

# The Role of MSMEs in Shipbuilding and Future Naval Technologies

Strategy to Transition from Atmanirbharta to Atmanirbhar by 2047

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*Micro, Small and Medium Enterprises (MSMEs) have great potential to provide innovative solutions, technology and support services to the country's defence industry. In the competitive world, it is essential for the Indian defence industry to have a robust defence ecosystem to counter the potential challenges posed by modern warfare. The MSMEs, as an integral part of the Indian defence ecosystem, can contribute significantly to the development of future naval technologies. Besides serving as ancillary units, MSMEs are equipped now to undertake research, design and development of innovative naval technologies, which can give India a competitive edge in the global market. Moreover, Indian shipyards face significant challenges in the construction of newer warships and combat systems for the Indian Navy, and MSMEs can provide valuable support in building these vessels. They can collaborate with shipyards to develop cutting-edge technologies and components required for the warships. This collaboration can not only enhance the capabilities of the Indian Navy but also create new business opportunities for the MSMEs. This article discusses the potential role of MSMEs in constructing next-generation warships and combat systems. It*

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*identifies the key areas of focus for research and development, explores the challenges MSMEs face in building research ecosystems, and recommends effective strategies to empower MSMEs to participate in building advanced warships for India.*

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## INTRODUCTION

The modernisation efforts of the Indian Navy, through the induction of advanced warships, submarines and aircraft, are a clear indication of the Navy's commitment to safeguard India's maritime interests. The Indian Navy has set a goal of having at least 175 warships by 2035 to enhance its strategic reach, mobility and flexibility in the IOR and beyond.<sup>1</sup> During the inauguration of the MSME plant, then Chief of Naval Staff Admiral Hari Kumar said, 'The Indian navy is committed to achieving *aatma-nirbharta*, and we have promised the national leadership that we will become completely *aatma-nirbhar* by 2047, and for that, we will require the help of industry.'<sup>2</sup> He also emphasised on the role of industries in building game-changing technologies, which gives strategic autonomy during the conflict.

The ongoing conflict between Russia and Ukraine highlights two crucial factors in modern warfare. First, the outcome of any battle is heavily influenced by the technology used. Advanced technologies such as Artificial Intelligence (AI)/Machine Learning (ML) and the increasing use of unmanned maritime platforms play a significant role in shaping the future battlespace. Second, the ability of a nation's defence industry-complex to promptly repair or replace military equipment destroyed on the battlefield can be the deciding factor in winning a war. Despite losing a significant amount of military equipment, both Russian and Ukrainian forces were able to continue to stay in the fight due to their ability to quickly repair and replace destroyed equipment on the battlefield.

The Russia-Ukraine war serves as a stark reminder of the critical role that a robust defence industrial capability plays in modern warfare. India, in particular, is aspiring to take a leading role in the Indo-Pacific region. For that, it is crucial to build niche capabilities in advanced technologies to become a prominent regional power and support its larger initiatives, such as the Indo-Pacific Ocean Initiative (IPOI) and SAGAR (Security And Growth for All in the Region). To ensure a secure and stable maritime environment in the Indo-Pacific and encourage New Delhi's cooperative measures,

innovation and adaptability are necessary. To further expand the cooperation in the region and build a world-class navy, Indian industries, particularly micro, small and medium enterprises (MSMEs), have an important role in the future growth of Indian naval power.

MSMEs play a crucial role in fostering economic development and enabling national security through participation in the defence industry, albeit in a supporting role in manufacturing. India has over 6.3 crore MSMEs<sup>3</sup> and contributes significantly to manufacturing thousands of quality products. As much as 50 per cent of the manpower in manufacturing in India is engaged in MSMEs.<sup>4</sup> Small and medium enterprises in India have great potential to provide innovative solutions, technology and support services to the country's defence industry. These MSMEs possess valuable traits, such as agility and adaptability, which are crucial in meeting the dynamic challenges faced by the Indian Armed Forces.

