

# The Making of Technological Innovation Ecosystem in Defence Sector

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*Cultivating dynamic defence innovation ecosystems that are bolstered by sustainable policies and robust infrastructure is the need of the hour. To achieve this, the Government of India has committed to adopt a multifaceted approach, by collaboration among researchers, talent and industries, including micro, small and medium enterprises (MSMEs) and start-ups. This article explores the evolving ecosystem of start-ups, which has a role in fostering technological innovation within a self-reliant defence ecosystem. It highlights the role of collaborations between the defence establishment and various evolving stakeholders in reshaping innovation in the technological domain. Innovation in critical defence technologies relies on well-defined policy-led ecosystems to transition from conceptualisation to production. The importance of collaboration and innovation ecosystems in advancing defence technology by engaging stakeholders, like MSMEs, in defence supply chain and indigenisation efforts is also highlighted. In addition, there have been initiatives, which ensure securing early stage funding for innovations by MSMEs and start-ups.*

**Keywords:** *Atmanirbharta, Self-Reliance, Defence Ecosystem, Start-up, iDEX*

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## INTRODUCTION

Defence technology holds significant importance as it directly impacts a nation's security and overall stability. The research and development (R&D) process necessitates a dynamic ecosystem, characterised by sustainable policy interventions and infrastructure implementation. This requirement can be understood in terms of providing institutional support to specialised research centres contributing to cutting-edge research. Collaborations between academia and the defence sector promote knowledge exchange and talent development.<sup>1</sup> Additionally, engaging private industries, including both large corporations and start-ups, is vital.<sup>2</sup> Such partnerships facilitate technology transfer, product development and the commercialisation of defence solutions.

Mechanisms for technology transfer play a crucial role in streamlining processes to transition successful R&D outcomes into production and deployment. Encouraging start-ups and small businesses to participate in defence R&D fosters agility, creativity and adaptability, often bringing fresh ideas and novel approaches.<sup>3</sup> Moreover, effective funding mechanisms at every level are essential. The Government of India has endeavoured to streamline this aspect over the past few years. Beyond established systems and structures, this ecosystem should incorporate space and mechanisms for identifying and nurturing talent. Globally, organising challenges and competitions has been observed to spur creativity and attract diverse talent. These talent promotion platforms may invite solutions for specific defence challenges as well.<sup>4</sup> The establishment of technological incubators nurtures early stage innovations, while accelerators aid in scaling promising technologies, both playing a crucial role in the ecosystem. Fundamentally, these efforts are underpinned by policy frameworks and regulations. Clear policies, regulations and intellectual property (IP) guidelines encourage participation and protect stakeholders' interests.<sup>5</sup>

The aforementioned conceptual premises have been evident in various government initiatives aimed at fostering technological innovation, particularly to enhance self-reliance in the defence sector and reduce dependence on imports. One such initiative is the establishment of 'Innovations for Defence Excellence' (iDEX) in order to promote self-reliance.<sup>6</sup> This shows the government's confidence in local talent and commitment to developing indigenous technology in defence and aerospace.<sup>7</sup> There is a growing need to create an atmosphere that encourages various stakeholders to come together

and collaborate. This includes start-ups, micro, small and medium enterprises (MSMEs) and research institutions.

Simultaneously, a burgeoning indigenous technological revolution is underway in India driven by start-ups, with the Indian defence start-up ecosystem experiencing noteworthy growth attributed to policy reforms. These reforms advocate for domestic design, development and manufacture of defence equipment. Through nurturing start-ups and promoting R&D, the government aims to bolster national security and cultivate self-sufficiency in defence technology. Furthermore, the foundation of this self-reliance in technological innovation rests upon home-grown talent. The government seeks to harness India's exceptional science, technology and research capabilities, with the objective of advancing new defence capabilities not only for the armed forces but also for export markets. By leveraging the nation's intellectual capital, India aspires to emerge as a hub for cutting-edge defence technologies. Various initiatives have been implemented to catalyse the process of providing a platform for innovation to bloom and flourish.

The transition from R&D outcomes to practical defence technology solutions in India is impeded by several critical challenges. Despite substantial governmental efforts to promote self-reliance and innovation through various initiatives, such as iDEX, the development of a cohesive and supportive ecosystem remains problematic. Key issues include: inadequate institutional support for specialised research centres; ineffective mechanisms for technology transfer; and insufficient collaboration among academia, private industry and start-ups. Additionally, there are gaps in funding mechanisms and policy frameworks, which are necessary for safeguarding intellectual property (IP) and fostering stakeholder engagement. Addressing these challenges is imperative for enhancing India's defence technology capabilities, fostering indigenous innovation and reducing reliance on foreign imports.

This article aims to evaluate the efficacy of current initiatives, identify existing deficiencies and recommend strategies to strengthen the innovation ecosystem within the defence sector. It also attempts to delineate these initiatives, whether they pertain to policy formulation or the development of infrastructure, aimed at bolstering the innovation ecosystem in the defence sector, thereby fostering India's self-reliance to meet future challenges.

### **TECHNOLOGICAL INNOVATION: BUILDING A POLICY FRAMEWORK**

The emergence of innovation in technology, particularly critical defence technologies, heavily depends on the conceptualisation and subsequent

development, which must be translated into production later on. This transition is only achievable through a well-defined policy-led ecosystem. The government has formulated several strategic initiatives aimed at fortifying the national defence infrastructure. Encouragement is extended to Indian enterprises, encompassing both public and private sectors, to engage actively in the conceptualisation, development and production of defence systems through the implementation of the 'Make' procedure delineated in Defence Acquisition Procedure 2020 (DAP 2020). This framework not only facilitates participation but also incorporates provisions for financial support to facilitate prototype development.

