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Public–Private Partnership in Defence Technology Development

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ABSTRACT

This article examines the trend towards public-private partnerships (PPP) in the Indian defense sector, which aligns with the Atmanirbhar Bharat initiative. It examines the various arrangements related to defense procurement and contrasts the distinctive features of PPPs with the prevailing mechanisms. It also discusses the evolution of defense spending for PPP arrangements. In addition, the article assesses the significant contributions of leading private defense manufacturers in achieving self-sufficiency goals under the Atmanirbhar Bharat scheme. A comparative assessment of the Chinese PPP model in the defense sector, it provides valuable insights into the effectiveness and adaptability of PPP arrangements within the Indian paradigm. This analysis aims to comprehensively understand PPP dynamics and its pivotal role in supporting India's strategic objectives.

Keywords: PPP, Defense, China, India, Atmanirbhar Bharat

INTRODUCTION

'A Public Private Partnership (PPP) means an arrangement between a Government or statutory entity or Government entity and a private sector entity for the provision of public assets and/or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified period of time.'[1] In the defence sector, the PPP model focuses on a long-term contract between the defence forces and the private entity by ensuring efficient management of fiscal constraints and life cycle costs (including acquisition and maintenance costs). In conventional defence contracts, a government agency procures directly from contractors through a competitive bidding process. This contract specifies the requirements and a clear commitment from the contractors to fulfil the requirements in exchange for a predetermined price. In a PPP model, on the other hand, bidders offer payment over the utilisation period, after which the assets belong to the government entity. The PPP model, therefore, allows the government to retain legal ownership of the assets. In some cases, procurement also takes place via concession agreements. In a concession agreement, the nature and scope of the engagement are entirely different from a PPP model. The government offers concessions to private companies to incentivise them to innovate in defence technology. A PPP method, therefore, appears to offer a more structured partnership where both parties share the risk and benefit. To determine whether or not a traditional procurement method is better than a PPP method, it is necessary to understand the difference between public-private partnerships, concession agreements, traditional contracts and defence privatisation.

Table. 1. Comparison of Various Acquisition Models

	PPP Model	**Concession Agreement**	**ConventionalContract**	**Privatisation**
Ownership and control	Shared ownership	Government ownership	Government ownership Service provider - contractors	Ownership -a private entity
Nature of engagement	Collaborative and structuredpartnership	Incentive based	Direct and negotiations	Determinedby private providers
Scope of engagement	Broader range of developmental activities	Financial and regulatory incentives	Terms, conditions and legal framework	Determinedby private providers

Time period	Long term	specified/fixed	Transactional	specified
Scope of Innovation andDevelopment	Prioritise innovation	Focus onspecific requirements	Focus on immediate procurement needs	Prioritise innovationfor competitive advantage
Risk and Reward allocation	Shared risks and responsibility Reward - performance/outcome-based	Execution and risks - Private	Risks - Government (high cost, performance failure)	Risks - a private entity

Source: MP-Idsa issue brief public-private partnership (compiled by Author)

The benefits offered by the PPP model in the defence sector must be carefully distinguished from traditional contracts in terms of project scale, flexibility, stability of returns and value for money to assess and highlight the contribution of different stakeholders in improving and maintaining mission and combat capabilities. *PPP contracts are, therefore, a set of property exchanges in which the public sector imparts the right of building, operating and managing the projects to the private sector. In contrast, the private sectors contribute capital and management expertise to provide services or goods to defence departments.*[2] While the UK Ministry of Defence has developed and used the Public Sector Comparator (PSC) to compare the value derived from the transfer of risk, India has focused on Net Present Value (NPV), multi-criteria decision analysis (MCDA) and comparative benchmarking to assess various aspects of defence procurement and production. NPV analysis considers investment cost, operating revenue and associated rate to calculate the present value of cash flows. Comparative Benchmarking, on the other hand, compares key performance indicators (KPIs). i.e. Project duration, quality standards and service level for Public-private partnership projects.

PPP Projects in Indian Defence

In 2014, India ranked first globally in Public-private partnership readiness. However, the number of PPP projects and investments rapidly declined (Loseva et al., 2020). According to the Department of Economic Affairs PPI Unit, India has 358 projects appraised by the public-private partnership appraisal committee with a total project cost of Rs 676,636.57 crore.