To further enhance indigenous capabilities, promote research and development, and to create a self-reliant defence ecosystem, partnerships between MSMEs, the Indian Navy and the major public and private manufacturers should be strengthened. There is a need to focus on MSMEs' involvement in the maritime domain related to defence requirements and identify the challenges. Indian warship construction programme is not only restricted to the five major Public Sector Undertaking (PSU) shipyards—Mazagon Dock Ltd (MDL), Garden Reach Shipbuilders and Engineers Ltd (GRSE), Goa Shipyard Ltd (GSL), Cochin Shipyard and Hindustan Shipyard Ltd (HSL); other private-owned shipyards like Alcock Ashdown Shipyard, ABG Shipyard also receive government orders.

The aim of this study is to assess the role of MSMEs in building next-generation warships and combat systems for the Indian Navy. The article discusses the potential role of MSMEs in constructing next-generation warships and combat systems. It identifies the key areas of focus for research and development, explores the challenges MSMEs face in building research ecosystems, and recommends effective strategies to empower MSMEs to participate in building advanced warships for India.

### INDIAN NAVY'S INDIGENISATION STRATEGY

The Indian Navy will opt for 'leapfrogging' technologies, to ensure that a high percentage of assets with contemporary equipment remains capable of combating emergent threats. This will be pursued by encouraging building of partnerships with suitable organisations...These aspects would also

entail participation of the private sector, which will aid development of an indigenous defence industry and a strong R&D base...

Ensuring Secure Seas—Indian Maritime  
Security Strategy (2015)

The above quote from the Indian Maritime Security Strategy 2015 clearly states that the navy will focus on acquiring ‘advanced technologies’ through all available means. The Indian Navy’s indigenisation efforts were launched a long time ago with the aim of achieving indigenisation in ship and submarine design. The Indian Navy was the first to realise the need for developing indigenous capabilities and established the Corp of Naval Construction in 1954. This was followed by establishing the Directorate of Naval Design in 1970, which became the bedrock of all warship design activities in the country.<sup>5</sup> The Navy has gained valuable experience in designing warships and submarines, leading to a greater appreciation of the importance of indigenisation. The Navy continues to emphasise the indigenisation of platforms, weapons, sensors and equipment by encouraging the participation of both the public and private sectors. Side-by-side, the Navy is also focused on modernising its force plans to build future warfighting capabilities, which would require the induction of disruptive technologies and capabilities to adapt to the constantly evolving naval battlespace.

The Navy’s success through indigenous production and deployment over a wide range of systems and subsystems is increasing the naval combative capability and being exported. By 2022, India had exported/ gifted/ leased 11 ships/ boats, five aircraft and one submarine, and trained over 15,000 personnel from 46 countries, majority of them being from the Indo-Pacific.<sup>6</sup> The then Chief of Naval Staff Admiral R. Hari Kumar also pointed out that ‘While we have a credible force level, as we move forward, it is our endeavour to retain sustained focus on enhancing our capabilities and capacities, with a primary focus on “Ordnance on Target”. This “ordnance-centricity” is the central driver to refining our capability perspective plans.’<sup>7</sup> The Navy’s idea of self-reliance is not only to reduce import, but also to develop a sustainable model to maintain strategic autonomy in India’s foreign policy.

Three relevant documents can be used to derive the Indian Navy’s strategy for indigenisation and future requirements—(i) Swavlamban 2.0 (Indigenisation Plan), October 2023 contains a comprehensive reference document for all indigenisation requirements of the Indian Navy; (ii) the Indian Naval Indigenisation Plan (INIP) 2015–2030 supersedes the ‘Indigenisation Plan’ plan published in 2008; and (iii) the ‘Integrated Unmanned Roadmap

for Indian Navy', which Defence Minister Rajnath Singh released during the Naval Commander Conference in 2021 (publicly unavailable and will not be discussed in this article). The analysis of Swavlamban 2.0 and INIP 2015–2030 Report shows that self-reliance through indigenous development is crucial for combat readiness. In order to bridge the gap between the desired capability and the existing one, the Indian Navy formulated an indigenisation strategy focused on 'technology leapfrog'.

The central focus of this approach is to leverage technology to achieve a competitive edge in the naval domain. The strategy is designed to prioritise the development of indigenous technologies that can address the current gaps in the navy's capabilities. Unlike the old indigenisation strategy, which focused on import substitution through reverse engineering, which helped indigenise some subsystems and components, it never led to cutting-edge weapon technology development in the country.<sup>8</sup> Instead, it tied the Indian Navy with decade-old technology. The new strategy aims to develop indigenous technologies.