Further, in order to foster indigenous talent within the country, the Ministry of Defence (MoD) has prominently integrated financial assistance measures into its DAP. As outlined in the document, the government is committed to extend financial support of up to 70 per cent of the prototype development (Make-I) cost or a maximum of Rs 250 crore per development endeavour.<sup>8</sup> Along with this, DAP 2020 also assures that even in the case of industry-funded design and development and innovative solutions by Indian vendor (Make-II and Make-III) for which no government funding is provided, government will make procurement on successful prototype development.<sup>9</sup> In the case of Make-III, DAP says that the defence system can be manufactured in India as an import substitution for supporting weapon systems and equipment currently held in the inventory of the services. Indian firms have the option to manufacture these either through collaboration or by obtaining transfer of technology (ToT) from foreign original equipment manufacturers.<sup>10</sup>

The concept of ToT holds immense significance globally. It serves as the conduit through which innovations incubated within laboratory environments can seamlessly bridge the gap between academia and industry, facilitating production. Notably, this process becomes particularly critical when dealing with dual-use technology, that is, technology that can be applied for both civilian and military purposes. Understanding ToT is pivotal because it encompasses a multifaceted journey, spanning from technology development to the subsequent opportunities it unlocks. A pivotal moment in this trajectory occurred when the government opted to transfer technical concepts and technology, originating from its institutional capabilities, to a new cohort of talented individuals—a move deemed revolutionary. India's foremost defence technical research institution, the Defence Research and Development Organisation (DRDO), played a crucial role in facilitating this transformative transition.

The DRDO guidelines for ToT were initially issued on 30 June 2015,<sup>11</sup> with subsequent clarifications and procedural simplifications to aid industry participation and streamline the ToT process. 'Technology' encompasses designs, know-how, processes, products and related IP owned by the DRDO, to be transferred to industries under licensing agreements.<sup>12</sup> The overarching objective of the ToT policy is to disseminate DRDO-developed technologies efficiently, fostering growth and enhancing capabilities within the defence manufacturing sector towards achieving self-reliance. The current DRDO policy for ToT came into force on 19 August 2019.

The ToT policy facilitates two critical processes simultaneously: one, the utilisation of already developed technology for actual production and usage; and two, fostering an innovative environment that can build upon the foundation of DRDO's technology, thus leading to the development of additional new technologies. The DRDO facilitates the transfer of both defence and dual-use technologies to private companies through a 'Licensing Agreement for Transfer of Technology' (LAToT).<sup>13</sup> These agreements stipulate that recipient industries cannot sub-licence or transfer the technology without prior written approval from the DRDO. Additionally, they must ensure that the technology remains confidential, limiting access only to necessary personnel and sub-contractors involved in product execution or manufacture.

In other words, the DRDO develops products for the Indian Armed Forces and upon successful trial and evaluation, transfers the technology to Indian industries for mass production through the LAToTs.<sup>14</sup> As of March 2023, the DRDO had signed more than 700 LAToTs under its current ToT policy initiated in August 2019.<sup>15</sup> The signing of LAToT provides several benefits to the industry. The industry becomes a bonafide ToT holder of DRDO technology transfer document, which includes the bill of materials, complete know-how, processes, quality processes, etc.<sup>16</sup>

### START-UP ECOSYSTEM AND TECHNOLOGICAL INNOVATION

Due to their inherent agility, innovation and disruptive potential, start-ups play a pivotal role in fostering a self-reliant defence ecosystem. In the context of defence, start-ups bring fresh perspectives and novel technologies that can address critical gaps and modernise existing systems. Unlike traditional defence contractors, start-ups operate with greater flexibility, enabling rapid prototyping and adaptation to evolving security challenges. In this context,

the world has seen an evolving start-up ecosystem in India, especially during last one decade.

India's start-up ecosystem continues to flourish, ranking as the third largest in the world and showing promising year-on-year growth rates of 12–15 per cent. In 2018, there were approximately 50,000 start-ups; and by June 2023, a significant portion, ranging from 8,900 to 9,300, were technology-led ventures, highlighting the country's prowess in technological innovation.<sup>17</sup> The year 2019 witnessed a remarkable surge in tech start-ups, with 1,300 new ventures emerging, equivalent to an impressive average of two to three tech start-ups being born every day. This rapid expansion underscores India's dynamic entrepreneurial landscape and its capacity to foster innovation across various sectors.<sup>18</sup> The burgeoning start-up ecosystem has significantly propelled technological innovation for the defence sector. Over the past decade, the emergence of defence start-ups in India has delineated a transformative trajectory. This evolution has been notably augmented by the dedicated initiative of 'Acing Development of Innovative Technologies with iDEX' (ADITI) scheme, which has fostered the development of critical and strategic defence technologies.<sup>19</sup>

The primary goal behind this scheme has been the development of about 30 deep-tech critical and strategic technologies within the proposed time-frame, fostering a 'technology watch tool' to align with modern armed forces' needs.<sup>20</sup> Along with ADITI, the Defence India Start-up Challenge (DISC), further nurturing the introduction of the problem statements, aims at addressing critical defence challenges and enhancing national security through innovative solutions. It underlines the importance of fostering collaboration between the defence establishment and the start-up ecosystem to bolster defence capabilities.<sup>21</sup> The significance of fortifying defence start-ups becomes evident upon considering their pivotal role in reshaping critical domains, like artificial intelligence (AI), robotics and cybersecurity.<sup>22</sup> Additionally, discussions on diversity and inclusion in defence entrepreneurship, as well as initiatives like the iDEX internship programme and partnerships with investors, underscore the efforts to nurture talent and drive innovation in the defence sector.<sup>23</sup>

The functional part of the ADITI initiative supports up to two winners per challenge, with applicants eligible for only one challenge at a time. Upon closure of a challenge, new ones are considered. Start-ups, MSMEs and partner incubators are the primary beneficiaries, collaborating to enhance India's self-defence capabilities and defence exports. Individual innovators

are also eligible, contingent upon their registration as start-up/MSME post-selection.<sup>24</sup> A network of 10 partner incubators will offer specialised support and mentorship. The initiative aims to address defence sector needs through challenges, offering grants of up to 50 per cent of the product development budget, capped at Rs 25 crores per winner, disbursed in milestones.<sup>25</sup>

In addition, the government has undertaken to integrate the Atal Innovation Mission (AIM) into defence innovation through a series of initiatives, chiefly via the Support for Prototype and Research Kickstart (SPARK) programme.<sup>26</sup> The SPARK framework, initiated by the Defence Innovation Organisation (DIO) in collaboration with AIM, aims to foster innovation within India's defence and security sector. This initiative operates with a dual objective: first, to facilitate the development of functional prototypes aligned with national security requirements, thereby stimulating innovation within the Indian defence industry; and second, to support the commercialisation of novel technological products and solutions by linking them with the Indian defence establishment.<sup>27</sup>

Under the SPARK framework, solicitations will be made for proposals addressing specific technological needs of the Indian defence establishment. Successful applicants demonstrating the capability and commitment to deliver functional prototypes or commercialise existing technologies may receive support of up to Rs 1.5 crore, disbursed based on predefined milestones and in various forms, including grants, equity or debt.<sup>28</sup> The precise amount and mode of funding will be determined by a high-powered committee following a rigorous evaluation process. Additionally, the MoD and AIM will retain the authority to modify the scheme as necessary, with the potential for increased funding in exceptional cases as determined by the committee.<sup>29</sup> Eligible expenditures under SPARK funding encompass a range of activities, including R&D, prototyping, pilot implementation and market assessment, thus facilitating the transition from concept to commercialisation for innovators and start-ups in the defence sector. Selected applicants will receive comprehensive guidelines on fund utilisation to ensure efficient resource allocation towards the objectives of the SPARK framework.