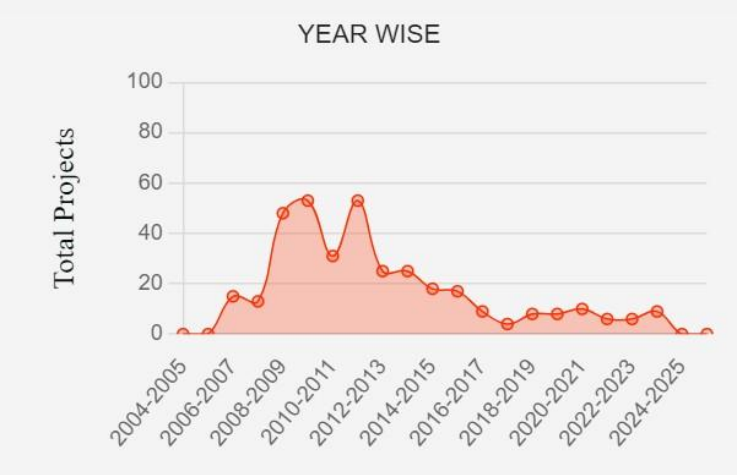

Fig. 1. Year Wise PPP Projects Source : pppinindia.gov.in

The total number of PPP projects declined due to bureaucratic red-tapism, regulatory framework and low reliability of different developmental projects. The number of PPP projects within the defence sector has also been limited. However, in April 2023, 606 Industrial Licences were issued to 369 companies operating in the Defence Sector to modernise and liberalise investment. The capital allocation for the modernisation of the Defense services has also been increased to INR 1,62,600 Cr with a target of 1.75 Lakh Cr in defence manufacturing by 2025, resulting in a rise of 13% for the financial

year 2023-24. To foster the indigenous development of defence technologies, the Defense Research and Development Organization (DRDO) has allocated resources from its Technology Development Fund (TDF) towards collaborations with Micro, Small, and Medium Enterprises (MSMEs) as well as startups. This strategic investment has facilitated the indigenisation of 164 technologies, with a total funding of $30.8 million. Engaging 1886 experts and 5270 companies, this initiative underscores the commitment towards bolstering domestic capabilities. Aligned with the Atma Nirbhar Bharat (Self-Reliant India) Initiative, Defense Public Sector Undertakings (DPSUs) have successfully indigenised 72 out of the 214 items listed in the 1st and 2nd Positive Indigenisation List (PIL). As of April 2022, 19,509 defence items have been listed on the SRIJAN portal, which serves as a non-transactional online marketplace, fostering collaboration and innovation within the defence sector [4]

Corporatisation of Ordnance Factory Board

The Indian Ordnance Factories (IOF) organisation comprises 41 factories dedicated to the indigenous manufacturing, testing, logistics, research, development, and marketing of defence hardware across land, sea, and air systems. The primary objective of the Ordnance Factory Board (OFB) is to achieve self-reliance in supplying the armed forces with high-quality equipment. Vijay Kelkar, renowned for his expertise in Public-Private Partnerships (PPPs) and Offset policy in the defence manufacturing sector, had proposed that granting Navratna status to the OFB would enable it to form joint ventures, collaborate on product development with reputable partners and facilitate technology transfer agreements.[5] Admiral Raman Puri has suggested categorising production based on the level of control over the manufacturing process and technological capabilities. He recommended that the Defense Public Sector Undertaking should have exclusive control over weapons, ammunition, and explosives, while combat vehicle production could be conducted under the PPP model. Furthermore, privatisation is advised for low-tech items such as clothing, uniforms, shoes, and tents. On October 1st, 2021, the Government transferred management, control, and operation of the 41 production units to 7 government companies.

