

Factors Influencing Self-Reliance in Defence Capabilities of India: A Systematic Literature Review

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Abstract

India is the fifth-largest economy and one of the fastest-growing economies in the world. It has a well-established defence industry in both the public and private sectors, and the Defence Research and Development Organisation (DRDO) to develop indigenous technologies.

Several initiatives have been introduced to strengthen the domestic defence industry, including the 'Make in India' campaign that increased foreign direct investment in defence companies, grants to support defence start-ups, and a negative import list for defence products. However, India remains heavily dependent on imports of foreign arms. This study focuses on understanding the relationships between various factors impacting India's achievement of self-reliance in defence capability. Aspects such as defence budget affordability and allocation, envisaged defence capability to face security risks, development of innovative defence technologies, embracing new warfare concepts in keeping with emerging trends and current defence acquisition processes and procedures to enhance self-reliance have been analysed through a Systematic Literature Survey. Based on these inputs, India has presented a conceptual model for achieving self-reliance in defence capabilities.

Keywords: Geopolitical Risks, Self-reliance in Indian Defence Capability, Indian Defence Budget, Indigenous Defence Technology, New Warfare Concepts, Defence Acquisition Processes.

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Introduction

On attaining independence, due to the success of its nonviolent independence movement, India did not feel the requirement of having strong armed forces. However, the 1948 operations in Jammu and Kashmir pointed to the future (Cohen & Dasgupta, 2010). The conflict with China in 1962 bared the realities of geopolitics to India. The defeat in 1962 became a blot on the Indian defence forces and the political masters (Subramaniam, 2016). The 1962 Indo-China debacle put the modernisation and expansion of Indian defence forces on a war footing. However, in the 1965 war with Pakistan, though capable of delivering a decisive blow to Pakistan, India pushed for a ceasefire. There are conflicting beliefs that the decision to go in for a ceasefire was due to mistaken reports of the army running out of ammunition (Kalyanaraman, 2105).

In the 1971 Indo-Pak war, India exhibited its national power by adequately equipping itself and by aligning with the Soviet Union to face the overt threats of the United States and Great Britain. The United States sent a naval task force to the Bay of Bengal to help Pakistan, which was neutralised by Soviet nuclear submarines, and the British naval forces also turned away from the initial threat posturing. The possible threat of escalation to a nuclear threat was thwarted by a lightning Indian advance to Dhaka (Widmaier, 2005). Post-1971 war saw Indian defence preparedness take a back seat again. Apathetic defence procurement, plagued by inadequate budgetary support, red tapism, and inept and lengthy winding procedures, became more pronounced in the late 1990s. The lag in technology and shortages of critical weapon systems hurt the equipment holding and capabilities of the Indian defence forces. When armed conflict with Pakistan erupted in Kargil, Indian defence forces found themselves with critical shortages in weapons, equipment, and high-altitude clothing required to operate in such inhospitable terrain (Malik, 2009).

India resorted to emergency procurements at much higher costs to fight the war in Kargil. While the United States refused to help, Israel came forward to supply India with the most critical weapon systems. This defence partnership has strengthened (Chaudhuri & Rein, 2022). After the Kargil conflict, Indian defence

expenditure rose sharply, many new systems were procured, and depleted reserves were replenished. However, the indifferent bureaucratic system befell the defence procurements in no time. Faced with border incursions and skirmishes with Chinese forces in Ladakh in 2020, Indian forces had to again go in for emergency purchases, with defence forces being given enhanced financial powers of up to ₹500 crores per purchase (Times of India, June 25, 2020).

The Indian government has launched a concerted 'Aatma Nirbharta' (Self-Reliance) initiative for defence indigenisation and self-reliance. The private sector is being encouraged to enter defence production. The Defence procurement procedures have been further modified with 'Make Indian' procurement categories in the new Defence Acquisition Procedures (DAP) 2020. However, the bulky document has not been able to simplify the rigid procurement categories and procedures (Cowshish, 2020). The Defence Offset Policy, wherein a percentage of the cost of foreign procurements is required to be invested for developing the indigenous defence industry, was opened to private industry to enable them to enter defence manufacturing, but that too seems to have failed (Behera, 2021). Due to threats from its two belligerent neighbours, Indian defence expenditure remains high. In 2021, Indian defence expenditure was the third highest in the world, with a slight increase of 0.9 % from 2020 and a considerable 33 % from 2012 (Stockholm International Peace Research Institute (SIPRI), 2021). However, India occupies the top slot among arms importers worldwide (SIPRI, 2022).

Methodology

The study was conducted in areas related to defence procurement with a focus on self-reliance in Indian defence capabilities. It involved several related themes, such as how various countries approached security threats and allocated defence budgets. The implication of defence expenditures on military power and how military alliances dictate military expenditures were analysed. The economic capacity for a higher defence budget and how military modernisation aspirations are met have been studied. The ever-evolving nature of defence technology and the need for governments to invest in defence research and development, incurring

considerable expenditure, were other key analysis factors. The models of procurement policies across the world were also studied, especially in countries with similar economic conditions.