In line with the government's broader commitment to fostering innovation and supporting start-ups, Startup India initiative was launched on 16 January 2016.<sup>30</sup> The sustained efforts of the government in implementing this initiative have yielded significant results, as evidenced by the substantial increase in the number of recognised start-ups from 445 in 2016 to 86,713 by the end of 2022.<sup>31</sup> The growth underscores the effectiveness

of the government's policies and initiatives in fostering innovation and entrepreneurship in the country. In addition, the government has enacted several pivotal amendments to existing regulations and statutes. For instance, restriction of annual capacity in the industrial licence for defence sector has been removed under Industries (Development & Regulation) Act, 1951. The licensee has been allowed to sell the defence items to government entities under the control of Ministry of Home Affairs, public sector undertakings, state governments and other defence licensee companies, without the approval of the Department of Defence Production (DDP).<sup>32</sup>

A factor contributing to the rise of defence start-ups is their notable enhancement of the capabilities of the armed forces, particularly within the domain of unmanned systems. The examples include idea Forge,<sup>33</sup> New Space Research and Technologies<sup>34</sup> and Raphe mPhibr,<sup>35</sup> which supply the Indian Army with unmanned aerial vehicles for border surveillance and logistics operations in high-altitude regions.<sup>36</sup> Torus Robotics is pioneering in unmanned ground vehicles for heavy load transportation, while EyeROV is focusing on remotely operated underwater vehicles for maritime inspections.<sup>37</sup> Additionally, Sagar Defence Engineering is spearheading the development of weaponised autonomous unmanned boats for the Indian Navy. Despite the promising potential demonstrated by the defence start-up ecosystem, it remains in its nascent stages and faces inherent challenges in the development of defence applications.<sup>38</sup>

## BRINGING STAKEHOLDERS TOGETHER

Technological innovation is not a unidirectional process, rather, it operates within a complex ecosystem comprising various stakeholders. This ecosystem involves multiple partners engaged in different stages from innovation to production. Stakeholders play a critical role as they serve as the linchpin that renders this process practical and multi-dimensional. The establishment of Defence Innovation Hubs (DIHs) has played a crucial role in expediting the advancement of technological innovation and manufacturing within the defence sector.

The iDEX framework drives innovation in the defence sector through autonomous DIHs. These hubs accelerate creative ideas, technologies and solutions to bolster defence capabilities.<sup>39</sup> They also facilitate collaboration among the various stakeholders, like start-ups, academia and the defence industry,<sup>40</sup> and provide a conducive environment for innovation, aiming to address evolving defence needs while fostering self-reliance and technological



advancement. Additionally, DIHs serve as platforms for innovators to directly engage with the services, obtaining crucial feedback to develop solutions for India's defence platforms.<sup>41</sup> Moreover, the hubs are targeted to be situated in districts listed within the Ministry of MSME, in collaboration with United Nations Industrial Development Organization or supported by local industry associations. These requirements aim to cultivate an environment conducive to defence innovation and technological progress in the specified regions.<sup>42</sup> In 2019, the DIO had announced the setting up of two DIHs in Tamil Nadu (Coimbatore) and Maharashtra (Nashik).<sup>43</sup> In fact, the DIO, launched in 2018, has been one of the major initiatives to support innovation in defence sector under the iDEX.<sup>44</sup>

The MSMEs are a transformative presence within India's defence sector, making significant contributions to the defence production supply chain, bolstering export capabilities and setting new standards. These enterprises actively participate in the design and development of defence products, the Technology Development Fund (TDF) and the 'Make' project under DAP 2020.<sup>45</sup> The MSMEs have emerged as catalysts redefining the productivity of the defence sector. In 2022, over 10,000 MSMEs actively contributed to boosting India's defence production.<sup>46</sup>

The government has also ensured the engagement of various stakeholders, including MSMEs, start-ups, individual innovators, R&D institutes and academia, providing them with grants, funding and support for R&D projects.<sup>47</sup> A key programme under iDEX is the DISC, which has received budgetary support of Rs 498.80 crores for the period 2021–22 to 2025–26.<sup>48</sup> This scheme aims to financially assist approximately 300 start-ups, MSMEs and individual innovators, as well as around 20 partner incubators, through the DIO. By October 2022, Rs 300 crores had been approved for over 100 iDEX winners, enabling the development of products and technologies across more than 50 technological areas. Since its inception (in 2018),<sup>49</sup> iDEX has garnered significant interest, receiving approximately 6,000 applications across seven editions, with the eighth edition recently launched. Various programmes under the iDEX platform cater to all three services of the armed forces, as well as the Ordnance Factories Board (OFB) and defence public sector undertakings (DPSUs). Notably, the SPRINT (Supporting Pole-Vaulting in R&D through iDEX) programme, launched alongside the seventh edition of DISC, focuses on addressing Navy-specific challenges.<sup>50</sup> Additionally, a Prime SPRINT challenge, with six problem statements, has been launched to further stimulate innovation and development in the defence sector.<sup>51</sup>

Developing the capacity for domestic manufacturing of defence products within the defence sector holds paramount significance as it is indispensable for advancing self-reliance initiatives. In this regard, the pivotal role of MSMEs, in conjunction with large-scale manufacturing capabilities, cannot be overstated. They serve as vital links within the defence supply chain by furnishing essential components, systems and services crucial for larger defence projects. This function not only guarantees a consistent provision of necessary materials but also fosters the indigenisation of defence production. The MSMEs engage in the manufacturing of a diverse range of defence equipment, encompassing firearms to sophisticated electronic warfare systems.<sup>52</sup> Such diversification ensures the establishment of a robust and self-sustaining defence ecosystem that is adept at fulfilling the multifaceted requirements of the armed forces. Moreover, MSMEs have transitioned beyond mere supply chain participants to become significant contributors in the conception, development and fabrication of comprehensive defence systems.

