"IDEX INITIATIVE IN INDIAN ARMY A CRITICAL ANALYSIS"

Dissertation Submitted to the Panjab University, Chandigarh for the award of degree of **Executive Masters in Public Administration and Public Policy,** in partial fulfilment of the requirement for the Advanced Professional Programme in Public Administration (2023-24)

Submitted by

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NEW DELHI

Certificate

I have the pleasure to certify that Brigadier Amit Misra**,** has pursued his research work and prepared the present dissertation titled 'IDEX Initiative in Indian Army : A Critical Analysis', under my guidance and supervision. The same is the result of research done by him and to the best of my knowledge; no part of the same has been part of any monograph, dissertation or book earlier. This is being submitted to the Panjab University, Chandigarh, for the purpose of **Executive Masters in Public Administration and Public Policy** in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Brigadier Amit Misra is worthy of consideration for the award of Executive Masters degree of the Panjab University, Chandigarh.

Date : March

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New Delhi

March 2024

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Declaration

I, the undersigned, hereby declare that the dissertation titled '**IDEX Initiative in Indian Army : A Critical Analysis**' is my own work and that all the sources I have accessed or quoted have been indicated or acknowledged by means of completed references and bibliography. The dissertation has not been submitted for any other degree of this university or elsewhere.

New Delhi **Brigadier Amit Misra**

March 2024 **Roll No – 4913**

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LIST OF ABBREVIATIONS

Abbreviation	Full Form
ADB	Army Design Bureau
AFV	Armoured Fighting Vehicle
AI	Artificial Intelligence
AID	Agence de l'innovation de Défense (France)
Cr	Crore
DA	Developing Agency
DAP 2020	Defence Acquisition Procedure 2020
DGQA	Directorate General of quality Assurance
DII	Defence Innovation Initiative
DIO	Defence Innovation Organisation
DIU	Defence Innovation Unit
DISC	Defence India Startup Challenge
DPSU	Defence Public Sector Undertaking
DRDO	Defence Research and Development Organisation
FET	Field Evaluation Trials
GoI	Government of India
GSQR	General Staff Qualitative Requirements
HEMRL	High Explosive Materials Research Laboratory
HPSC	High Powered Screening Committee
IA	Indian Army
MoD	Ministry of Defence
MOQ	Minimum Order Quantity
MoU	Memorandum of Understanding
MS	Milestone
MSME	Medium, Small and Micro Enterprises
OFB	Ordnance Factory Board
PDC	Projected Date of Completion
PDS	Problem Definition statement
PFT	Project Facilitation Team
PRU	Product Requirement Units
PSQR	Preliminary Service Qualitative Requirements
R&D	Research and Development
SPARK	Support for Prototype And Research Kickstart
SSCT	Single Stage Composite Trial
TDF	Technology Development Fund
TEC	Technical Evaluation Committee

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ABSTRACT

In the rapidly evolving global landscape, maintaining military supremacy necessitates continuous integration of cutting-edge technology. This imperative is underscored by the enhanced awareness, communication, lethality, and protection benefits that the latest innovations offer. The dissertation explores the integration challenges and ethical considerations accompanying this pursuit. Despite challenges, embracing technological advancements is imperative for national defence. The global landscape showcases initiatives in the USA, UK, and France, highlighting strengths and challenges. The focus then shifts to India's Defence Innovation Organization, established to overcome constraints in the Indian defence innovation ecosystem. IDEX, a pivotal shift in India's defence approach, aims to boost domestic innovation, address military needs, strengthen the defence industry, and promote self-reliance. The core objective is to create an ecosystem fostering innovation, entrepreneurship, and technology development in defence and aerospace. The IDEX framework outlines activities ranging from setting up innovation hubs to facilitating scale-up and indigenization. Ultimately, IDEX seeks to establish a culture of collaboration between innovators and the Indian defence industry, ensuring a self-reliant and technologically advanced defence sector.

The IDEX process serves as a pioneering initiative by the Ministry of Defence, Government of India, aimed at leveraging the innovation potential of start-ups and MSMEs to infuse cutting-edge technology into the armed forces. The process is outlined through the launch of various challenges, including Defence India Startup Challenge, Open Challenges, IDEX PRIME, and IDEX PRIME (Space), presenting problem statements from Armed Forces, DPSUs, and OFB. The challenges are open to start-ups, Indian companies, and individual innovators.