PRISMA framework was used to screen the articles and select relevant published data. After initial screening, the selected articles were checked for credibility. Most of the articles were from highly rated-journals and various government reports. The content of articles selected to be included in the systematic review was subjected to a detailed and thorough analysis. The analysis gave a comprehensive description of various facets of the subject, leading to the extraction of major themes and sub-themes. The relevant themes and sub-themes were then tabulated and organised to develop a theoretical and conceptual framework based on the study of the subject.

The study reviewed 85 relevant articles on self-reliance in Indian defence capabilities. The table below presents a breakdown of papers across the themes.

Self-reliance in Indian Defence Capabilities: Primary Focus areas of the papers reviewed.

	Number of Papers	Percentage
Defence procurement policies	24	33 %
Defence technology development	23	31 %
Defence budget allocation	15	20 %
Defence capability development	12	16 %

Table 1: Defence Procurement: Primary focus area of the papers reviewed

Source: By Author based on the primary themes of the papers reviewed

Allocation of Adequate Funds for Defence: A Prerequisite for Self-Reliance.

Indian defence expenditure remains high due to clear and present threats from its two belligerent neighbours. In 2021, Indian defence expenditure was the third highest in the world, with a slight increase of 0.9 % from 2020 and a considerable 33 % from 2012 (Stockholm International Peace Research Institute (SIPRI), 2022a). However, India occupies the top slot among arms importers in the world (SIPRI, 2022b). Numerically, India possesses the world's second-largest army, seventh-largest navy and fourth-largest air force, in addition to being acknowledged as having nuclear weapon capability. The professionalism of its armed forces is well recognised and is comparable to advanced military forces. However, Indian military capability is constrained, and the country does not have a strategic reach (Tellis, 2020).

The continuing restricted defence budget allocations imply that unless there is a concerted upsurge in defence fund allocation, India will not have the military wherewithal and capability to provide a security umbrella to its neighbours as well as play its intended role of partnering the United States in the Indo-Pacific to counter China (Behera, 2023). Notably, the United States has increased its defence budget, which has been falling since 2018 due to the Chinese aggressive defence posturing, especially in the West Pacific (Spoehr, 2022). The Indian defence budget for 2023-24 was ₹5,93,537.64, which is 1.97% of the gross domestic product (GDP) (37th Report of Standing Committee on Defence, 2023). However, the defence budget provision below 2 per cent of India's GDP may be inadequate for required modernisation. The funds available may be insufficient even to replace obsolete military equipment (Kanwal & Kohli, 2018). India's drive for self-reliance in defence technology requires continuous funding to maintain its essential military capability. This entails reorienting the defence budget to a capital-intensive modernisation initiative from revenue-based, manpower-focused defence spending (Behera, 2022).

Year	Budget Estimates	Revised Estimates	Actual Expenditure
2017-18	2,59,261.90	2,63,003.85	2,72,559.83
2018-19	2,79,305.32	2,82,100.23	2,87,688.65
2019-20	3,05,296.07	3,16,296.07	3,18,664.58

2020-21	3,23,053.00	3,43,822.00	3,40,093.51
2021-22	3,47,088.28	3,68,418.13	3,66,545.90
2022-23	3,85,370.15	4,09,500.48	2,67,523.08*

* up to Dec 2022

Table 2: Year-wise allocations and actual Defence Service Estimate expenditure (in ₹crores)

Source: The 37th Report of the Standing Committee on Defence, 2023

The Indian Defence Services Estimate for 2023-24 includes the revenue and capital budget ₹ 4,32,720, up from ₹4,09,500 in 2022-23. While the Revenue budget increased from ₹2,59,500 in 2022-23 to ₹2,70,120 in 2023-24, the Capital budget has increased from ₹1,52,369 in 2022-23 to ₹1,62,600.00 in 2023-24, a 6.3% hike. Since the capital budget also has other than capital acquisition expenditures, the actual Capital Acquisition (modernisation) allocation has gone up from ₹1,24,408 to ₹1,32,301, indicating a 6.3% increase. From 2018-19, the Indian Defence Budget allotment for modernisation has seen a 73% increase with ₹68,618 allocation in 2023 (37th Report of Standing Committee on Defence, 2023).

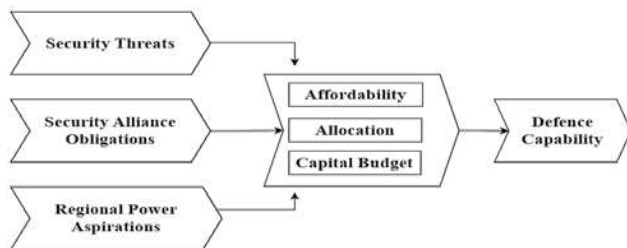


Figure 1: Factors vindicating a higher defence budget

Source: Prepared by Author.

The allocation of an adequate defence budget has a major role in ensuring continuity in the earmarking of funds for ongoing projects, considering the long and protracted development timelines required for defence equipment and procurement procedures (Seki, 2019). Limited allocation of funds may result in the delay of major defence projects or reduce their total scope. However, the overall cost may increase in the long run due to additional costs required to maintain and upgrade in-service obsolete equipment (Brooke-Holland, 2019). A life cycle costing method is usually followed for defence budget allocation,

which involves considering factors such as threat assessment, both external and internal, GDP, defence budget requirement, manpower, human development index, job availability, etc. (Navarro-Galera et al., 2014).