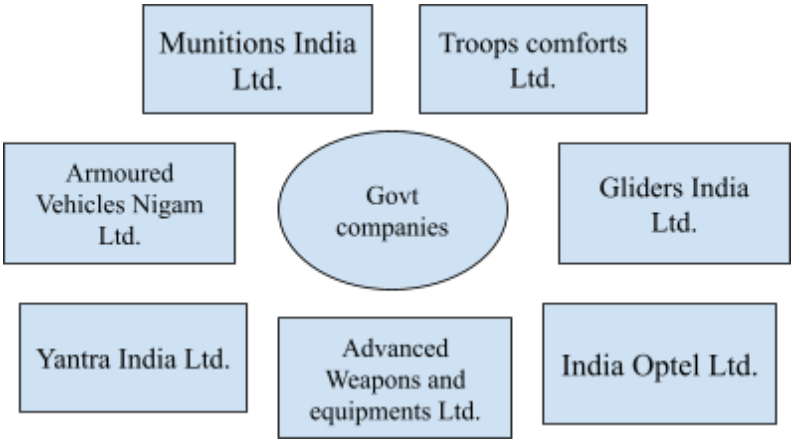

Fig. 2. Directorate of Ordnance (Coordination and Services)- ddpdoo.gov.in

The corporatisation of OFB significantly influences the Public-Private Partnership (PPP) model in defence manufacturing, impacting aspects such as risk-sharing, efficiency, resource accessibility, and innovation. Presently, only a select few Public Sector Undertakings (PSUs) are involved in producing troop comfort equipment, including gliders, parachutes, and optics. Therefore, conducting a thorough cost-benefit analysis becomes imperative to fully realise the advantages of corporatisation, fostering an environment conducive to PPP in defence manufacturing and encouraging innovation and efficiency. According to the Ministry of Defence's annual report for 2022-23, an artificial intelligence (AI) roadmap has been finalised for defence PSUs and the OFB, aimed at developing AI-based products. However, auditors have identified a significant portion of losses totalling ₹251 crore incurred by factories due to product sales to the Ministry of Home Affairs (MHA), followed by ₹47 crore to the armed forces, ₹36 crore to state police, and ₹32 crore to civilians over five years from 2015 to 2020. [6] Ordnance Factory Trichy, Small Arms Rifle Kanpur, and Rifle Factory Ishapore are three defence Public Sector Undertakings (PSUs) that bore the brunt of this situation. The most severely affected by the questionable pricing mechanism was Rifle Factory Ishapore, which witnessed its losses escalate from ₹9 crore in 2015-16 to ₹83 crore in 2018-19 and further to ₹90 crore in 2019-20.[7]

