in compliance with specifications. Historical performance provides a more reliable basis for evaluating execution risk than price alone.

A similar logic can be applied in India. Under a VPRS model, vendor ratings could be derived from at least two broad performance categories: delivery performance and quality performance. Delivery performance would assess frequency of late deliveries, average duration of delay, adherence to contractual schedules, and consistency. Quality performance would assess product complaints, packaging issues, rejections, failure in laboratory tests, and compliance with specification standards. The rating should be based on a sufficiently long historical window, such as two years, so that it reflects patterns rather than isolated incidents.

The scoring model may be illustrated through a simple example. Suppose a vendor has supplied 100 contract items. If 20 deliveries were late, with a total of 200 delay days, then the delay frequency would be 20 per cent and the average delay duration would be 10 days. Similarly, if the vendor had 10 product complaints, five packaging complaints, and five lab test failures, the total defect count would be 20, giving a defect rate of 20 per cent. A corresponding formula could generate a delivery score and a quality score, which could then be weighted equally or according to sectoral need to produce an overall vendor rating. Such a rating can then classify vendors into categories such as Excellent, Good, Average, or Poor.

The significance of such a system lies not in the mathematics alone, but in its procurement application. Bid evaluation could be restructured so that

vendor performance has substantial weightage. For example, 80 per cent on vendor rating and 20 per cent on price, or another calibrated structure depending on item category. The goal would be to award the contract to the bidder with the highest combined value score rather than the lowest standalone price. This would reward firms that invest in process control, quality assurance, timely delivery and long-term capability. It would also create a strong incentive for MSMEs and private players to improve their standards because future procurement opportunities would directly depend on accumulated performance.

A related reference point already exists in GeM, where a vendor rating mechanism evaluates suppliers on timely delivery, quality of order fulfillment, reliability and coverage, along with a negative incident history effect for suspensions or disablements. This framework is valuable because it treats vendor performance as a reputational and market signal. However, defence procurement requires a more tailored and perhaps more stringent version, especially for technically sensitive and strategic items. It is also important to distinguish vendor rating from Quality-cum-Cost Based Selection (QCBS). QCBS is a tender-stage methodology for comparing technical and financial bids, often used in consultancy procurement. Vendor rating, by contrast, is a post-execution performance measure that informs future eligibility and credibility. The two serve different purposes and should not be conflated.

Another practical application of VPRS would be to connect ratings with procurement thresholds in pre-eligibility criteria (before tendering stage). For example, vendors with the highest rating band could be eligible to participate in particularly high-value or strategic contracts above a specified financial threshold. Vendors in lower but acceptable categories could participate in smaller tenders or development orders. The below par vendors could be placed under a watch and be restricted from high-risk contracts and they can be temporarily excluded until their performance enhances. This approach shall balance the reliability *vis-à-vis* inclusion that shall allow emerging MSMEs to participate and enter in the system through smaller contracts, which would build their performance history and move towards larger opportunities over time.

This needs an effective integration between GeM and SRIJAN. GeM provides an e-procurement environment with performance-linked data, while SRIJAN identifies indigenisation opportunities and enables interaction between defence entities and industry, but it is not primarily transactional. If both systems are adequately integrated, they can generate uniform and comparable historical data on MSMEs and private firms supplying to the

defence sector. This would lay the foundation for a standardised VPRS. Such a model would fundamentally change procurement competition from price-led to performance-led, and thereby become one of the most effective tools for leveraging private sector innovation.

India must establish a dedicated Acquisition Cadre and Defence Procurement within the Ministry of Defence in order to support output-oriented procurement. Such a cadre should draw personnel from civilian services, armed forces, finance, cross-functional in composition and legal backgrounds. It should receive structured training in negotiation, lifecycle costing, international defence trade, contract law, negotiation and systems engineering. Recruitment and induction should be merit-based, with clear career continuity and promotional pathways. A specialised cadre of this kind would reduce dependence on ad hoc decision-making, improve institutional memory, build technical and commercial expertise, and create greater confidence in handling complex procurement choices beyond a narrow L1 framework.