The prioritisation of defence expenditure over economic development, especially in middle and smaller democratic countries, is contentious. Countries are forced to make hard choices about scarce budget availability to maintain a credible defence force when faced with security threats. It is evident that diverting funds for defence requirements would adversely affect fund allocations for infrastructure development, undermining economic growth and may lead to raising public debt and higher budget deficits (Priebe et al., 2021). In the Indian context, though revenue defence expenditure may not have resulted in tangible benefits, overall capital defence spending may have promoted economic growth, especially in dual-use technologies (Mohanty et al., 2020).

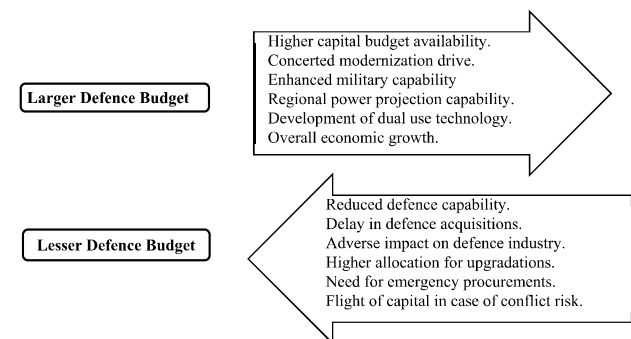


Figure 2: Effects of the size of defence budget.

Source: Prepared by Author.

Perceived disparity in relative defence capability with adversaries can be costly. The border clashes between Indian and Chinese Forces in 2020 can be attributed to the increasing gap in military capabilities between India and China. India, therefore, needs to have strong and capable armed forces covering not only the Army, Navy, and Air Force but also the space and cyber forces. India also should assign requisite funds for defence research and development and encourage private investment in innovation. It is seen that a 10 % increase in state-funded research and development results in a 5 % to 6 % increase in privately funded research and development

(Moretti et al., 2021). It also makes economic sense to address geopolitical risks proactively since analysis shows that when faced with higher geopolitical risks, investors tend to move out capital to safer havens (Caldara et al., 2018). Promoting military hardware exports by India may help to sustain the indigenous defence industry and the research and development efforts (Thurner et al., 2017). An option for the Indian defence industry is to look at mature European and Asian defence markets, such as Korea, to develop and supply new technology products produced in India (Chhibber & Dhawan, 2013)

Acquiring Indigenous Military Capability through Planned Defence Procurement

Losing a war could be catastrophic, with political, economic, and human repercussions, making investment in military capability necessary. While it is vital to win the current war, capabilities must be built to deal with future threat scenarios (Spring, 2006). The military capability-building decision matrix involves how large the forces should be, what kind of operations they are to undertake, the type of training, what kind of equipment they need, and their capability to maintain the speed of operations. The military capability building could be either entirely building a new set of forces or modernising the current capabilities. (Treverton et al., 2003). Capability Planning involves various steps such as determining the security threats, laying down an operation plan to face the threats, capability development to achieve the strategic objectives, and project management to equip the defence forces with the requisite military equipment, it is a tool to develop a credible defence force (Despont, 2022).

By combining military capabilities, military deterrence through forming alliances is a cost-effective way to deter adversaries. However, the alliances entered into may not always be honoured and depend on the nature of the conflict, especially alliance commitments for offensives, which are mostly honoured. The planning for force structuring could thus consider military alliances and their probability of success in countering the adversaries (Joiner et al., 2019). The alliance formation can also be coercive, such as using sanctions against adversaries and forcing other countries to sanction the adversaries. A successful outcome in forcing others to sanction the

adversaries would lead to furthering their national interests and putting the adversary on the defensive. (Lohman & Carafano, 2020).

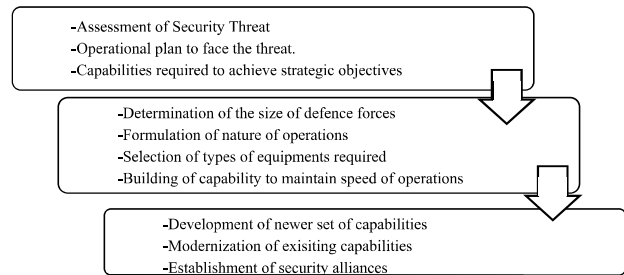


Figure 3: Military capability development progression.

Source: Prepared by Author.

Affordability, followed by budget discipline, is essential in laying down realistic and cost-effective defence expenditure estimates, leading to various options for force structuring. It is essential to lay down the right and optimum mix of regular manpower, short-service/fixed-term servicemen, reserve forces, civilian support staff, and services leased to contractors. Ideally, a standard tool can be developed incorporating all the variables to meet the specific requirements of the defence forces and arrive at the right mix of manpower. Such inputs would be valuable in manpower decision-making, taking a significant portion of the defence budget (McIntosh et al., 2021). The control of financial outgo due to civilian personnel employed in defence organisations is also an option to ensure transparency in defence costs (Warren et al., 2020).

Air and naval forces can quickly adapt to situations since they are not much different and are essentially structured based on their concept of operations and to neutralise adversary's capabilities. However, land operations vary due to terrain and peculiarities, such as conventional operations against another state, proxy wars or intra-state conflicts. India, like the United States, France, and the United Kingdom, has adopted various training methods for unconventional warfare. Indian forces are required to conduct such operations in diverse operational environments, from the jungles of the Northeast to the mountainous terrain in Jammu and Kashmir. Indian land forces engaged in irregular warfare have also been able to quickly adapt to carry out highly intense conventional operations such as the 1999 Kargil War (Johnson et al., 2009).