The need for developing national capabilities to innovate and create business opportunities in emerging technological areas has been acutely felt as there continues to be a dearth of early stage funding for commercialisation of innovations by MSMEs due to higher risks of investment in unproven technologies.<sup>53</sup> Thus, major proportion of the available early stage funding gets invested in relatively low-risk opportunities based on proven technologies, thereby limiting innovations to reach the market. The collaborative programme of Technology Information, Forecasting and Assessment Council (TIFAC) and Small Industries Development Bank of India (SIDBI) Srijan, launched in 2010, aims at facilitating development, demonstration and commercialisation of technology innovation projects pertaining to new products, or process development to encourage and promote development of capabilities in MSMEs to innovate and to bring high-risk innovations to the market for opening up opportunities for business linked with innovations.<sup>54</sup> The TIFAC has created a revolving fund of Rs 30 crores for technology innovation and placed it with the SIDBI to provide assistance to MSMEs for development, upscaling, demonstration and commercialisation of innovative technology-based projects.<sup>55</sup> The MSMEs seeking financial assistance from the fund for technology innovation projects may send detailed project proposal either to the TIFAC or the SIDBI.

In order to foster innovation among the nation's defence manufacturers, with a particular emphasis on MSMEs, the government has implemented additional measures aimed at advancing the Srijan scheme. To facilitate this

process, the MoD has introduced positive indigenisation lists, standing out as a pivotal reform towards indigenisation.<sup>56</sup> Aligned with the 'Atmanirbhar Bharat Abhiyan', these lists underscore the government's commitment to fostering self-sufficiency and enhancing exports through active collaboration between the public and private sectors. Previously, the DAP had established four positive indigenisation lists, encompassing 411 military items; since then, the DDP has notified additional four lists, comprising a total of 4,666 items, including critical components for DPSUs.<sup>57</sup>

The industry, particularly the private sector, is exhibiting growing confidence and capability in manufacturing and integrating sophisticated defence systems, sensors, simulators, weapons and ammunition, facilitated by government reforms. This surge is expected to catalyse domestic R&D investment, bolstering technological and manufacturing prowess.<sup>58</sup> By acknowledging the burgeoning capabilities of the domestic defence industry, these lists reflect a firm commitment to nurturing a robust and self-reliant defence sector, thus reducing reliance on imports. Further, more than 26,000 defence items have been uploaded on the Srijan portal and are offered to the industry for indigenisation.<sup>59</sup> Indigenisation is a dynamic process and so far, 7,031 items have already been indigenised, which cater to the domestic and global markets. As per data available till December 2022, the defence imports have reduced from 46 per cent to 36.7 per cent since 2018–19.<sup>60</sup>

Streamlining of funding at every stage of innovation process has been significant, particularly in the last decade. In 2014, the Government of India initiated several significant steps aimed at fostering technological development and innovation, poised to propel the nation towards self-reliance, with the TDF scheme as one of the key initiatives.<sup>61</sup> The TDF, a flagship initiative of the MoD, aims to foster self-reliance in defence technology by engaging private industries, especially MSMEs and start-ups. It facilitates the development of cutting-edge defence technologies through grants, emphasising the 'Make in India' initiative. Initially managed by the DDP, the scheme was later entrusted to the DRDO for comprehensive execution.<sup>62</sup> The process involves competitive bidding, with emphasis on technical prowess and cost-effectiveness. Through partnerships with agencies, like Invest India, the DRDO strives to attract capable industries and start-ups, ensuring wider participation and fostering innovation in defence technology. It supports projects up to Rs 10 crores, encouraging participation from industries, especially MSMEs and start-ups.<sup>63</sup> Benefits include joint ownership of IP rights, sales opportunities, licensing and exports. Start-ups receive support for projects up to 1 crore, with funding also extended to associated incubators.

## DETERMINED EFFORTS, TANGIBLE OUTCOMES

The implementation of DAP 2020 has shown significant assurance, evidenced by the initiation of four projects within the inaugural year under the Make-I category.

Further, 56 proposals have been accorded 'Approval in Principal' under Make-II category out of which 23 proposals have been accorded Acceptance of Necessity (AoN). In addition, Defence Research and Development Organisation (DRDO) has also undertaken 233 projects during the past three years since 2018 (till March 2021).<sup>64</sup>

These endeavours encompass a spectrum of new indigenous equipment, including cruise missiles, hypersonic missiles, anti-ship missiles, extended range anti-submarine rockets, mounted gun systems, ammunitions, electronic warfare systems, radars, torpedoes, high-endurance autonomous underwater vehicles and more.<sup>65</sup> The expansion of the initiative experienced significant acceleration when the DDP, acting through India Optel Limited, issued 101 project sanction orders in 2023 to Indian manufacturers under the Make-II scheme of DAP 2020.<sup>66</sup> The 'Make' scheme has opened a new avenue for defence innovation and development because all three armed forces have pushed the process of this scheme. For instance, the Indian Navy:

is pursuing a total of 38 Make projects according to DAP 2020. Presently, 26 projects are being steered under Make-II category, 10 projects under Make I category and two projects under Make III Category. In addition, Eight Make II joint projects are being steered with IA [Indian Army] and IAF [Indian Air Force] as lead services.<sup>67</sup>

On the other hand, necessary technical support is provided by the DRDO scientists for technology transfer, which further boosts the defence manufacturing sector and self-reliance in defence. The technologies transferred cover a wide range of domains, including electronics, laser technology, armaments, life sciences, materials science, combat vehicles, naval systems and aeronautics. In 2021, for instance, the DRDO transferred 14 technologies across electronics, armaments, life sciences and aeronautics to 20 industries through LAToTs. Innovations included low-level transportable radar, inertial navigation system for ship application and multi-agent robotic system. The transfer also encompassed various armament systems, reflecting the DRDO's commitment to enhancing indigenous defence capabilities.<sup>68</sup>