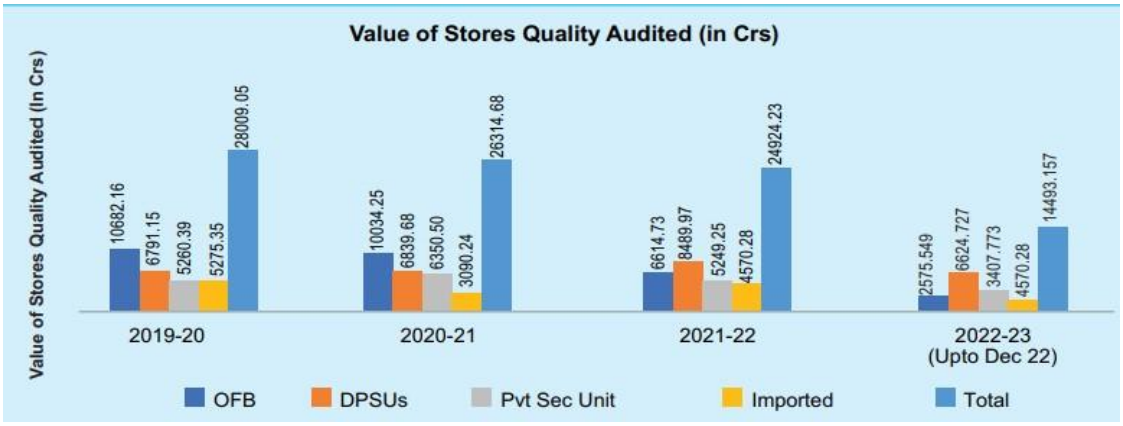

Fig. 3. MOD Annual Report 2022-23

The overhead rate within the Ordnance Factory Board (OFB) is notably higher than that of private companies producing similar products. Audit reports from Advanced Weapons and Equipment India (AWEIL) and the Directorate of Ordnance indicate that the smaller factories struggled to manage unit production costs due to these elevated overhead expenses. Consequently, the army has ceased procurement of weapons from these smaller facilities. The overhead costs at Rifle Factory Ishapore, Small Arms Factory Kanpur, and Ordnance Factory Tiruchirappalli range significantly, representing between 52% and 72% of the production costs. [8] One of the biggest challenges for OFB is the transition to corporatisation, where it must seek marketing loans as it needs access to interest-free capital. In addition, investment in new capital and machinery remains remarkably low, with research and development expenditure accounting for just 0.8% of turnover. [9] This analysis underscores the crucial role played by the private sector and academia in attaining self-reliance in defence. The discourse surrounding Atmanirbhar Bharat in defence necessitates thoughtful attention to these aspects, emphasising the need to leverage the capabilities of private players rather than relying solely on the corporatisation of Ordnance Factories (OFs) as a panacea for efficiency.

Table. 2. Major private players in defence manufacturing (state-wise)

	Gujarat	**Uttar Pradesh**	**Odisha**
PPP Model	Production of precision goods and focus on thedefence offset sector	Technology Transfer for MegaAnchor and Anchor units	Raw material mother units anddefence-grade products
One-time incentives	land cost rebate, fixed capital rebate and stampduty exemption	Patent filing support, Common Facility Centres subsidy	registration cost for Patent and Intellectual Property, assistancefor R&D investment
RecurringIncentives	interest cost subversion, electricity duty rebate andstate GST reimbursement	Skill development, training initiatives and transport subsidy	100% Reimbursement of Employment Cost Subsidy, Reimbursement of training cost
Major Players	Adani, Reliance, Bosch Rexroth, Larsen & Toubro,Pipavav Defence & Offshore Engineering	Hindustan Aeronautics Limited (HAL), Mahindra	Hindustan Aeronautics Limited(HAL)
	Company Ltd		
Facilities available	Major port-based traderoutes	Common Facility Centres, Patent filing support	Integrated Test Range (ITR) and Proof & Experimental Establishment (PXE), Central Tool Room & Training Centre(CTTC)
Defence equipment/items	manufacturing precisionengineering goods and meeting Defence offset requirements	Defence &Aerospace Manufacturing	producing Aerospace and Defence grade products, LightCombat Aircraft

Source: Invest India (compiled by author)

Role of Emerging Technologies in Defence (PPP)

The First Industrial Revolution, which began in the mid-1780s, marked the era of mechanisation. The Second Industrial Revolution was characterised by electrification, starting in the mid-1870s. Following this, the Third Industrial Revolution emerged in the mid-1960s, focusing on automation. The onset of the Fourth Industrial Revolution, known as Industry 4.0, around 2011, integrated cyber and physical systems. This revolution fosters interconnected industrial ecosystems within factories, facilitating instantaneous data exchange and enabling interactions between humans and machines, as well as between machines themselves, on an unprecedented scale and speed. The Fourth Industrial Revolution (4IR) stands apart from its predecessors by emphasising software more than hardware. While the first Industrial Revolution is closely associated with the steam engine, the second with the internal combustion engine, and the third with microelectronics, the 4IR lacks a singular iconic piece of hardware. However, it may involve even more sophisticated semiconductor chips. Nonetheless, the technologies of the 4IR hold the potential to generate fresh opportunities and complexities, particularly in the realm of identifying novel and impactful military technologies and discerning how these capabilities could confer military advantages in the years ahead. Leveraging modern technologies to enhance defence manufacturing can be an important step in increasing the production of defence technologies. For Aerospace & Defense companies evaluating the adoption of Industry 4.0 across manufacturing industries, 84% of executives recognised the significance of utilising digital technologies as a crucial differentiator.[10] However, only 25% of these executives actively employed these technologies to access, manage, analyse, and leverage data for real-time decision-making.