Hybrid warfare incorporating the entire gamut of conventional and unconventional means in the Ukraine War has thrown up lessons in military capability development. Ukraine undertook a formal organisational learning process after the Donbas War in 2014. The Donbas War was analysed, and lessons learned were culled out and incorporated into the Ukraine Armed Forces training to increase its operational effectiveness. The support of the United States and NATO was sought for these efforts, as was the support of the civilian government, which oversaw the entire process (Dyson et al., 2022). In contrast, the Polish Armed Forces embarked on force modernisation in 2012 to replace its 30- to 40-year-old major weapon platforms of Soviet / Russian origin. The progress was tardy with limited success. The Polish army was burdened with its legacy T series of tanks of the Soviet era, Leopard Tanks from Germany, and M1 Abrams from the United States, posing severe logistics and operational issues due to completely different features of the tanks. Arbitrary military procurements further compounded the problem with civilian interference. At the outbreak of the Ukraine War, Poland was left weak with limited military capabilities (Chang, F., 2022).

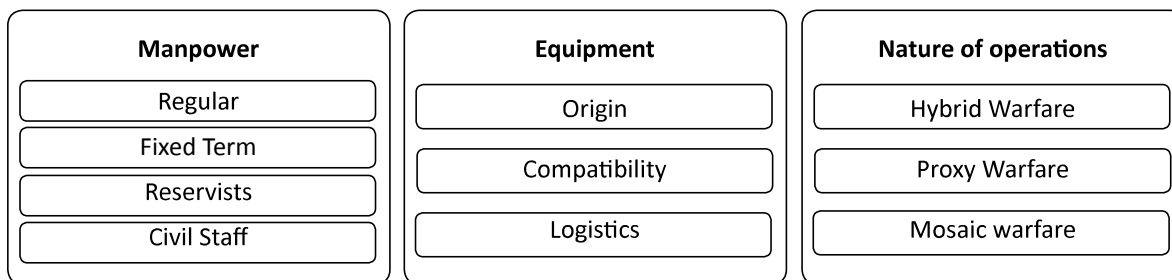


Figure 4: Complexities in defence capabilities development.

Source: Prepared by Author.

The advent of autonomous vehicles such as drones and technologies like robotics and Artificial Intelligence has led to the concept of Mosaic Warfare. Mosaic warfare advocates moving away from monolithic, single fighting platforms with multiple capabilities to a heterogeneous force comprising individual mosaic tiles. The concept emerges from the considerable time and effort it takes to develop monolithic fighting platforms and to field them in operations. At the same time, simpler niche technology-based force elements can be grouped for effective mission execution. Conventional approaches to warfare may not produce the desired results due to the quantum jump witnessed in defence technologies. The essence is the integration of smaller force elements for coordinated mission execution (Predd et al., 2021).

Indian forces may have more combat experience and can quickly adapt to operational situations. However, Indian military modernisation with the “Make in India’ drive is still nascent. To pursue strategic autonomy, India currently does not have credible defence alliances to fall back on in case of crisis escalation with China. India needs to, therefore, enhance its military budget and reorganise its forces for jointness in operations. India should avoid the temptation to match China with advanced defence capabilities since China may already be prepared with countermeasures. In case of open hostilities due to India’s strong defence line in the Himalayas, China may be forced to open the maritime front. India must undermine Chinese strengths and offset its weaknesses (Dougherty, 2019).

Promoting Defence Research and Development for Indigenous Military Capability

The Indian Parliament Standing Committee on Defence observed that the expenditure on defence research and development has been shrinking over the past few years. The defence research and development expenditure in 2019-20, 2020-21 and 2021-22 (up to December 2021) stood at ₹17,779.24, ₹16,075.07, and ₹11,668.79, respectively. The Committee recommended that a timeframe be fixed for expeditious formulation of modalities of engagement of the Defence Research and Development Organisation (DRDO), the defence research and development arm of the Indian Ministry of Defence, with private industry and academia. It

also mooted the establishment of a nodal umbrella body for wide-ranging requirements of testing and certifications of defence systems so that 25 % of the research and development budget earmarked for private industries, start-ups and academia is appropriately utilised in 2022-23 (26th Report of Standing Committee on Defence, 2022).

Having indigenous defence technology is critical for the growth of domestic defence industries. Indigenous weapon systems would be cost-effective, and local industries could ramp up production to meet the surge in demand in case of hostilities. Depending on foreign powers for advanced weapon systems can be risky since the country may have to sacrifice strategic autonomy and divert huge resources to procure the defence systems. Close coordination between civilian and defence research and development and the defence industry absorbing innovative technologies and taking up defence manufacturing is essential (Jae-ok, Paek, 2010). Project execution from an engineering perspective is paramount for the timely completion of defence research and development projects. Awarding discounts for pursuing related projects would help in the timely and successful execution of such projects (Bommel et al., 2014).