Recently, the DRDO handed over 23 LAToTs to 22 industries, covering various domains, such as electronics, armaments and aeronautics. These agreements include technologies like carbon/carbon aircraft brakes for the Light Combat Helicopter (LCA) Tejas and high-pressure water mist fire suppression system.<sup>69</sup> The DRDO handed over System for Advance Manufacturing Assessment and Rating (SAMAR) assessment certificates to nine industry partners.<sup>70</sup> The SAMAR has been developed by the DRDO in collaboration with the Quality Council of India (QCI), which serves as a standard to measure the competency of defence manufacturing enterprises. It provides an objective assessment of the manufacturing capability of defence manufacturing enterprises.<sup>71</sup> Along with this, SAMAR aims to strengthen the defence manufacturing ecosystem in the country with an objective to realise the vision of making India self-reliant in defence manufacturing.<sup>72</sup>

As mentioned earlier, the TDF plays a crucial role. Under TDF, a significant stride towards indigenous innovation is evident, with 164 technologies currently undergoing indigenisation through R&D efforts.<sup>73</sup> This concerted push towards self-reliance in defence technology is further underscored by the allocation of Rs 254 crores in funds, benefitting 5,408 companies.<sup>74</sup> Such initiatives not only bolster the Make in India agenda but also signify a concerted effort by the MoD and the DRDO to foster a robust ecosystem for defence innovation. This allocation of resources and support is poised to catalyse advancements across various sectors, nurturing home-grown talent and positioning India as a formidable force in defence technology on the global stage.

The programme has engaged over 2,000 experts, with four successful rounds of the 'Dare to Dream' initiative identifying 60 innovators. Core areas of focus include deep technologies and cyber domains, such as avionics, composite materials, AI, blockchain and more.<sup>75</sup> Notably, collaborations, like the memorandum of understanding between Naval Innovation and Indigenisation Organisation (NIIO) and TDF for naval sub-systems indigenisation, signify strategic partnerships.<sup>76</sup> Technologies developed under the TDF, ranging from composite materials to high-performance propulsion systems, offer promising commercial prospects and potential import substitution, leading to significant cost savings for the government.<sup>77</sup> Through this initiative (TDF), the scheme seeks to enhance India's capacity for defence technology, create an ecosystem of R&D, bolster domestic defence manufacturing and ultimately, achieve self-reliance in defence technology.<sup>78</sup> With 70 projects already sanctioned and 16 defence technologies realised, the

scheme has demonstrated tangible progress towards these goals, marking a significant stride towards bolstering India's defence capabilities.<sup>79</sup>

## CHALLENGES AND THE WAY FORWARD

The 'Make' procedure outlined in DAP 2020 presents several noteworthy challenges. The procedural framework exhibits a degree of bureaucratic complexity that may impede efficient approval processes and project implementation. Furthermore, the complex regulatory environment poses significant obstacles for entities seeking to innovate within the defence industry. The 'Make' procedure entails a series of stages—feasibility studies, project sanctioning, prototype development and trials—that are both lengthy and administratively burdensome.<sup>80</sup> This complexity deters smaller firms, start-ups and innovators from engaging in defence projects, thereby hindering technological advancement. Also, 'DAP-2020 contains ambiguous concepts and unnecessary changes, such as re-designating certain roles without improving functionality. Such modifications, combined with indecisiveness and slow decision-making, risk undermining the effectiveness of the procurement system.'<sup>81</sup> These challenges are further intensified by an opaque multi-stage acquisition cycle.<sup>82</sup>

In the case of funding in Make-I category, the government funds up to 70 per cent of development costs, capped at Rs 250 crore per agency, with phased disbursement based on progress. Make-II projects receive no government funding and rely on solutions from Indian vendors, including start-ups and MSMEs.<sup>83</sup> In addition, the 'Make' categories in DAP 2020 (such as Make-I and Make-II) impose rigid frameworks that may not accommodate the fluid nature of technological innovation. Moreover, 'the timelines in Make-II procedure have been reduced to 69–105 weeks'<sup>84</sup> and 'in case of only single vendor having offered the prototype within timelines stipulated in the Project Sanction Order, not more than two time extensions will be accorded'.<sup>85</sup> In addition, the ToT<sup>86</sup> process is complex, involving negotiations, legal agreements and regulatory compliance, which can be daunting for smaller firms. Bureaucratic hurdles lead to delays and higher costs, deterring innovation. Restricted access to advanced technologies and high acquisition costs limit opportunities for the MSMEs. The IP concerns and inconsistent support further complicate the process. Export restrictions also hinder global market access, affecting the growth and sustainability of Indian companies. The ToT process involves complex stages, including

negotiations, legal agreements and regulatory compliance,<sup>87</sup> which can be challenging for smaller companies with limited resources.

Additionally, the ADITI scheme,<sup>88</sup> which aims to foster innovation in defence technologies, faces some challenges. Funding might be insufficient for high-cost projects and bureaucratic hurdles can delay progress. Many projects may not reach higher technology readiness levels (TRLs),<sup>89</sup> limiting their deployment. Start-ups often struggle with scaling and market access, and integrating new technologies with existing systems can be complex. Programmes, such as SPARK, which contribute significantly to fostering innovation within India's defence ecosystem may encounter several potential challenges. A key concern is the possible inadequacy of infrastructure and resources needed by smaller start-ups and MSMEs to effectively develop and test prototypes.<sup>90</sup> Moreover, the nature of defence innovation often necessitates collaboration among diverse stakeholders, including the military, academia and industry.<sup>91</sup> Facilitating these collaborations can be complex and may benefit from more structured support mechanisms. Such considerations suggest potential barriers that could affect the establishment of a robust and dynamic defence innovation ecosystem.

The framework for understanding the challenges in fostering a resilient defence innovation ecosystem involves navigating procedural, regulatory and collaborative complexities, as seen in the 'Make' procedure under DAP 2020. The procedural requirements, combined with intricate regulations and extended timelines, may inadvertently discourage smaller firms and start-ups from engaging in defence innovation. Additionally, the structured frameworks and technology transfer processes may not always align with the dynamic nature of technological advancement, while access to resources and support for stakeholder collaboration could benefit from further enhancement. These factors collectively suggest areas where improvements might help in nurturing a more vibrant and effective innovation environment in the defence sector.

To cultivate a robust and forward-looking defence innovation ecosystem, it may be advantageous to implement certain refinements to the current and ongoing governmental initiatives. Strengthening the collaborative networks between the military, industry, academia and research institutions emerges as a critical factor; also, vibrant and synergistic partnerships among these sectors could significantly drive technological progress. This may necessitate periodic evaluations and updates of existing policies to ensure alignment with prevailing technological trends, mitigate uncertainties and provide greater precision regarding technology transfer mechanisms. Additionally,

it is prudent to invest in human capital through meticulously designed educational programmes, specialised training and skill development initiatives specifically tailored to the needs of defence innovation. Such measures are likely to foster a workforce adept at navigating and addressing future technological challenges.