The start-up that has no history must establish its credibility through IDEX, Technology Establish Fund (TDF), source development orders, depending on the procurement mechanism in DPSU, IDEX, etc. Alternatively, before the tendering stage, the vendors with the highest credentials could be eligible to participate in particularly high-value or strategic contracts above a specified financial threshold. Vendors in lower but acceptable categories could participate in smaller tenders or development orders. The below par vendors could be placed under a watch and be restricted from high-risk contracts and can be temporarily excluded until their performance enhances. This approach shall balance the reliability *vis-à-vis* inclusion which shall allow emerging MSMEs to participate and enter into the system through smaller contracts which would build their performance history and move towards larger opportunities over time.

Capacity Verification and Source Development: Building a Reliable Industrial Base

The development of source is important for expanding the vendor base, reducing overdependence, and encouraging competition on a small number of suppliers. It is also essential for absorption of the innovation. A defence ecosystem cannot be resilient if innovations and technical advancements remain confined to a few approved firms or prototypes. Once multiple vendors are developed and validated, production can be scaled more effectively and

supply risks can be reduced. In this sense, source development is not merely a procurement function; it is an industrial strategy function.

However, source development in defence faces significant operational constraints. One major issue is that the quantity of procurement items earmarked for new vendors is often too low to attract serious participation. For technologically capable private firms, especially those with advanced manufacturing potential, the cost of entering defence production can be substantial. Expenditures are incurred in quality control systems, inspection compliance, process adaptation, tooling and certification. Therefore, if the initial order volume is considerably small, the potential revenue generated may not justify the effort placed into entering the contracts for defence production. As a result, the most capable firms may not participate at all, leaving the field to vendors with more limited technological capability.

A second problem is the high rejection rate during early supplies from newly developed sources. Thus, new vendors often need time in order to understand the inspection procedures, technical specifications, metallurgy, defence quality standards or machining requirements. Even the minute deviations from the prescribed standards can lead to rejection in defence manufacturing. Since several suppliers are not familiar with the specialised systems, the first few batches often do not meet the passing criterion resulting in the increase of the administrative burden on the procurement agencies and discourages sellers and buyers. Repeated inspection, rework and re-tendering can delay supply schedules and erode trust in source development initiatives.

The third challenge is time. Developing a new source can take years. The process may involve technical evaluation, sample development, quality validation, order trials, approval stages, and eventual scaling to regular procurement. During this long period, production entities continue to rely on the existing limited vendor base, which defeats the purpose of source diversification. The result is that source development often remains underutilised as a policy tool.

To make source development meaningful, three conditions are necessary. *First*, procurement volumes for development tenders must be sufficient to attract genuine interest. A token order does not create an industrial incentive. *Second*, procurement action must be speeded up, with parallel approvals where possible, so that vendor development does not become trapped in a multi-year cycle. *Third*, capacity verification must be treated as a serious on-ground exercise rather than a paper-based formality.

Capacity verification is especially important. A vendor may appear compliant on documentation but may lack the machinery, skilled

manpower, process discipline, infrastructure, or quality systems necessary for defence production. Therefore, technical and procurement officials should physically inspect vendor facilities to verify real capability. The inspection can be conducted by GeM officials or Srijan officials for verification. Such inspections should assess equipment availability, human resource competence, process controls, testing capacity, production planning, and compliance with technical standards. Only those firms with genuine capability should be inducted into the vendor base. Standardised capacity verification will reduce supply failures, repeated rejections and delays in execution.

A more effective source development system would allow innovation to move beyond isolated pilots. It would create multiple production-capable vendors, increase absorptive capacity, improve scalability, and ensure that new technologies are not trapped in laboratory or prototype form. In this way, source development becomes a direct instrument for leveraging private sector innovation rather than merely expanding the supplier list.