India has been equipping its forces with mostly imported military equipment. In particular, Indian military aviation has been lagging with old and obsolete fighter and transport aircraft. (Beno et al., 2022). India undertook ambitious 'Make in India' defence equipment development programs such as the Futuristic Infantry Combat Vehicle, Tactical Communication System, and Battlefield Management System projects. However, the lengthy winding procurement procedures, lack of adequate funding and bureaucratic interference caused delays, and the projects remain incomplete (Patel & Tripathi, 2022). DRDO has failed to perform its role of developing new technologies for the Indian Defence Forces. However, there have been some notable successes, especially in strategic technologies in the nuclear domain, integrated missile development programs and the fourth-generation light combat aircraft (Krishnan, 2009). Another pillar of innovation in defence technologies is the defence public sector units. Only state-owned enterprises that have invested in innovation, research, and development have been able to compete with private industry

and prevail, while others have had to close down gradually (Bhatta, 2018). The military's ability to absorb the production is the major factor in deciding the domestic defence industry's value, size and capability. Underproduction would mean a waste of national resources, while overproduction can lead to an arms race (DeVore & Marc, 2021).

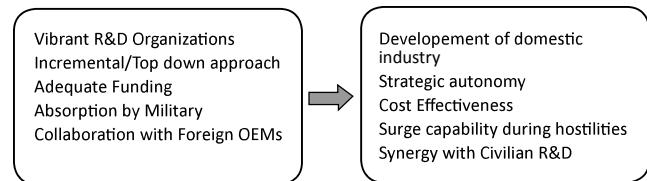


Figure 5: Factors affecting development of indigenous defence technologies

Source: Prepared by Author.

An option in the drive for self-reliance in advanced defence technologies is establishing partnerships for co-development and co-production with countries such as Israel that have the latest defence technology products. Procurement terms and conditions such as buyback provisions and export to third countries can be incorporated to make it successful. Providing adequate funds for defence procurement and diligently following laid down procurement policies are important (Cowshish, 2017). France is another country with whom India has a close defence relationship. The belligerence of China, especially its larger presence in the Indian Ocean, has prodded both countries to be closer. France understands India's security concerns and has been a trusted partner (Singh, 2022).

To gain operational advantage and ascendancy, militaries worldwide pursue emerging technologies such as nanotechnology and quantum computing. (Akila et al., 2022). Many countries are also investing in the development of artificial intelligence in the military domain. (Boulanin et al., 2020). Developments in electronic warfare capabilities have become a necessity to shape the battlefield and achieve dominance. With surveillance systems being employed in all four dimensions, including space, electronic warfare can dictate the course of confrontation (Luzin, 2022). Similar is the case with innovation in dual-use technologies. Pursuing only defence innovation requires funding, procurement, and integrating the technology into the military to justify the expenditure (Nelson, 2020). Bringing

civil-defence synergies in research and development contributes positively to efficiency and better cost management. However, challenges exist due to the peculiar nature of defence innovation and product development (Fiott et al., 2022). In the final analysis, the success of research and development projects depends on actual procurement post-development. (McCormick et al., 2020). The superiority of a defence force depends on well-trained manpower and better technology weaponry. However, focus on sustained manpower predominant operations, such as irregular warfare, tends to push innovation and technology to the background, adversely affecting the defence industry (Dunlap, 2011). Competition in selecting research and development partners is another extremely complex procurement area, and the defence forces must get the best value for the money (Calafat et al., 2021).

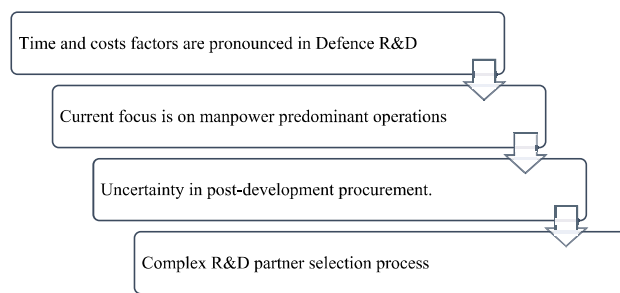


Figure 6: Challenges in development of indigenous defence technology.

Source: Prepared by Author

India and China aspire to become self-reliant in defence ecosystems but are being nurtured differently. Indian approach appears to be to improve its defence ecosystem incrementally. Conversely, China aims to match and surpass the United States in defence technology and capabilities (Nouwens et al., 2019). China has embarked on a centralised, top-down approach to bring private industries into defence, while India has taken the route of innovation through the encouragement of small and medium-sized enterprises and start-ups. The inability to garner the vast infrastructure of the public defence sector and the bringing in private investment into defence has been the major drawbacks in the Indian context (Murti, 2020). China has been systematically achieving defence technology milestones. China accounts for 25 % of the world's manufacturing output, of which 50 % can be considered dual use

for military purposes (Weinbaum et al., 2022). With constantly emerging defence technologies and dual-use technologies, a revolution is happening in defence innovation in China. (Cheung, 2021).

Indian governmental procurements are biased towards low-cost options, often ignoring product quality and life cycle advantages. The cost-effective innovations that Indian organisations are forced to undertake due to the need to lower costs have passed on the advantage to multinational companies at the forefront of innovations. One of these spillovers is the emergence of start-ups with production innovation, who have benefited from research and development by multinational companies (Prashantham et al., 2018). Defence industries are hesitant to carry out innovative products independently due to the high costs and the considerable time needed to produce mature defence products. The current drive of 'Make in India' and achieving self-reliance in defence products must overcome this dilemma. Previous attempts at self-reliance in defence production failed miserably since systemic and technological deficiencies were not addressed. The ground situation has not had the needed transformation, and the likelihood of the current initiative not succeeding is also possible (Rossiter et al., 2019).