For example, the Indian Navy has achieved about 90 per cent indigenisation in the Float category, followed by about 50–60 per cent in the Move category and about 30 per cent in the Fight category.<sup>9</sup> The analysis indicates that India successfully achieved a high level of indigenisation in the Float category but not in the Move and Fight categories. To achieve indigenisation and technology development in the Move and Fight Category, where cutting-edge technology is required, the Indian Navy planned to go publicly about technology requirements. It increased its engagement with significant stakeholders, such as DRDO, DPSUs, the private sector, academia and international researchers. The Indian Navy documents have identified numerous technologies and future requirements for the Navy with an aim to incorporate them by 2030. These technologies include but are not limited to Robotics and Artificial Intelligence, Sensor Technology, Materials Technology Dealing with Meta-metals and High Energetic Technology, Explosive Antimatter, Fusion technology, Hypersonic Missile Technology, Nanotechnology, etc.<sup>10</sup> All of these technologies are currently state-of-the-art subjects in the field of security.

Moreover, the various schemes announced by the Ministry of Defence aim to promote innovation, research and development in the private sector. Particularly, The Defence Acquisition Procedure (DAP) 2020, with a focus on 'Atmanirbhar Bharat', provides financial flexibility for MSMEs to engage more prudently with the Indian armed forces in the development of indigenous technology. In capital procurement, AoN costs up to Rs 100

crores, which are reserved for MSMEs, provided at least two or more MSMEs are eligible to participate in the category.<sup>11</sup> The 2022 amendment to DAP (2020) reduces the financial burden on the Indian Defence Industry by eliminating the need for an Integrity Pact Bank Guarantee (IPBG) and using Earnest Money Deposit (EMD) as bid security. Post contract, Integrity Pact will be covered through the Performance Cum Warranty Bank Guarantee (PWBG). Additionally, EMD is not required for recognised MSMEs.<sup>12</sup> Furthermore, to support the iDEX, the procurement process under iDEX has been simplified to reduce the time from the grant of AoN to the signing of the contract to 22 weeks. Once the product is developed within the iDEX framework and Project Definition Statement (PDS), it will be converted into PSQRs before the ‘single stage composite trials’, bypassing the RFI-based SQR formulation process.<sup>13</sup> The DAP 2020 acts as a catalyst between the industry and user, but the main impetus comes from the armed forces, which also have a stake in driving the technology and innovation. The Indian Navy has taken several steps in that regard in line with government schemes to achieve indigenisation and technology development (Table 1).

**Table 1** Government and Indian Navy Schemes and Policies

| Indian Navy’s Agencies Involved in Indigenisation and Technology Development | Government Schemes/Route for Indigenisation and Technology Development |
|--|--|
| Directorate of Indigenisation: Ship systems.                                 | Make Schemes   |
| Directorate of Air Projects and Plans: Aviation systems.                     | DRDO Funded Projects/Technology Development Fund                       |
| Directorate of Armament Production and Indigenisation: Armament systems      | iDEX (Defence Innovation Organisation)                                 |
| Naval Indigenization and Innovation Organization (NIIO): N-TAC, TDAC         | Indian Naval Students Technical Engagement Programme (IN STEP)         |
| Center for Indigenisation and Self-Reliance (CISR)                           |  |
| Indian Naval Incubation Centre for Artificial Intelligence (INICAI)          |  |
| Weapon and Electronic System Engineering Establishment (WESEE)               |  |

Source: The author collected from various sources.

In addition to the Director of indigenisation to foster innovation, the Navy has created the Naval Innovation and Indigenisation Organisation (NIIO). This three-tiered organisation works on innovation and indigenisation. The NIIO is responsible for providing top-level directives, while a working group under the N-TAC implements the projects and the Technology Development Acceleration Cell. A Technology Development Acceleration Cell (TDAC) has also been created to accelerate the induction of emerging technologies.<sup>14</sup> These units conduct state-of-the-art research, development and innovation within the naval structure. In 2023, NIIO organised a seminar in which the Navy gave challenges to industry to propose naval technologies. Out of more than 1,106 proposals received, 118 proposals were declared winners.<sup>15</sup> The Navy also engaged with industry chambers specialising in Defence, like the Society of Indian Defence Manufacturing (SIDM) to bridge the gap between industry and the Navy.