## CONCLUSION

It is imperative that there is an established process for the integration of indigenous talent and capabilities into defence development through the 'Make' procedure of DAP 2020. This framework emphasises active engagement of Indian enterprises, public and private, in defence conceptualisation, development and production, supported by financial incentives for prototype development. These steps underscore the importance of policy-led initiatives in fostering innovation and self-reliance, exemplified by the MoD's commitment to financial assistance for prototype development under DAP 2020.

The article also highlights the role of DRDO in facilitating technology transfer and fostering an innovative environment, showcasing efforts to disseminate defence technologies efficiently and enhance capabilities within the defence manufacturing sector. In addition, the evolving start-up ecosystem in India over the last decade has significantly bolstered technological innovation, particularly within the defence sector. The surge in tech start-ups, especially those focused on critical and strategic defence technologies, underscores the transformative trajectory witnessed in defence innovation. The primary ideological theme here revolves around fostering collaboration between the defence establishment and the start-up ecosystem to address critical defence challenges and enhance national security. However, future challenges include scaling up the impact of these initiatives to mature the defence start-up ecosystem further and overcoming hurdles in developing defence applications. Despite these challenges, defence start-ups have showcased remarkable enhancements in unmanned systems, exemplifying the potential for transforming defence capabilities in India.

As we have seen, the process of bringing all the stakeholders together, emphasises the vital role of collaboration and innovation ecosystems in advancing defence technology. Key stakeholders, such as MSMEs, are pivotal in driving this transformation, contributing to the defence supply chain and indigenisation efforts. However, challenges persist, particularly regarding early stage funding for high-risk innovations by MSMEs. The collaborative



technology innovation programme of TIFAC and SIDBI, Srijan, is a notable effort to bridge this gap, facilitating the development and commercialisation of high-risk technologies. Moving forward, nurturing a robust innovation ecosystem will be crucial in addressing these challenges, thereby empowering stakeholders to drive transformative advancements in defence technology. Self-reliance in defence technology innovation is not only a strategic choice for India, it is an imperative. Over the years, it has evolved into a vital component of India's national security apparatus. The ongoing process to boost the technological innovation mechanism will further accelerate the defence manufacturing sector to meet future challenges effectively through various efforts and initiatives.

## NOTES

1. 'Innovations for Defence Excellence (iDEX): Operationalization Plan for Defence Innovation Organization (DIO) and Defence Innovation Fund (DIF)', April 2018, available at [https://makeinindiadefence.gov.in/admin/writereaddata/upload/files/Complete%20document%20on%20iDEX\\_1.pdf](https://makeinindiadefence.gov.in/admin/writereaddata/upload/files/Complete%20document%20on%20iDEX_1.pdf), accessed on 9 April 2024.
2. 'Reforms in Defence Sector: Propelling Private Sector Participation (2014–2021)', Department of Defence Production (DDP), Ministry of Defence (MoD), Government of India, 2021, available at <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/sep/defenceenglish.pdf>, accessed on 9 April 2024.
3. Ibid.
4. 'Research and Development Ecosystem in India', Vision IAS, 2022, available at [https://d19k0hz679a7ts.cloudfront.net/value\\_added\\_material/2549b-research-and-development\\_ecosystem-in-india.pdf](https://d19k0hz679a7ts.cloudfront.net/value_added_material/2549b-research-and-development_ecosystem-in-india.pdf), accessed on 9 April 2024.
5. 'Innovations for Defence Excellence (iDEX): Operationalization Plan for Defence Innovation Organization (DIO) and Defence Innovation Fund (DIF)', n. 1.
6. 'About iDEX', iDEX, available at <https://idex.gov.in/about-idex>, accessed on 9 April 2024.
7. 'Self-Reliance in Defence Sector', Press Information Bureau, Ministry of Defence, Government of India, 19 December 2022, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1884817>, accessed on 10 April 2024.
8. *Defence Acquisition Procedure 2020*, Ministry of Defence, Government of India, September 2020, p. 322, available at <https://www.mod.gov.in/sites/default/files/DAP2030new.pdf>, accessed on 12 March 2024.
9. Ibid.
10. Ibid.
11. 'DRDO Policy and Procedures for Transfer of Technology', Directorate of Industry Interface & Technology Management, DRDO, 2019, available at <https://www.drdo.gov.in/drdo/sites/default/files/inline-files/DRDO%20Policy%20&%20>

Procedure%20%20for%20ToT.pdf#:~:text=Licensing%20Agreement%20for%20Transfer%20of%20Technology%20(LATOT), accessed on 12 March 2024.

12. Ibid.

13. 'Technology Transfer by DRDO', Press Information Bureau, Ministry of Defence, Government of India, 27 March 2023, available at <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1911125>, accessed on 13 March 2024.

14. Ibid.

15. Ibid. Also see 'DRDO Hands Over 23 Licensing Agreements for Transfer of Technologies', *Business Standard*, 25 February 2024, available at [https://www.business-standard.com/india-news/drdo-hands-over-23-licensing-agreements-for-transfer-of-technologies-124022500665\\_1.html](https://www.business-standard.com/india-news/drdo-hands-over-23-licensing-agreements-for-transfer-of-technologies-124022500665_1.html), accessed on 13 March 2024.

16. 'Transfer of Technology (ToT) of DRDO Developed Counter COVID-19 Technologies', DRDO, Ministry of Defence, Government of India, available at <https://www.drdo.gov.in/drdo/transfer-technology-tot-drdo-developed-counter-covid-19-technologies>, accessed on 12 March 2024.

17. 'Indian Startup Ecosystem', Startup India, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India, 27 June 2023, available at <https://www.startupindia.gov.in/content/sih/en/international/go-to-market-guide/indian-startup-ecosystem.html>, accessed on 1 April 2024.

18. Ibid.

19. 'ADITI (Acing Development of Innovative Technologies with iDEX)', DIO, DDP, Ministry of Defence, Government of India, available at <https://idex.gov.in/sites/default/files/2024-03/ADITI%20Scheme%20.pdf>, accessed on 1 April 2024.

20. 'DefConnect 2024: Raksha Mantri Launches ADITI Scheme to Promote Innovations in Critical & Strategic Defence Technologies', Press Information Bureau, Ministry of Defence, Government of India, 4 March 2024, available at <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=2011171>, accessed on 1 April 2024.