Optimal Procurement Methods for Acquiring Indigenous Military Capability

Indian procurement procedures remain complex and bureaucratic, leading to considerable delays and cost overruns. The issues afflicting the entire procurement process are erratic, insufficient budgeting, constantly changing equipment capability requirements, lack of proficient decision makers, indifferent quality assurance staff, and strategic direction (Kumar, 2013). Lately, however, considerable efforts have been made to tap the vibrant Indian start-up ecosystem and increase the private industry's participation in defence procurement (Behera, 2021b). The lack of a national security strategy laying down military capabilities that must be developed and the lack of accountability in military capability development and procurement are major concerns (Raza & Shekhar, 2021).

All the major stakeholders in defence procurement have their own challenges. Defence forces want

future technology equipment with unrealistic features to fight tomorrow's war. The Ministry of Finance wants to divert funds for economic developmental needs, while the Ministry of Defence lacks specialisation and does not have a long-term perception of capability development and the necessity for funds. Public sector enterprises continue to be stuck in the past and resist change. Compounding the issues is the nature of the defence industry, where standard market economics do not apply, the optimum product cost, quality and timelines are difficult to achieve simultaneously, defence budgets are prone to arbitrary cuts based on economic developmental needs and while defence products have a long shelf life and the technology tends to get obsolete. (Jaishankar, 2019).

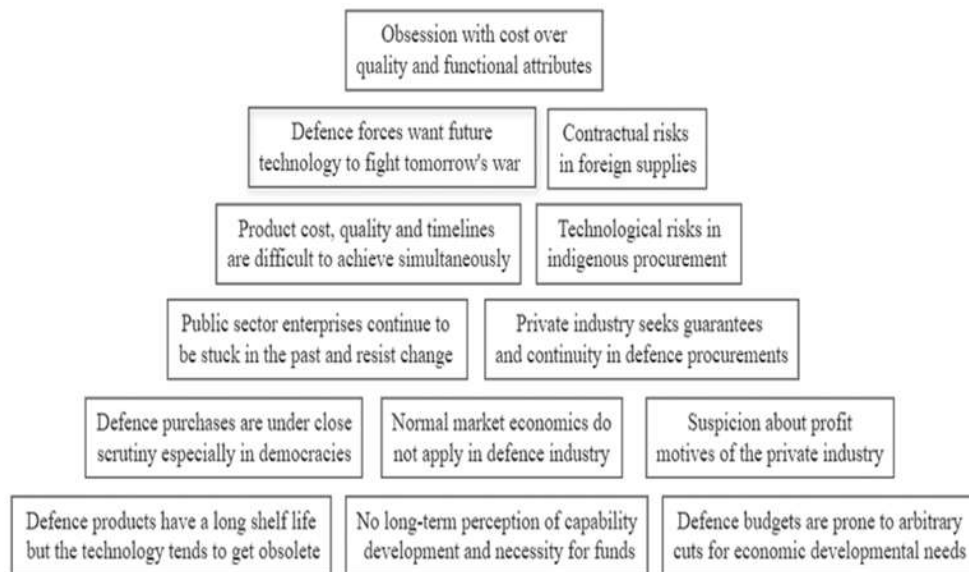


Figure 7: Defence procurement challenges.

Source: Prepared by Author

Despite rigorous procurement procedures, defence purchases are prone to scrutiny with economic and political ramifications, especially in countries with democratically elected governments (Markowski et al., 2009). The necessity to move from an inefficient defence public sector to a market-driven competitive private industry is another issue open to debate with private industry seeking guarantees and continuity in defence procurements. (Markowski & Hall, 1998). Procuring defence equipment from a single source is prone to corruption risk; hence, most countries try to compete for open competition. However, countries prefer single sources for security reasons (Pyman et al., 2009). The interplay between product functional aspirations of the defence forces, the governmental focus on cost control and contractors' motivation for profit margins often result in considerable project complexity, time and cost overruns and ultimately compromises on the final product capabilities. However, awareness of the causes of project complexity, which the stakeholders mainly induce, can become the tool to reduce overall project complexity or incorporate complexity mitigation measures (De Rezende & Blackwell, 2020).

The objectives of acquisition policies are to increase competition and remove corruption, for which various measures can be introduced, including registering protests in case of suspicion of fraud and discrimination (Francois, 2020). The United States has been reforming its defence procurement from the 1980s, but desired results have eluded the efforts. The major reasons for the lack of success of such measures are the preference for a centralised system rather than open commercial procurements, suspicion about profit motives of the private industry, and obsession with cost over quality and functional attributes. Private industry may encourage competition and give the best value for money (Greenwalt, 2013). Open competition with several rounds of bids and splitting the award between the winner and the next loser in a laid-down proportion is also practised

(Todd, 2012). There are differing views that competition in defence acquisition does not reduce cost but only creates a picture of the lower bid being given the contract since the vendor would have a built-in considerable margin. Also, a vendor's preceding profit margin may indicate financial difficulty, and the vendor may not be able to deliver the product as stipulated (Levenson, 2014). Procurement of dual-use equipment and technology locally faces only domestic competition. Opening dual-use technology procurement to external sources can help reduce costs substantially. (Martin et al., 1999). Defence market access is an issue when bigger nations are involved in equipping countries or alliances. Biased taxation and market access policies can impact indigenous defence procurements (Simon, 2022).