The Indian Navy's collaboration with government, public-private organisations and research institutions indicates that 'technology leapfrogging' is important to 'bridge the gap'. At the same time, it is also important to understand that the success of technology leapfrogging depends on how to implement disruptive technologies rapidly and effectively, how to ensure that the leapfrogged technology is scalable and sustainable in the long term, and how to foster an environment of continuous innovation to stay ahead of future challenges. All three factors are important because technology leapfrogging is not a one-time event but an ongoing process of adaptation and improvement. To cater to the needs of the Indian Navy, the solution lies in building naval ecosystems. Indian shipyards, being specialised component manufacturers, lack the agility and flexibility that MSMEs/start-ups possess. Although Indian shipyards handle larger projects, they cannot match the MSMEs/start-ups in areas such as AI/ML, Robotics and autonomous systems. Therefore, the technology 'leapfrogging' can only be achieved through public-private partnerships.

### **MSMEs' PRESENT ENGAGEMENT WITH PUBLIC SECTOR SHIPYARDS**

During the initial phase of the rapid expansion of MSMEs across all sectors in the country, they played a supporting role in the defence sector by providing manufacturing support to larger firms and PSUs. This support included undertaking component or sub-assembly manufacturing, providing services such as supporting shipyards in production, servicing onboard platforms built by shipyards, and participating in maintenance, modifications and upgrades.

The MSMEs also progressed towards designing some segments of a system or equipment or building the items to specifications. Based on the impetus from the government and facilitation, skill development for MSMEs and tie-ups with foreign firms, the capability of MSMEs has been growing, and so are the numbers. It is relevant to note that MSMEs have been playing a role similar to ancillary units that emerge and sustain an ecosystem around any heavy industry, such as the auto industry, FMCG industry, ports and shipyards, etc. MSMEs/ start-ups are small companies with fewer people, are tightly knit, highly flexible, hungry for work, and have an appetite to take on turn-key jobs involving individual and consortium-based work. A large number of MSMEs are in supporting roles or as sub-contractors to firms that are providing repair and refit services to naval ships.

The construction of the Indian Navy's aircraft carrier, *Vikrant*, illustrates MSMEs' critical role in the shipbuilding industry. The ambitious project leveraged the expertise of about 500 MSMEs and provided employment opportunities to over 12,000 workers across ancillary industries.<sup>16</sup> This underscores the vital contribution of MSMEs and ancillary industries in supporting the growth and success of the shipbuilding sector. The Indian Navy continues to engage with MSMEs to achieve indigenisation and promote the domestic industry in building systems locally. The Indian Navy also inducted two Diving Support Vessels (DSVs), *Nistar* and *Nipun* with approx. 80 per cent indigenous content. More than 120 MSMEs across India participated in this project.<sup>17</sup> Further, each shipyard reserves items that will be exclusively purchased from MSMEs. With the new policy and increased government support, MSMEs are now actively involved in shipbuilding. This has created a positive momentum, with more and more MSMEs contributing to shipbuilding in India.

The Ministry of MSME has taken several steps to increase MSME participation in shipbuilding projects. One such initiative is the public procurement policy for MSMEs Order 2012, which makes it mandatory for public sector shipyards to procure at least 25 per cent of the total procurement from MSMEs.<sup>18</sup> DPSUs provide online support and guidance to MSMEs for registration and uploading of tenders on the Government e-Marketplace (GeM) and NIC portals. Moreover, the Defence Acquisition Procedure 2020 introduces new provisions to enhance MSME/start-up participation in defence sectors. This includes procurement costs not exceeding Rs 100 crores per year earmarked for MSMEs under the Make I & II sub-categories.<sup>19</sup> MSMEs/start-ups can now qualify for the Make-1 project with relaxed financial parameters and eligibility criteria. Further, the Defence