Defence Innovation Organisation and iDEX: Achievements, Gaps and the Problem of Scale

Under Section 8, the Government of India created the Defence Innovation Organisation as a not-for-profit company, thus functioning under the Department of Defence Production (DDP), Ministry of Defence. Its purpose is to act as an umbrella institution for promotion of innovation and development in the aerospace and defence sectors by engaging MSMEs, R&D institutions, innovators and academia. Its operational arm, Innovations for Defence Excellence (iDEX), was launched in April 2018 to foster innovation and technology development and to support the goal of self-reliance.

The iDEX framework has played a transformative role in opening defence sector to non-traditional actors. It has created problem statements, challenge-based competitions, grant support, and a pathway for start-up engagement that did not meaningfully exist before. Over the years, its scale has expanded considerably and an increasing number of contracts have been signed under the initiative which demonstrates market response as well as institutional momentum. Through instruments such as Defence India Startup Challenge (DISC), Open Challenges, Support for Prototype and Research Kickstart in Defence (SPARK), and Acing Development of Innovative Technologies with iDEX (ADITI), iDEX has attempted to support both demand-driven and exploratory innovation. ADITI emphasises on strategic and advanced technologies such as autonomy, AI and space-related systems, while SPARK

focuses on early-stage prototyping and development. DISC channels innovation towards identified service requirements. These open challenges encourage innovators to recommend new technologies independently.

The government in the beginning allocated Rs 45 crore in the financial year 2021–2022, and thereafter iDEX gained momentum and achieved its 100th contract milestone in July 2022, and further increased to nearly 150 contracts by the end of December 2022. This growth trajectory further sustained the signing of 250 contracts in 2023 with the Mission DefSpace witnessing its first contract thereby highlighting the expansion of the programme into emerging domains of the space technology sector. iDex recorded and achieved the milestone of 350 contracts by June 2024 underscoring sustained participation with MSMEs and start-ups. This initiative engaged 649 start-ups and MSMEs, opened 549 problem statements, and signed 430 contracts which underscored its role as a primary driver in promoting indigenous technical development, strengthening self-reliance, and encouraging private sector participation in defence manufacturing. Together, they signify the rapid expansion in the innovation ecosystem in iDEX over the last five years.

These initiatives signal to the market that defence is no longer a sector reserved only for established state-linked players. They are essential as they lead to an innovation pipeline that includes MSMEs and start-ups at multiple stages. They also contribute to changing the culture of defence production by making innovation-led participation more legitimate and more visible.

At the same time, the limitations of iDEX must be recognised. The first major issue is duplication and fragmentation. Innovation-related initiatives are also being pursued through DRDO-linked mechanisms such as TDF. There is an increased risk of overlapping problem statements, duplication of resources, and parallel efforts with coordination. Streamlining between iDEX and other defence innovation schemes is, therefore, necessary.

Second, while iDEX is effective at generating prototypes and encouraging participation, it remains weaker in scaling, procurement linkage and commercialisation. Winners of innovation challenges often face uncertainty regarding quantity and timelines of future procurement. It is critical to note that a prototype may be developed successfully, but the path from prototype to production may not be clearly defined. The defence establishment is often the primary buyer, thus delays in procurement can result in significant cost burdens on MSMEs and start-ups which eventually weakens the business case for sustained advancements and innovation.

The third issue is that funding limits, which can constrain ambition especially for deep-tech or hardware-heavy projects where the development

costs are high. Although grant support is valuable, certain niche or strategic technologies may require larger and more sustained financial support than current limits allow. Relatedly, the requirement that start-ups fund a substantial share of development can be challenging for smaller innovators.

Fourth, India needs to build more robust international innovation partnerships in a structured manner. Initiatives such as INDUS-X show the value of bilateral defence innovation cooperation, but they need continuity, roadmap clarity, procurement predictability, and stronger testing and evaluation collaboration. Joint innovation challenges, accelerators, standards alignment, and responsible development of AI and automation would strengthen the ecosystem further.

Fifth, even after following successful trials, a separate commercial RFP for bulk production under Indian make-and-manufacture category is issued to the eligible iDEX winners, the original innovator must compete for production in accordance with the applicable procurement rules.