The favoured defence acquisition method is often incremental (Mortlock, 2020). Another model for efficient defence procurement is the portfolio optimisation method, which combines several projects or capabilities for acquisition efficiency. A conceptually optimised portfolio will ensure efficient use of capital to generate the best value in defence procurement. (Mun, 2020). Offsets in defence procurement are a method to develop indigenous defence industry capability wherein countries stipulate that a certain percentage of the foreign procurement must be invested locally for co-production or technology transfer. Brazil has been successful in harnessing the benefits of offsets in defence procurement. In Brazil, large and medium defence companies garner most of the defence orders, but small firms have also started taking part in defence procurement. (Schmidt et al., 2015). Most countries promote small and medium-sized enterprises in defence procurement; however, making the defence tenders lot-wise to enable small and medium-sized enterprises to take part may not be successful (Ebig & Glas, 2016).

Enunciation of a clear national security strategy and defence capability requirements
Well defined indigenization plan
Adequate budgetary provisions for defence procurement
Move to a market-driven competitive private industry
Manage interplay between product capabilities, cost control and contractors profit margins
Reduce procurement complexity to ensure product functional capabilities
Resort to dual-use technology procurement for substantial cost reduction
Combine several projects if feasible, for acquisition efficiency
Seek offsets in defence procurement to develop indigenous defence industry capability
Promote small and medium-sized enterprises in defence procurement
Avoid procurement from a single source due to monopoly and corruption risk
Electronic bidding can make procurement fast and transparent
Induct less refined equipment and later incorporate improvements based on user experience

Figure 8: Defence procurement challenges.

Source: Prepared by Author

For an efficient defence procurement system, the enunciation of a national security strategy, providing adequate budgetary provisions for defence procurement, creation of a combined all-services agency to determine desired equipment features, professional procurement managers and a clearly defined indigenisation plan are crucial (Behera, 2021b). Electronic bidding with methods like reverse auction has gained currency recently since it is a fast and transparent mode of procurement. It was seen in a study of the Brazilian electronic procurement system that anti-competitive practices still existed, and scams were directly proportional to firm size and overbilling indicators (Sampaio et al., 2022).

Politics decides the defence budget, but how the funds are expended depends on the procurement community (Bartels, 2022). A detailed study of causal risks in defence procurement shows that the core focus has to be on defence procurement, giving the best value for money. (Retter et al., 2021). Country-specific defence procurement models are available that incorporate the scope of the equipment, the capability of timely supply, and how no delivery would impact the defence forces. A study of 88 Indian defence contracts showed that technological risks in indigenous procurement were the major reason for poor procurement performance, followed by contractual risks in foreign supplies. Both led to cost ramifications (Oishee et al., 2021). A rigid defence acquisition with fixed technology delivery may lead to cost overruns and delays. Hence, it may be better to induct less refined equipment based on the acquisition team's experience and capability and improve the equipment based on actual user experience (Patil & Bhaduri, 2020).

Discussion

Several papers argue that geopolitical risks and regional ambitions make it essential for India to acquire the requisite military capability through increased defence fund allocation for military modernisation. Security alignments with other like-minded countries can be a tool to reduce defence fund allocation based on economic affordability and the scrutiny faced in the democratic form of government. There is, however, a contrarian view that defence expenditures may have helped boost the economy in the Indian context. Most relevant papers highlight that Indian dependency on defence imports continues, and 'Make in India' efforts still have a long way to go. For self-reliance and Indigenous defence capability, continuous, enhanced, and assured allocation of the defence budget is essential.

The study brought out the concept of a capability-based planning decision matrix that can be followed to achieve self-reliance in military capability, including consideration of issues such as the formation of an integrated defence force for optimised utilisation of resources and effectiveness, a mix of regular and fixed-term manpower and the nature of operations they are to undertake. Emerging defence technologies such as drones, robotics, artificial

intelligence, and autonomous vehicles create unique warfare environments, leading to faster equipment obsolescence and new warfare concepts. The study also revealed the dangers of arbitrary induction of various military equipment, which could compound logistical and operational issues and imply diligence in building military capability.

The criticality of defence innovation and development of indigenous defence technology, coupled with a capable domestic defence industrial ecosystem for strategic autonomy, emerged from the study. Continued dependence on the import of advanced weapon systems diverts huge resources. On the other hand, Indigenous weapon systems would be cost-effective, and local industry can ramp up production to meet the surge in demand in case of hostilities. Addressing systemic and technological deficiencies for a synergised approach to defence technology development and establishing partnerships for co-development and co-production with countries having the latest defence technology would pay dividends. The study found that streamlining defence research and development setup, significant investment in defence innovation, the establishment of foreign partnerships in developing niche defence technologies, pursuing dual-use technology, and encouraging private industry with the involvement of academia are some of the initiatives which would help in the drive for achieving self-reliance in defence technology and procurement of domestic defence products.