Offset guidelines introduce new schemes that multiply MSMEs by 1.5 when they participate as Indian Offset Partners (IOP) with the aim of promoting MSMEs' integration into the global supply chain.<sup>20</sup> The Ministry of Defence has reported that they have signed 239 capital acquisition contracts for the procurement of defence equipment from 2018 to 2023.<sup>21</sup> Out of these contracts, 168 of them, accounting for 68 per cent of the total contract value, have been signed with Indian vendors, including MSMEs.<sup>22</sup> No specific data is maintained to estimate how much capital acquisition is made from MSMEs by public sector shipyards. The analysis of five shipyards highlights their level of engagement with MSMEs and the potential benefits of such collaborations can be seen in two areas to achieve indigenisation and research and development of technologies.

**Table 2** Public Sector Shipyards' Indigenisation Plan for 2022–2023

|   | GRSE         | MDL         | HSL              | GSL          | CSL |
|---|--------------|-------------|------------------|--------------|-----|
| Government e-Marketplace (GeM)                  | 524.07 Crore | N/A         | Rs. 311.69 Crore | 292.19 Crore | N/A |
| Total procurement made from MSEs in percentage* | 63%          | 34.20%      | 78.97%           | 25%          | 54% |
| 'Make in India' Initiative#                     | 27           | 05          | 27               | 23           | N/A |
| Undertaking Project through iDEX                | Yes          | Yes         | Yes              | Yes          | Yes |
| Investment in R&D                               | 0            | 96.52 Crore | 0                | 10 Crore     | 0   |

Source: Annual Report 2022–23.

Notes: \*required target of 25 per cent procurement of goods and services from MSME;

# Number of items indigenised from Positive Indigenisation List

### Achieving Indigenisation

The Ministry of Defence has been working towards achieving indigenisation, a process of increasing the domestic production of critical defence equipment. To this end, the Ministry has released a list of five Positive Indigenisation Lists (PILs) for DPSUs (Defence Public Sector Undertakings). These lists contain approximately 5,000 central line replacement units, sub-systems, assemblies, sub-assemblies, components and spares, the imports of which have been embargoed for a specific period of time.<sup>23</sup> In an effort to promote the domestic manufacturing of these products, the shipyards have taken an active role in indigenising some of these items on the PIL list by collaborating

with large and medium-scale manufacturers. This has been achieved by procuring products directly from local vendors using the GeM portal or through the Make-I and Make-II/iDEX route. Major shipyards have made efforts to indigenise products by sourcing from domestic vendors, as shown in Table 2. Shipyard also uploaded items planned for indigenisation in the coming years onto the Srijan portal (<https://srijandefence.gov.in/>). These efforts have helped reduce the country's dependence on imports and boost the domestic production of critical defence equipment.

### **Technology Development**

The shipyards have also indicated that integrating autonomous vehicles is pivotal for enhancing efficiency and expanding capabilities in contemporary maritime operations. They have been diligently working on a triad of autonomous vehicles, including Autonomous Underwater Vehicles (AUVs), Unmanned Surface Vehicles (USVs), and ship-based drones, alongside various technological initiatives. These endeavours aim to revolutionise maritime operations by leveraging cutting-edge technologies. Notable projects include the implementation of AI for predictive maintenance of ship equipment, energy management through fuel cell technology, and the development of AI-enabled Autonomous Underwater Swarm Drones. A cornerstone of this collaborative innovation is that shipyards were able to actively engage with MSMEs/start-ups to capitalise on their specialised expertise. This collaborative model has yielded tangible results, exemplified by the development of Swadhin, a USV, GRSE in collaboration with a start-up and Neerakshi, an AUV, developed with the assistance of an MSME based in Salem.<sup>24</sup>

Additionally, shipyards prioritises youth empowerment through sponsorship programmes, enabling emerging talent to work closely with the design team, fostering knowledge transfer and infusing fresh perspectives into the innovation process. The collaborative approach to innovation and integration of autonomous vehicles and cutting-edge technologies positions Public Sector Shipyards at the forefront of maritime innovation. The MSME/start-up, with its innovative approach, was able to supply the shipyards with the required solutions and meet their expectations. This successful endeavour highlighted the MSME/start-ups' capabilities in the maritime sector and showcased how they can fill the gaps in research and development that larger enterprises like public sector shipyards may overlook. The MSME/start-up's contribution is a prime example of how the maritime industry can

benefit from smaller enterprises' fresh and innovative ideas. This symbiotic relationship between the industry and MSMEs/start-ups can be scaled up to achieve the target set by the Indian Navy Indigenisation Plan.