When an innovative MSME/start-up develops and successfully demonstrates a complex defence technology, how should the procurement system ensure that the technological knowledge and capability accumulated during development are retained and effectively transferred into the scaling stage? An L1 award may satisfy the requirements of price-based procurement, but L1 selection by itself does not guarantee that the selected production source will possess the same depth of technological knowledge, development experience, or capability accumulated by the original innovator. The central conclusion is that iDEX has successfully created an innovation ecosystem, but it has not yet fully created an innovation deployment system. Its greatest achievement lies in participation and idea generation. Its greatest weakness lies in scaling and absorption. Unless innovations generated under iDEX are linked to credible procurement pathways, testing infrastructure, and production opportunities, the initiative's long-term strategic impact will remain below its potential. The next stage of reform must, therefore, focus on converting innovation activity into sustained capability acquisition.

Performance-linked R&D, Special Technology Missions and Intellectual Property as Strategic Enablers

R&D remains one of the weakest links in India's defence industrial ecosystem. Private firms and companies in the defence sector were mainly confined to supplying the raw materials and semi-furnished inputs to the public sector enterprises before 2001. After 2001, these reforms have

improved the participation, but MSME and private sector involvement in deference research and development remains limited. Several private entities find pure research and development commercially unattractive as compared to technology transfer and production contract arrangements. This results in a structural problem, as innovation through actual research in under-incentivised and dependence over the foreign technology persists, especially for electronics and sophisticated systems.

As per the Directory of R&D Institutions, 2021, there were 7,888 R&D institutions in the country, out of which 66 per cent were in the private sector. As per the Department of Science & Technology's *R&D Statistics 2022–23*, private sector research in India is heavily concentrated in commercially-driven industries such as pharma (33.6 per cent), IT (9.9 per cent), and transport (7.7 per cent). In contrast, defence accounts for only 7.3 per cent of private industrial R&D. Private sector penetration in defence innovation in India remains relatively low. This shows that while the private sector has research capacity, defence is not yet a sufficiently attractive field for significant investment. The result is that advanced innovation in defence remains constrained by weak private sector participation.

One often overlooked issue is the incentive structure for scientists and researchers. India aims to develop advanced capabilities in autonomous systems, advanced materials, high-end electronics, cyber technologies and artificial intelligence. These areas require substantial research investment, long developmental cycles and specialised human capital. However, if compensation, career progression and institutional culture remain bureaucratic and performance-linked, attracting and retaining top talent becomes difficult. This affects both public institutions and the broader innovation ecosystem. World-class innovation cannot be expected where incentives are modest, mobility is limited, and performance is weakly rewarded.

A performance-linked approach for defence R&D is, therefore, necessary. Compensation, advancement and institutional support should be linked to measurable outcomes such as prototype maturity, technology transfer, successful induction, export potential and strategic relevance. Alongside this, the government should create stronger policy and fiscal incentives for private sector R&D. These include milestone-based support, tax benefits, post-procurement incentives, subsidies, and co-development grants connected to successful adoption and delivery. These incentives may also be structured as a percentage of contract value with additional support for exports and critical technologies after successful procurement such as cyber defence, advanced manufacturing and AI.

These special strategic projects further require significant focused governance. India's experience with important programmes such as Future Ready Combat Vehicle (FRCV), Advanced Medium Combat Aircraft (AMCA), Future Infantry Combat Vehicle (FICV), aircraft carrier development, and Kaveri engine development reflects that delays, fragmented institutional arrangements, and cost overruns can significantly impede progress. These projects cannot be treated through administrative structures alone. They require technological focus, mission-mode governance, and strong integration between DRDO, universities, private firms, military and MSMEs.