The infrastructure supporting cloud computing, which demands extensive data storage capabilities and computing power, must be within Indian territory. Access to private and public data should be facilitated in usable and interoperable formats. Unfortunately, insufficient emphasis and investment is directed towards research and development in pertinent technologies. (reference) Skilling and training is progressing slowly, necessitating a reorientation of educational curricula. There is a pressing need to ease trade barriers to foster innovation and international involvement, encouraging manufacturers to establish labs and promote investment through start-ups and research and development initiatives. This is critical for advancing India's manufacturing ecosystem in the era of Industry 4.0. The Government of India, through private-sector partnerships, is encouraging the implementation of Industry 4.0 technologies; propelled by governmental policy initiatives, the Ministry of Defence (MoD) has introduced three schemes to foster research and development within the industry, startup sector and academic institutions. These initiatives include Innovations for Defence Excellence (iDEX), the Technology Development Fund (TDF), and the Make category. Several of these initiatives have begun to show results, albeit to a limited extent. For example, the iDEX scheme, introduced in 2018 to encourage innovation and technological advancement in the defence and aerospace sectors through financial support, has resulted in the execution of 102 contracts.[11] A Deep Tech startup headquartered in Bengaluru, QNu Labs, has achieved a significant milestone by creating cutting-edge quantum communication technology for secure communication over 150 km.[12] Notably, the Indian Army, the intended beneficiary of this technology, has initiated its deployment process by issuing a commercial tender to the company. This development underscores the efficacy of the technology and highlights the strength of India's private innovation landscape.[13] An uplift for the private sector in research and development was provided in the Interim Union Budget. The finance minister revealed the government's plan to incentivise the industry to design and develop military platforms and equipment in partnership with DRDO and other organisations through the Special Purpose Vehicle (SPV) model.

Additionally, to spur industry involvement, she announced the allocation of 25 per cent of the defence R&D budget for the industry, startups, and academia.[14]

Following the budget announcement, the government has identified 18 items for industry-led design and development through various procurement routes. These include hypersonic glide vehicles, lightweight tanks, multi-role helicopters, low-orbit pseudo-satellites, and anti-jamming systems.[15] Additionally, funding provided to the industry under the Technology Development Fund (TDF), previously capped at INR 100 million, has been increased to INR 500 million, marking a fivefold rise. Acknowledging the private sector's pivotal role, the government has allocated a distinct budget for procurement. In the fiscal year 2022-23, out of the total allocation of INR 845.98 billion for capital procurement from the domestic industry, INR 211.49 billion (25per cent) was explicitly earmarked for the private sector.[16]

Comparative Analysis of the Chinese PPP Model in Defence

The People's Liberation Army Ground Force is responsible for directly providing goods and services. It is responsible for producing all necessary resources, as in traditional equipment or service procurement; it also takes responsibility for acquisition activities and associated risks. Since 1990, China has implemented over 2000 PPP projects *(Fürst Wrede Military Base in Munich: First PPP Federal Pilot Project 2021).*

The People's Liberation Army (PLA) has adopted a multilateral approach to modernise its logistics system by engaging in

outsourcing practices. It employs a more systematic and scientific management approach towards its logistical support systems. China's Central Military Commission (CMC) has delineated a comprehensive strategy to establish a contemporary logistics infrastructure to bolster military operations. This strategy encompasses infrastructural enhancements, integration of information technology, automation, and fostering collaboration between the military and civilian sectors to leverage civilian expertise and resources in logistics support. This collaborative effort involves forging partnerships with private enterprises, academic institutions, and government agencies to augment logistics capabilities.