There are certain gaps in the shipyard ecosystems that need attention in order to promote R&D and innovation among MSMEs/start-ups. For instance, in defence circles worldwide, UAVs/USVs/UUVs/AUVs, etc., are the buzzwords. This area has lower costs per unit, shorter manufacturing time, the use of dual-use technologies, a large number of required units and large payload flexibility. The need of the hour is a flexible and adaptive approach to design, development and manufacturing. MSMEs see this as a major opportunity to provide cradle-to-grave solutions in this sphere of activity. Presently, online sourcing by DPSUs or laboratories does not have the provision to include such options other than products and services. Second, challenges put forth in forums like iDEX involve small equipment or systems with limited joint funding for MSMEs to prove their capability to undertake such tasks to completion. These iDEX challenges, when successful, remained as completed prototypes. The conversion rate of this success into orders for these products has been low.

The analysis shows that the role of MSMEs is significant in developing domestic capabilities and achieving the technological solutions that the Navy requires. However, to encourage MSMEs in R&D and take on larger projects, public sector shipyards need to strategise and make it more feasible for MSMEs/start-ups to interact with them. The traditional role of MSMEs as an ancillary industry needs to be reconsidered as it holds the potential to emerge as a technology development partner to DPSUs. Today, it is evident that MSMEs are willing to take on challenges on a part-funding basis to prove their ability in the design and development of products that are indicated by the services as critical requirements. Several such products have successfully passed rigorous tests. So, it is necessary to create a framework and policy that can enhance and encourage the participation of MSMEs in R&D activities. It might be helpful to shift the focus from product and specifications to problems and solutions. This aspect has been taken cognizance of by the Indian Navy, which has resulted in the launch of initiatives such as iDEX SPRINT (Supporting Pole-Vaulting in R&D through Innovations for Defence Excellence), NIIO and Technology Development Acceleration Cell (TDAC) which took up 75 technology challenges. The response to this was overwhelming. There were 113 winners in the DISC 7 SPRINT category, with grants of up to 1.5 crores, and five winners in the DISC 7

SPRINT-PRIME category, with grants of up to 10 crores. The development of prototypes is currently underway for all the winners.<sup>25</sup>

Initiatives such as ADITI (Acing Development of Innovative Technologies with iDEX) are a few steps in the right direction. As of date, the development work is in progress and post prototype testing or technology demonstration, the conversion rate of these outcomes into induction as systems into service is still to be examined. This shift would imply providing a problem statement by service thereby providing a broad canvas of science and technology that would be available to the innovators thereby providing an impetus for MSME to take on the challenge of examining options, leading to some amount of core design with limited research, system engineering and development of solutions.

#### **STRATEGY TO EMPOWER MSMEs IN BUILDING NEXT-GENERATION WARSHIPS AND COMBAT SYSTEMS**

There is a need to create frameworks that would facilitate MSMEs/start-ups in being able to meet the requirements. Certain major areas, if addressed correctly, could become enablers in enhancing national capacity to provide solutions to challenges faced by the users. First, the right step would be to provide testing laboratory access at no cost to enable the MSME to test the products developed using existing government facilities and accredited laboratories. Second, there is a possibility of examining the feasibility of creating a repository of proprietary software or centralising licenses. This would allow MSMEs to access the software during the development phases of their products or solutions. For instance, the ANSYS software is quite expensive for MSMEs and start-ups.<sup>26</sup> If the government were to hold the software in a repository, any MSME could use it by paying only for usage fees instead of purchasing the software at a high cost. It would also encourage MSMEs to participate in the development of new equipment or systems. Third, Test sites for field testing may be earmarked, controlled and monitored to ensure that MSMEs have access to these for conducting tests. The policy needs to be updated and a robust organisational framework provided for MSMEs' participation in defence technologies. A central command and control structure must be established to prevent duplication of effort, provide direction for optimisation and overall direction for MSMEs' growth. Moreover, the following points further discuss crucial policy direction to empower MSMEs in developing advanced/disruptive technology.