The IDEX structure, depicted in Figure 2.1, involves a multi-stage evaluation process. Start-ups and MSMEs respond to specific problem statements, undergo rigorous evaluation by a High Powered Selection Committee, and winners receive innovation grants through the 'Support for Prototype and Research Kickstart' program. The grant winners then engage in a Technical Appraisal, sign agreements with IDEX, and proceed through multiple milestones toward the development of a production-ready prototype.

This dissertation explores the innovation landscape within the Indian Army (IA) with a particular focus on the IDEX initiative. The IA, known for its resourcefulness in challenging conditions, has a rich

history of in-house innovations. The IDEX initiative, backed by the Ministry of Defence, aims to harness cutting-edge technology from the country's talent pool.

The Army Design Bureau, established in 2016, serves as a crucial link between field formations, product developers, and the Defence Innovation Organization. The IA actively supports IDEX. The dissertation delves into 57 IDEX projects initiated by the IA, outlining their progress and categorizing them based on development stages, delays, and project types (software vs. hardware). It presents a breakdown of costs, revealing a range from Rs 1.16 Cr to Rs 21.46 Cr, emphasizing the financial commitment of the Defence Innovation Ecosystem.

Two case studies, one successful (Integrated Mobile Camouflage System - IMCS) and one unsuccessful (Active Protection System), shed light on the intricacies of IDEX projects. IMCS, a product of Open Challenge 1, demonstrates successful collaboration, adaptability, and perseverance, while the Active Protection System faces challenges attributed to ambitious problem statements, bureaucratic hurdles, and external factors like the COVID-19 pandemic. Surveys targeting IA stakeholders and current Development Agencies engaged in IDEX projects provide insights into perceptions, challenges, and areas for improvement. IA stakeholders express varying levels of confidence in handling IDEX procedures, raising concerns about timelines, funding, and DAs' comprehension of military requirements.

The dissertation includes an interview of Major General CS Mann, AVSM, VSM, Additional Director General of the Army Design Bureau, offering a valuable perspective on IDEX's effectiveness in the IA. The role of bureaucracy in supporting IDEX through policy development, collaboration facilitation, funding, process streamlining, and ongoing evaluation is emphasized.

The IDEX program, in its early stages, has shown substantial response from startups and MSMEs, attracting numerous challenges. However, several impediments hinder its optimal exploitation. This study, through interactions with stakeholders, identifies key obstacles including bureaucratic mindsets, complex approval processes, procurement challenges, funding constraints, unrealistic timelines, lack of focus areas, and transparency issues. The study highlights the need for a shift in mindsets, simplified procedures, and addressing financial, technical, and procedural challenges. Chapter 4 outlines the way forward, suggesting measures such as relaxation in eligibility criteria, addressing benchmarking issues, accepting products with spiral development, expediting approval timelines, revising payment schedules, and supporting startups during the transition to the Make-Indian category. The ongoing efforts to amend procedures demonstrate the program's

adaptability, aiming to enhance the IDEX process continually. The study concludes by emphasizing the importance of collaborative efforts, overcoming bureaucratic hurdles, and supporting startups to unlock the full potential of the IDEX program in promoting innovation in defence technology. The study recognizes IDEX as a transformative initiative while identifying areas for improvement to enhance its impact on the Indian defence innovation ecosystem.

"*Innovation distinguishes between a leader and a follower*" – Steve Jobs

CHAPTER 1 : IDEX INITIATIVE IN INDIAN ARMY

Introduction

In the realm of military affairs, the paramount importance of innovation cannot be overemphasized, as it assumes a pivotal role in ensuring the efficacy, efficiency, and adaptability of a nation's defence forces. Persistent endeavours towards innovation and subsequent assimilation of pioneering developments into the military apparatus are imperative for attaining technological supremacy. This not only involves adapting to ever-evolving threats but also guarantees operational efficiency, minimizes casualties, optimizes resources, secures tactical and strategic advantages, sustains deterrence, addresses budgetary constraints, and nurtures human capital.