A dedicated high-powered mechanism within the Ministry of Defence should, therefore, be considered for emerging and selective technologies such as cyber defence monitoring, nano-based sensors, advanced displays, anti-stealth systems, autonomous systems and classified frontier domains. Such a body should not function in isolation. It should coordinate with the armed forces, public R&D institutions, academia and financially capable private firms. Competent private firms should be included on merit, especially where they can accelerate design, development and production. Defence-technology specific universities or specialised research centres may also be established or strengthened under strategic oversight for long-term support to such projects. One of the best examples taken by India is INDUS-X which is a bilateral defence innovation initiative launched in June 2023 by the US Department of Defense (DoD) and the Indian Ministry of Defence (MoD). It operates under the broader framework of the Initiative on Critical and Emerging Technologies. Such examples need to be created more for scalability and absorption.

Another major issue is testing infrastructure. Private companies frequently face restricted access to proof-firing and testing ranges which increases dependence and delays product validation on state-controlled facilities. This necessitates a more flexible approach. Private firms should be allowed controlled access to these facilities, and policy options may even permit the creation of privately developed testing infrastructure that can be leased or made available to the government under regulated conditions. Without testing access, private innovation cannot realistically mature.

Finally, intellectual property must be treated as a strategic indicator of innovation strength. It is encouraging that India has witnessed an upward trajectory in patent filings over the years. However, compared with countries such as China and the United States, India still lags far behind in absolute numbers and in conversion of patents into commercially viable, scalable

technologies (Table 1). Patent growth is meaningful only if inventions are integrated into industrial planning, procurement pipelines and supply chains. Early integration of private firms and MSMEs into defence planning is, therefore, essential so that their intellectual property can find real application rather than remain paper innovation.

Table 1 Patent Applications by Country of Origin, 2020–2024

	2020	2021	2022	2023	2024
China	14,39,894	15,38,690	15,84,354	16,42,643	17,96,738
India	34,850	39,595	52,674	64,131	76,470
Israel	15,172	16,109	15,968	15,217	15,180
United Kingdom	45,047	45,705	46,902	48,159	46,837
USA	5,03,348	5,20,626	5,27,057	5,21,382	5,03,271

Source: World Intellectual Property Organization (WIPO), Statistics Database, available at https://www.wipo.int/portal/en/index.html

The future of India's defence self-reliance will depend on whether it can create an ecosystem where R&D is rewarded, talent is retained, testing is accessible, technological risk-taking is enabled in procurement, and intellectual property is converted into deployable strategic capability.

Future Plans

The Draft Defence Acquisition Procedure (DAP) 2026 proposes several changes that could address some of the structural problems discussed earlier. This could strengthen the ability of India's defence acquisition system to leverage innovation generated by MSMEs, start-ups and private industry in developmental programmes like iDEX, DRDO's TRF, etc. These reforms could help connect innovation, procurement and production, while DAP-2020 had already created important pathways for indigenous design and development, including procurement of prototypes developed through iDEX and TDF.

First, the proposed Technology Readiness Level (TRL) based approach could reduce the gap between technology development and procurement. At present, a technology may be successfully developed but still face difficulty in moving from the development stage to actual acquisition. Linking procurement approaches to the maturity of the technology could provide a clearer path from prototype to deployment. The proposed provision for an *ab*

initio single-vendor route under Buy (Indian-IDDM) for equipment at TRL 6–9 could also help where a mature indigenous technology is available from a particular developer. If implemented with appropriate safeguards, this could reduce the risk that an indigenous technology remains stuck after successful development simply because the procurement process is not aligned with its technological maturity.

Second, the proposed spiral development and five years of assured orders for Make and iDEX projects could directly address the problem of uncertain demand. One of the difficulties faced by MSMEs and start-ups is the need to invest in specialised machinery, skilled manpower, testing facilities, and supply chains without knowing whether there will be sufficient orders after successful development. Assured orders could provide greater visibility and allow firms to plan investment and production capacity. This could make defence R&D commercially more attractive and reduce the risk of firms remaining at the prototype stage.

Third, the proposed easing of financial and experience requirements could address the entry barrier faced by smaller firms. A start-up or MSME may possess a strong technology but may not have the turnover, previous order history or long procurement record of an established defence supplier. Relaxing such requirements, where appropriate, could allow technically capable firms to participate. However, this should be accompanied by strong technical evaluation, testing and performance monitoring so that easier entry does not compromise reliability or operational capability.