### **MSMEs' involvement in R&D—System Engineering Approach**

As of now, MSMEs have relatively low involvement in R&D. It's not expected of them to be able to fund research and sustain the same. It requires a considerable amount of resources and must be supported by larger organisations with the financial capacity to absorb the expenditure. However, it's relevant to note that MSMEs can bring expertise to collaborate with R&D activities at a system engineering level, provided that a partnering firm, a DPSU, or a shipyard does the funding. For example, 'Staffing for innovation' can be a costly affair, especially when it comes to hiring algorithm specialists, domain experts or full-stack developers. It becomes challenging for public sector to manage high attrition fields like AI/ML when they hire someone halfway through a project, only to see them leave and have to find someone else. However, MSMEs and start-ups have the flexibility to identify and deploy experts quickly due to their more flexible policies. This type of joint work could result in the joint development of a complex system whose IPR may be jointly or separately held so as to enable the use of such systems in platforms being made by the DPSU as part of the equipment fit being delivered or for configurations of the system that could have export potential. In order for the proposed model to be successful, the framework must have the necessary means to tender under the appropriate head. The quality requirements (QRs) for firms that respond to the tender must be conducive to MSMEs' participation. The processes put in place to verify and validate capability, capacity and expertise with the MSMEs must be efficient. Finally, joint collaboration frameworks must be established. Many DPSUs have created models for joint ventures or MoUs for collaboration with MSMEs to realise system solutions, such as unmanned underwater vehicles, in their quest to find solutions for requirements specified by the Indian navy or with specifications drawn out in-house, hoping to get an order for the same. However, since these models are not standardised, there is a likelihood that all shipyards have one or more MSMEs working on the development of unmanned underwater vehicles.

### **Capability Assessment and Financial Constraints**

It is well known that before an MSME responds to a tender for developing a product or providing a service, they need to meet certain prerequisites as per policy. These include having sufficient turnover, financial capability to complete the job, and expertise in the product line or the product itself. Unfortunately, many MSMEs and start-ups fail to meet these criteria and cannot participate in the tendering process. To level the playing field, the

Ministry of MSME's Circular-2016 eased public procurement norms for start-ups and MSMEs on prior experience-prior turnover criteria if they meet the technical and qualification specifications. Despite this relaxation, MSMEs and start-ups still face challenges when dealing with DPSUs. Additionally, in India, MSMEs and start-ups face critical issues when it comes to financing. There are various challenges they must overcome, such as insufficient collateral, lack of awareness about government schemes, high interest rates and the absence of a credit history. Access to bank credits is one of the major problems they face. Capital is vital for the growth and development of MSMEs. Despite various government initiatives and clear instructions, most MSMEs find it challenging to obtain credit.

The second issue is strategic financial management. Competitiveness is directly linked to the allocation of funds or resources to specific departments in a systematic budget system. Simply earmarking the organisational strategic planning is a continuous and open process that includes development and evaluation of strategies. Literature indicates that most MSMEs do not engage in strategic financial planning. However, the research also supports the view that small businesses should actively plan their finances to compete and survive in the market effectively.<sup>27</sup> Despite having one of the largest banking networks in the country, providing finance to grassroots-level businesses remains an enormous challenge in India. Government schemes like iDEX and the Technology Development Fund provide grants to encourage participation of MSMEs and start-ups in developing technology capabilities for defence systems. Moreover, the 'Make Project' has significantly enhanced the role of MSMEs in the defence sector. But, for MSMEs to be sustainable in the long run, it is important for the government/DPSUs to encourage them to undertake innovative projects. This will enable them to secure funding from new sources such as angel investors and venture capitalists.

### **Sustainability: Participation in development vs Product Life Cycle Support**

The survival of any company, especially MSMEs, depends on sustainability. As small businesses with limited financial resources, MSMEs need to maintain sustainability in order to keep going. If an MSME invests in a partnership for development but doesn't receive enough orders after completion, its sustainability will be in jeopardy and it may have to shut down. Therefore, it is vital to consider sustainability. Since there are often surge orders for shipbuilding or equipment and systems, MSMEs need support mechanisms to help them through slow periods. This support can come from dual-use

technologies that have a market on both sides or from certain capabilities that they are qualified for, such as providing lifecycle support for equipment or systems.