Many sources highlighted the procurement conundrum with erratic and insufficient budgeting, repeatedly changing equipment capabilities, lack of proficient decision-makers, and lack of strategic direction. Also, in defence industries, normal market economics do not apply; defence products have a long shelf life, but technology tends to get obsolete fast, and cost, quality and timelines are difficult to achieve simultaneously. There are contradictory views of preferred centralised procurement in defence due to security ramifications rather than open commercial tendering. Literature also points towards the latest trend of electronic bidding to ensure fast and transparent procurement, with methods like reverse auction to achieve the best value for money. The study infers that measures such as an optimum mix of procurement from public and

private defence industries, promoting a vibrant start-up ecosystem and operative policies would promote indigenous defence procurement.

Conceptual Model

The study has thrown up four major aspects that impact the achievement of self-reliance in defence capabilities: defence budget, defence strategy, military technology, and effective procurement policies. The defence budget involves several related facets, such as the allocation of the defence budget to meet power aspirations and geopolitical risks, economic affordability, modernisation budget and overall capital expenditure. The acquisition of military capabilities comprises resource optimisation through jointness in operations and integrated defence structure. The role of indigenous industry in upgrading or replacing weapons and procuring new defence equipment based on criteria such as obsolescence and new technologies is axiomatic. Defence technology is emerging quickly, and new concepts such as information war and mosaic warfare have emerged.

Innovation and development of indigenous defence technology would reduce dependence on imports of defence equipment. Creating a robust research and development infrastructure spearheaded by DRDO and intimate engagement with academia can lead to developing new technologies. Co-development of a new generation of equipment with countries possessing state-of-the-art defence technologies could accelerate the conceptualisation and manufacture of new indigenous products. Finally, the defence procurement policies must optimise national defence and dual-use industrial capacities and lay down efficient procurement procedures. The capacities of defence public sector units and private industry should be considered national facilities, and their procurements could be optimised. A vibrant start-up ecosystem would support the defence industrial complex with innovation and entrepreneurship, leading to the achievement of self-reliance.

A graduated and well-orchestrated approach is axiomatic to achieving self-reliance in defence. The defence indigenisation conceptual framework encompasses harmonised ecosystems in defence consumables production, defence technology

design and innovation, and defence manufacturing. Indigenous capability in repair, service and maintenance of defence equipment and locally made consumables such as ammunition, spares and ancillary products would provide the desired autonomy in defence operations. The development of new military technologies indigenously is an inseparable factor in self-reliance. The indigenous defence industrial manufacturing setup has to be streamlined by optimally utilising national defence industrial capacity in the public and private sectors.



Figure 9: Conceptual model for building Indigenous Defence Capability

Source: Prepared by Author.

The study has attempted to examine the entire spectrum of factors that influence the achievement of self-reliance in defence capabilities. However, there are a few factors which require further study. The study looked at forming alliances with extraordinary powers as an affordable means to face threats from a superior adversary. There could also be an option to develop essentially defensive measures against the adversary, such as credible air defence and electronic warfare capability, to make any offensive action costly for the adversary. Another factor is an export-oriented military-industrial complex's role in boosting the country's economic development. While bigger military powers have garnered a fair share of the international defence market, countries

such as Korea and Israel have impressive defence export orders.

Conclusion

India remains on the list of top global arms importers and is heavily dependent on arms import despite many efforts to achieve self-reliance in defence equipment. India has embarked on an indigenisation and self-reliance drive to correct this dependence on foreign sources for defence equipment with the launch of 'Aatma Nirbharta (Self-Reliance)'. Many initiatives have been launched, such as earmarking all lesser-value defence procurements for small and medium-sized enterprises and promoting defence innovation by supporting the defence start-up ecosystem. Notwithstanding positive signals such as the mushrooming of defence start-ups, which the Ministry of Defence and DRDO are giving grants to develop technologies, India's quest for self-reliance remains elusive. The inefficient and unresponsive ordnance factories have been corporatised despite opposition from various quarters. The Defence procurement procedures have been further modified with 'Make Indian' procurement categories in the latest Defence Acquisition Procedures (DAP) 2020. Importing defence equipment is discouraged, and domestic production through joint ventures and co-production is promoted. However, these measures taken to invigorate defence procurement seem superficial and have an insignificant impact.

Various factors influence defence procurement and can lead to improving self-reliance in defence capability. The main issue is allocating a sufficient and continuous defence procurement budget to develop the indigenous defence industry. The defence budget has to be earmarked depending on the country's economic capacity and geopolitical risks. The security threats will determine the defence capability, force levels, and equipment quantities that must be procured based on the nature of operations the defence forces are expected to undertake. The indigenous industry should significantly upgrade or replace weapons and procure new defence equipment based on criteria such as obsolescence. Defence technology is emerging quickly, and new concepts such as information war and mosaic warfare have emerged. Developing and introducing new technologies indigenously is an inseparable

component of defence procurement. Finally, the challenges facing Indian defence procurement processes, especially the protracted and complex procurement procedures, which often outweigh the policies causing cost overruns and unacceptable delays, must be addressed to make them efficient, aligned to indigenous procurement, and industry-friendly. The desired outcome is a robust indigenous dual-use defence industrial complex supported by a dynamic defence design and innovation ecosystem.

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