Fourth, the proposed higher Indigenous Content requirements, incentives for indigenous design and Long-Term Bulk Acquisition could help create greater order visibility and encourage investment in domestic manufacturing. This is important because innovation cannot be sustained only through prototype funding. Firms need a reasonable prospect of production and scale before making large investments in specialised manufacturing capability.

If effectively implemented, the proposed reforms could also help address the fragmentation problem identified in India's wider innovation ecosystem. NITI Aayog's 2025 report titled 'Pathways to Progress' identifies fragmentation and lack of coordination as a structural challenge and also points to weak university–industry–government connections and difficulties in commercialising research.

However, their effectiveness will depend on implementation. This approach should also extend to R&D, indigenisation and conventional procurement within each DPSU and defence organisation, so that existing technological capabilities and demonstrated vendor performance can be

systematically used to leverage further innovation. India would need a credible system for recording and assessing vendor performance after delivery. Successful completion of a development project should create a documented performance record covering quality, reliability, delivery, maintainability and scalability. Such a record could then provide useful information for future procurement.

Conclusion

India's defence industrial transformation is at a critical stage. The policy environment has changed significantly since 2001, with the government taking important steps to open the sector to private participation, encourage MSMEs, promote indigenisation and build start-up-led innovation through platforms such as iDEX and TDF. The central question, therefore, is no longer whether the private sector should participate in defence. That question has already been answered in the affirmative. The real question is whether India's institutional architecture is capable of absorbing, scaling and sustaining private sector innovation in a way that strengthens national security.

This articles has argued that the answer to that very question remains incomplete. India has created multiple enabling schemes, but structural challenges continue to inhibit impact. Procurement is mostly still towards lowest-price selection. Vendor capability and past performance are not consistently incorporated into procurement decisions. Source development is slow and often economically unattractive for serious players. MSMEs and start-ups can innovate, but they face difficulty in scaling, commercialising and obtaining predictable orders. Private sector R&D remains under-incentivised, while advanced strategic projects suffer from weak integration and delayed execution.

The most important conceptual shift required is from a procurement-centric to a capability-centric system. Private firms and MSMEs should not be treated merely as peripheral suppliers, but as co-developers of strategic technology and production capacity. To realise this transition, India needs institutional reforms that link innovation to procurement, reward performance over underpricing, and create conditions for industrial scaling.

In that context, the proposal for a Vendor Performance Rating System is especially important. By integrating historical performance data through platforms such as SRIJAN and GeM, India can move towards best-value

procurement and create a more reliable, transparent and innovation-friendly acquisition environment. This would allow procurement decisions to consider not only the price and tender submitted by a vendor, but also what the vendor has actually delivered and how it has performed.

Enhanced performance parameters should not remain limited to selected development programmes. Where an indigenous company develops a component or technology that performs better than the existing requirement, this improvement should be measured, recorded and used to encourage further innovation. In this way, performance demonstrated during R&D and development can become part of the vendor's wider performance record and inform future procurement. The approach used in developmental programmes should also extend to R&D, indigenisation and conventional procurement within DPSUs and other defence organisations.

The proposed DAP-2026 could support this transition. Measures such as TRL-based procurement, spiral development, assured orders, wider opportunities for MSMEs and start-ups, improved testing procedures and greater emphasis on indigenous design could help reduce the gap between developing a technology and actually procuring and producing it. However, the success of these measures will depend on implementation.

India's strategic environment demands speed, precision, technological depth and industrial resilience. From Kargil to more recent operations, the lesson has been consistent: future military advantage will belong to states that can combine innovation, industrial capability and procurement responsiveness. India already possesses the foundations of such a system. What it now requires is deeper integration, stronger incentives, and more intelligent institutional design. Only then can private sector innovation and MSME participation be fully leveraged as instruments not just of economic growth, but of national power. The success of defence-industrial policy, therefore, should not be measured only by the number of schemes launched or companies participating. It should be measured by how effectively successful innovation is converted into reliable, scalable and deployable defence capability.

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