On the one hand, MSMEs may not have the resources to provide long-term product lifecycle support. On the other hand, for sustainability, the firm should be able to have an ability to provide long-term product lifecycle support. This paradox is to be resolved to provide stability to the ecosystem. One of the solutions is for the DPSUs to take the responsibility of product lifecycle support and use the services of the MSME to provide the same, the capital cost of spares and support would be borne by the DPSU being the bigger player with long lead sustainability.

### **Knowledge Management Portal for MSMEs**

There is a need to create a knowledge management portal for all MSMEs in the all sectors. There is a certain repository of information in light of the registration requirements for MSMEs and the repository of information that is collated and held with the state government and the central government. Each of the DPSUs or industries that is engaged with the MSMEs have their own statistics about the MSMEs that are on their vendor management lists. However, there is no central repository of information that is regularly updated with the right information that, when accessed, provides detailed information about the MSME, the kind of work that is being undertaken, critical areas or processes that the MSME is specialised in or has the capacity or domain expertise or R&D experience. The information that must be furnished to keep the portal up-to-date is a subject of study in itself. However, the portal should serve as a means for the MSMEs and industry to have a database to browse, verify, interact and identify those MSMEs who can contribute/partner/participate in undertaking projects with a consortium approach or through appropriate arrangements linked up to provide the necessary support to the lead agency. There is also a means to optimise resources and not reinvent the wheel when one of the MSMEs has done similar work in the past or has the wherewithal to provide qualified resources to undertake the task.

Such centralised information is crucial in that it would form the information backbone on which monitoring of activities by MSMEs dealing in critical areas of defence technologies, their contribution, projects and products, their strengths, their dealings with the market in terms of clients or international collaborations, can be undertaken. As the portal becomes more efficient and effective, the scope can be expanded to include the handling of applications for exports. Any limitations that are to be imposed or need to

identify categories, sectors and products that the MSMEs are exporting may be communicated through the portal. The proposed knowledge management portal is to be for all the MSMEs across all sectors.

### THE WAY AHEAD

In the defence industry, the role played by MSMEs is crucial for the future, particularly in the current era where dual-use technologies are prevalent. Out-of-the-box solutions are being sought and R&D efforts are required for designing and developing new systems. Domain expertise is necessary for mapping field conditions and for ensuring the performance of these new systems. Most shipbuilders lack the core competence for such technologies, and with growing competence within the nation, the need to go abroad to meet the requirements is progressively diminishing. Therefore, it is time to identify key areas and create thrust engines to boost the MSME ecosystem.

To empower MSMEs in enhancing their contribution towards warship construction and combat systems development, it is necessary to create a knowledge management portal for MSMEs to provide a current central repository that is updated regularly and has authenticated information. This would go a long way in creating groups or consortiums based on the nature of the project in hand and will help harness and synergise efforts put in by the MSMEs towards meeting complex requirements.

The problem definition by the user should be more along the lines of defining the challenge rather than translating the problem to the development of a product with technologies pre-determined by the user. The former provides greater flexibility, challenge and openness to adapt technologies of choice to provide solutions that may be more effective than envisaged. This also enables development work in the nation than to replicate or manufacture in India on ToT, where contractual limitations and binding curtail further development in-house.

Joint ventures with niche core technology firms that are world leaders are being considered to have R&D done within the nation, as is currently being done in many commercial areas. It is time to consider long-term partnerships and synergy with groups of MSMEs on a range of technologies, design, development and system engineering. The partnerships should also consider product lifecycle support to enhance sustainability.

There is a need to examine the policy framework with a view to finalising export strategies and provide guidelines, processes and control for exports by



any agency—Industry, MSMEs, start-ups, academia, etc., including know-how in addition to core technology areas. Boosting the MSME ecosystem to deliver system-level solutions and out-of-the-box innovative dual-use technology options to improve sustenance will go a long way and contribute towards India becoming one of the world leaders in defence technologies.

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