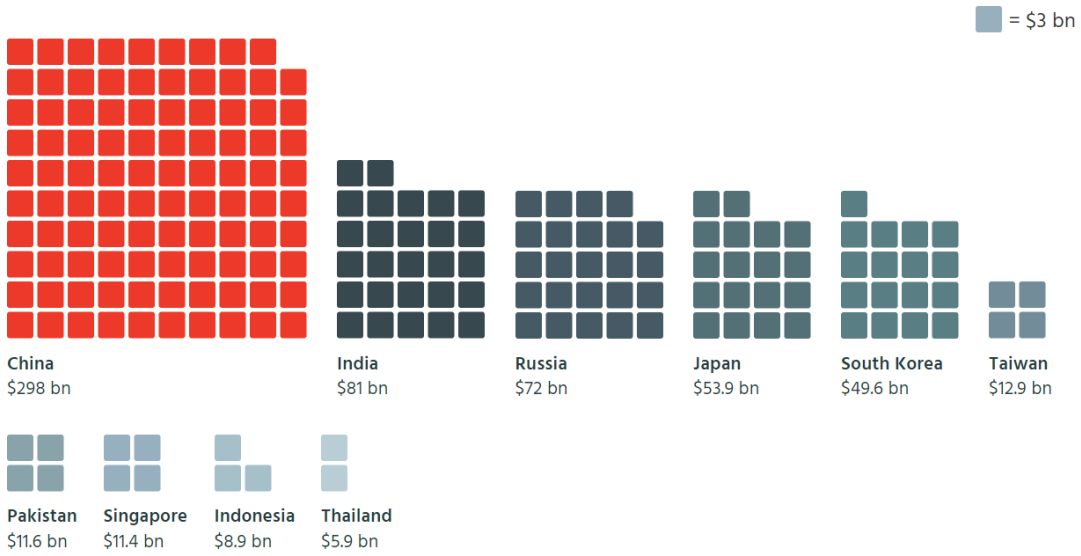

Fig. 4. Military Expenditure Source: SIPRI Military Expenditure Database

The 18th National Congress of the Communist Party of China (CPP) underscored the PLA's commitment to pursue a uniquely Chinese approach that integrates military and civilian sector development, constituting a fundamental aspect of its long-term logistics reform strategy. Influenced by the principles of New Public Management (NPM) in China, which emphasises market orientation, the PLA has transitioned from a model of self-sufficiency to one reliant on market-based procurement. Consequently, the PLA has begun outsourcing various services, including commercial and housing services for combat units stationed in urban centres, general-purpose materials storage, capital construction, logistical equipment production, andlogistical and technical services.

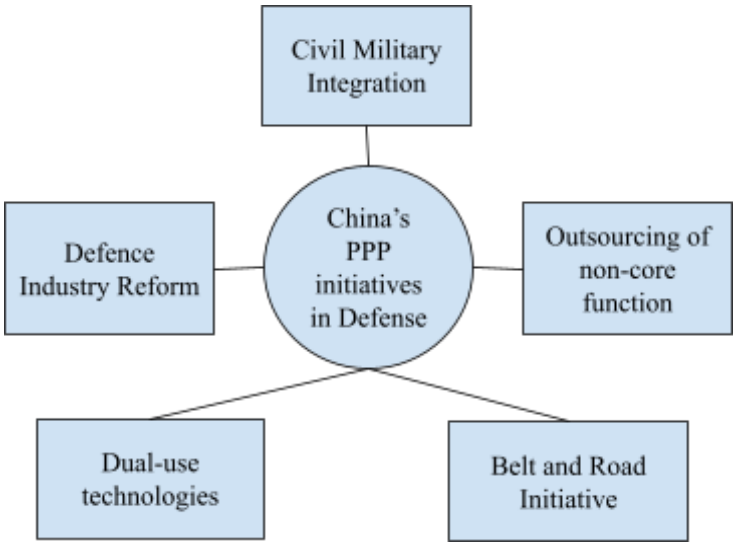

Fig. 5. Chinese PPP Initiatives 2022-23 Source: compiled by author

The Belt and Road Initiative (BRI) is a prominent illustration of China's utilisation of the Public-Private Partnership (PPP) model, offering many advantages encompassing technology transfer, innovation, soft power, and logistics. In contrast to conventional procurement methods reliant on government-to-government grants provided by China, the BRI entices investment from the private sector and facilitates financing from private markets. Functioning as a PPP model, the BRI alleviates the host government's financial obligations throughout the respective contract, enabling the utilisation of private capital for extended periods. By harnessing the PPP approach in defence initiatives along the Belt and Road routes, China can unlock fresh prospects for collaboration, innovation, and security cooperation. Ultimately, this contributes to advancing the strategic aims of the initiative while fostering regional peace and stability.

China encounters similar obstacles in implementing Public-Private Partnerships (PPPs) in defence as India. Bureaucratic hurdles, limited market development, and excessive oversight in the private sector pose challenges that impede efficiency and productivity within the defence industry. Furthermore, many defence projects' secretive and intricate nature often renders them inaccessible to private entities, making it challenging to identify and engage suitable partners.

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