21. Ibid.

22. Ibid.

23. Ibid.

24. 'ADITI (Acing Development of Innovative Technologies with iDEX)', n. 19.

25. Ibid.

26. 'SPARK: Support for Prototype and Research Kickstart (in Defence)', iDEX, available at [https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/files/SPARK\\_-\\_Support\\_for\\_Prototype\\_and\\_Research\\_Kickstart\\_%28in\\_Defence%29\\_framework\\_under\\_iDEX.pdf](https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/files/SPARK_-_Support_for_Prototype_and_Research_Kickstart_%28in_Defence%29_framework_under_iDEX.pdf), accessed on 19 March 2024.

27. 'Innovations for Defence Excellence (iDEX)', Press Information Bureau, Ministry of Defence, Government of India, 28 July 2021, available at <https://pib.gov.in/pressreleaseiframepage.aspx?prid=1739954>, accessed on 19 March 2024.

28. 'SPARK: Support for Prototype and Research Kickstart (in Defence)', n. 26.

29. Ibid.

30. 'Startup India', Department of Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India, 27 June 2023, available at [https://www.startupindia.gov.in/content/sih/en/about\\_us/about-us.html#:~:text=Since%20the%20launch%20of%20the,creators%20instead%20of%20job%20seekers](https://www.startupindia.gov.in/content/sih/en/about_us/about-us.html#:~:text=Since%20the%20launch%20of%20the,creators%20instead%20of%20job%20seekers), accessed on 27 March 2024.
31. Lok Sabha, 'Unstarred Question No. 1428', Department of Defence Production, Ministry of Defence, Government of India, 10 February 2023, available at <https://sansad.in/getFile/loksabhaquestions/annex/1711/AU1428.pdf?source=pqals>, accessed on 27 March 2024.
32. 'Ease of Doing Business in Defence Manufacturing', Press Information Bureau, Ministry of Defence, Government of India, 3 February 2021, available at [https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1694879#:~:text=Restriction%20of%20annual%20capacity%20in%20the%20Industrial,Home%20Affairs%20\(MHA\)%2C%20Public%20Sector%20Undertakings%20\(PSUs\)](https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1694879#:~:text=Restriction%20of%20annual%20capacity%20in%20the%20Industrial,Home%20Affairs%20(MHA)%2C%20Public%20Sector%20Undertakings%20(PSUs)), accessed on 2 April 2024.
33. 'IdeaForge Expands into Logistics Drones with Civilian and Military Applications', India Defence, 26 March 2024, available at <https://defence.in/threads/ideaforge-expands-into-logistics-drones-with-civilian-and-military-applications.4827/>, accessed on 20 March 2024.
34. Jatin Karani and Karan Goshar, 'Decoding the Defence Tech Opportunity in India', Inc42 Media, 12 June 2023, available at <https://inc42.com/resources/decoding-the-defence-tech-opportunity-in-india/?login=1>, accessed on 20 March 2024.
35. 'Indigenously Developed Drones Handed over to the Indian Army at Rashtriya Raksha Samarpan Parv', *Economics Times Government*, 20 November 2021, available at <https://government.economictimes.indiatimes.com/news/technology/indigenously-developed-drones-handed-over-to-the-indian-army-at-rashtriya-raksha-samarpan-parv/87811750>, accessed on 20 March 2024.
36. Rahul Bhatia, 'Defence Start-ups and India's Quest for Self-Reliance', Carnegie India, 5 September 2023, available at <https://carnegieindia.org/2023/09/05/defense-start-ups-and-india-s-quest-for-self-reliance-pub-90474>, accessed on 1 April 2024.
37. Ibid.
38. 'Defence Startups' Press Information Bureau, Ministry of Defence, Government of India, 17 December 2021, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1782604>, accessed on 1 April 2024.
39. 'Defence Innovation Hubs', Press Information Bureau, Ministry of Defence, Government of India, 11 February 2019, available at <https://pib.gov.in/newsite/PrintRelease.aspx?relid=188372>, accessed on 18 March 2024.
40. 'Innovations for Defence Excellence (iDEX): Operationalization Plan for Defence Innovation Organization (DIO) and Defence Innovation Fund (DIF)', n. 1.
41. Ibid.
42. Ibid.
43. 'Defence Innovation Hubs', n. 39.

44. 'About DIO' iDEX, available at <https://idex.gov.in/about-dio>, accessed on 19 March 2023.
45. Sanjeev Kumar, 'Empowering Defence: Unveiling the Integral Role of MSMEs in Advancing the Sector', *Manufacturing Today India*, 15 March 2024, available at <https://www.manufacturingtodayindia.com/empowering-defence-unveiling-the-integral-role-of-msmes-in-advancing-the-sector/#:~:text=With%20MSMEs%20emerging%20as%20the,the%20defence%20world%20is%20inexorable>, accessed on 19 March 2024.
46. Sanjeev Kumar, 'MSMEs Boosting Defence Production, Making Nation "Aatmanirbhar" in Defence Technologies & Systems', *ETGovernment.com*, 6 March 2024, available at <https://government.economicstimes.indiatimes.com/blog/msmes-boosting-defence-production-making-nation-aatmanirbhar-in-defence-technologies-systems/108265668#:~:text=In%202022%2C%20more%20than%2010%2C000>, accessed 6 April 2024.
47. Naval Jagota, 'Innovation for Defence Excellence (iDEX): Where Do We Stand?', Vivekananda International Foundation, 22 February 2023, available at <https://www.vifindia.org/2023/february/22/innovation-for-defence-excellence-idex#:~:text=The%20iDEX%20programme%20has%20progressed%20and%20signed,MSME%20or%20individual%20Innovators%20have%20been%20engaged>, accessed on 22 March 2024.
48. 'Scheme for Innovations for Defence Excellence (iDEX)', DIO, DDP, Ministry of Defence, Government of India, 2021, available at <https://www.ddpmod.gov.in/sites/default/files/iDEX%20scheme%20Final3.pdf#:~:text=A%20scheme%20of%20the%20Department%20of%20Defence>, accessed on 22 March 2024.
49. 'Defence India Start-up Challenges', iDEX, available at <https://idex.gov.in/challenge-categories>, accessed on 2 April 2024.
50. 'Prime Minister Shri Narendra Modi Unveils "SPRINT Challenges" Aimed at Giving a Boost to Usage of Indigenous Technology in Indian Navy', Press Information Bureau, Ministry of Defence, Government of India, 18 July 2022, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1842449>, accessed on 22 March 2024.
51. '2nd Edition of Indian Navy's Naval Innovation and Indigenisation Seminar', Press Information Bureau, Ministry of Defence, Government of India, 18 September 2023, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1958527>, accessed on 22 March 2024.
52. 'Self-Reliance in Defence Sector', Press Information Bureau, Ministry of Defence, Government of India, 4 August 2023, available at <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1945710>, accessed on 4 April 2024.
53. 'Srijan', Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, Ministry of Science and Technology, Government of India, available at <https://www.tifac.org.in/index.php/programmes/admin-finance/sidbi>, accessed on 5 April 2024.

54. 'TIFAC–SRIJAN Scheme', Small Industries Development Bank of India (SIDBI), Technology Innovation Programme, available at [https://www.sidbi.in/uploads/product/TIFAC\\_SRIJAN.pdf](https://www.sidbi.in/uploads/product/TIFAC_SRIJAN.pdf), accessed on 3 April 2024.
55. Ibid.
56. 'Major Announcements by Raksha Mantri during the Plenary Session of "Swavlamban 2.0"', Press Information Bureau, Ministry of Defence, Government of India, 4 October 2023, available at [https://pib.gov.in/PressReleasePage.aspx?PRID=1964272#:~:text=The%20DMA%20had%20earlier%20promulgated,Public%20Sector%20Undertakings%20\(DPSUs\)](https://pib.gov.in/PressReleasePage.aspx?PRID=1964272#:~:text=The%20DMA%20had%20earlier%20promulgated,Public%20Sector%20Undertakings%20(DPSUs)), accessed on 3 April 2024.
57. Ibid.
58. Ibid.
59. 'Self-Reliance in Defence Production', Press Information Bureau, Ministry of Defence, Government of India, 23 March 2023, available at <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1908804>, accessed on 3 April 2024.
60. Ibid.
61. 'Union Budget 2014–15', *india.gov.in* (National Portal of India), available at <https://www.india.gov.in/spotlight/union-budget-2014-2015#budget6>, accessed on 1 April 2024.
62. 'Technology Development Fund', Defence Research & Development Organisation, Ministry of Defence, Government of India, available at <https://tdf.drdo.gov.in/>, accessed on 4 April 2024.
63. Ibid.
64. Rajya Sabha, 'Unstarred Question No. 2897', 22 March 2021, available at <https://Sansad.In/Getfile/Annex/253/Au2897.Pdf?Source=Pqars>, accessed on 13 March 2024.
65. Ibid.
66. 'Ministry of Defence—Year End Review 2023', Press Information Bureau, Ministry of Defence, Government of India, 22 December 2023, available at <https://pib.gov.in/Pressreleaseiframepage.aspx?Prid=1989502>, accessed on 13 March 2024.
67. Ibid.
68. 'DRDO Hands Over Licensing Agreements for Transfer of Technology for 14 Technologies to 20 Industries', Press Information Bureau, Ministry of Defence, Government of India, 5 February 2021, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1695630>, accessed on 12 March 2024.
69. 'DRDO Hands Over 23 Licensing Agreements for Transfer of Technology to Industries during Maharashtra MSME Defence Expo 2024', Press Information Bureau, Ministry of Defence, Government of India, 25 February 2024, available at <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2008923>, accessed on 13 March 2024.
70. Ibid.
71. 'SAMAR, System for Advance Manufacturing Assessment and Rating', DRDO, Ministry of Defence, Government of India, available at <http://zedv3.umon.in/>, accessed on 13 March 2024.

72. Ibid.
73. 'Technology Development Fund', n. 62.
74. Ibid.
75. 'Dare to Dream 4.0', Technology Development Fund (TDF, DRDO, Ministry of Defence, Government of India, available at <https://tdf.drdo.gov.in/daretodream>, accessed on 3 April 2024.
76. Arvind Khare, 'Technology Development Fund: Opportunities and Challenges', Issue Brief, Manohar Parrikar Institute for Defence Studies and Analyses (MP-IDSA), 3 November 2023, available at <https://www.idsa.in/issuebrief/technology-development-fund-akhare-031123>, accessed on 3 November 2023.
77. Ibid.
78. 'Technology Development Fund', Press Information Bureau, Ministry of Defence, Government of India, 8 December 2023, available at <https://pib.gov.in/PressReleasePage.aspx?PRID=1983971>, accessed on 2 April 2024.
79. Ibid.
80. Amit Cowshish, 'Challenges in Defence Acquisitions', Vivekananda International Foundation, 26 August 2022, available at <https://www.vifindia.org/article/2022/august/26/challenges-in-defence-acquisitions>, accessed on 29 August 2024.
81. Amit Cowshish, 'Decoding Defence Acquisition Procedure 2020', Issue Brief, MP-IDSA, 20 November 2020, available at <https://idsa.in/issuebrief/decoding-dap-2020-acowshish-201120>, accessed on 29 August 2024.
82. Ibid.
83. 'Procedure for Procurement under "Make" and "Innovation" Categories', Chapter III, available at <https://makeinindiadefence.gov.in/admin/writereaddata/upload/files/Make%20Procedure.pdf>, accessed on 29 August 2024.
84. 'Defence Procurement Procedure for "Make-II" Subcategory of "Make" Procedure', Chapter III-A, available at [https://makeinindiadefence.gov.in/admin/writereaddata/upload/Make\\_-II\\_Procedure\\_final.pdf](https://makeinindiadefence.gov.in/admin/writereaddata/upload/Make_-II_Procedure_final.pdf), accessed on 29 August 2024.
85. Ibid.
86. 'Transfer of Technologies', Directorate of Industry Interface & Technology Management, DRDO, Ministry of Defence, Government of India, October 2019, available at <https://www.drdo.gov.in/drdo/transfer-technologies>, accessed on 30 August 2024.
87. Ibid.
88. 'DefConnect 2024: Raksha Mantri Launches ADITI Scheme to Promote Innovations in Critical & Strategic Defence Technologies', n. 20.
89. 'ADITI (Acing Development of Innovative Technologies with IDEX)', n. 19.
90. 'SPARK: Support for Prototype and Research Kickstart (in Defence)', n. 26.
91. 'Innovations for Defence Excellence (iDEX)', n. 27.