Consonant with this unwavering commitment to innovation, the Defence Acquisition Procedure (DAP) of 2020 delineates three programs for 'Procurement through Innovative Solutions': IDEX, the Technology Development Fund (TDF) of DRDO, and Indigenous Development by Services through Internal Organizations. Launched in 2018 as a component of the Defence Innovation Organization (DIO), the IDEX initiative aims to financially support and oversee innovations in the defence and aerospace sectors. The DIO functions as a 'Not for Profit' organization under Section 8 of the Companies Act 2013.

IDEX collaborates with various industries, notably Micro, Small, and Medium Enterprises (MSMEs), start-ups, and individual innovators, providing them with financial support and assistance for research and development that demonstrates promising potential for future adoption in Indian defence and aerospace requirements. The operational framework of IDEX encompasses the establishment of IDEX Hubs, the organization of challenges such as the Defence India Startup Challenges (DISC) tailored to specific armed forces requirements, evaluation of responses, guidance of selected participants through incubators, and facilitation of communication with pertinent stakeholders to develop viable solutions.

This initiative seeks to harness the abundant talent pool in the country and extends SPARK (Support for Prototype and Research Kickstart) Grants of up to Rs 1.5 Crore for individuals, start-ups, and MSMEs to bridge funding gaps in their projects. With a total of 10 DISCs organized by IDEX to date, featuring numerous challenges or problem statements, a comprehensive analysis of the outcomes of the scheme and verification of its efficacy would be judicious, given its nearly 5-year operational history.

Statement of the Problem

The Indian government, launched IDEX initiative as a step towards achieving self-reliance and enhancing defence capabilities. While IDEX holds significant promise, there exists a critical knowledge gap regarding its actual efficacy in driving innovation within the Indian Army. This research seeks to investigate the extent to which the IDEX initiative has effectively facilitated innovation in the Indian Army. In doing so, the study aims to identify the strengths and weaknesses of the IDEX program and provide valuable insights for policymakers, military strategists, and defence industry stakeholders to optimize its potential contribution to the Indian Army.

Rationale / Justification

The IDEX initiative was launched more than five years back and it is now time to carry out an initial assessment of the policy, its successes and failures so far and to evolve the policy further for better results. The following multifaceted factors urge us to carry out this assessment :-

- **Technological advancement and capability building of Indian Army**. Indian Army has to rapidly evolve in this modern era if it wants to stay relevant in the modern battlefield milieu. IDEX is one of the most important policy initiatives by the govt to harness the huge pool of talent available in the country to achieve this aim. It is important to assess how far the initiative has succeeded in this aim.

- **Optimal financial allocation by understanding the efficacy of various initiatives** . Finances are always limited and specially so in a developing country such as ours. We need to determine if we are getting the 'Bang for our Buck' and take future decisions to moderate the financial outlay accordingly.

- **Mid course corrections, if required**. IDEX is a relatively new policy launched barely five years back. While it is too early to realistically assess the success or failure of the policy, this analysis can provide us valuable inputs on possible tweaking of the policy in order to maximise returns.

- **Attainment of ATMANIRBHAR BHARAT**. IDEX aims at exploiting the vast pool of talent available within the country alongwith its successful 'start-up ecosystem' in order to attain the lofty objective of a self reliant India as the country enters its Amrit Kaal. This research will define the extent to which the policy has been successful in this field.

- **Academic and research contribution**. The research will contribute to the extremely limited academic resources available in this field.

- **Public accountability**. As mentioned earlier, for a developing country such as ours, funds are always limited and must be judiciously prioritised. This policy, which entails expenditure of public money on a new policy initiative is accountable to the public and this accountability demands a periodic review of its successes and failures.

The research on "IDEX Initiative in Indian Army" serves the broader interests of national security, efficient resource allocation, and strategic autonomy. It also contributes to the development of defence industries, informs decision-making, and promotes accountability.

Literature Review

IDEX being a relatively young concept, the availability of literature on the subject is rather scarce. Most of the available literature consists of a plethora of government procedures and policies related to product development and procurement in addition to a few articles about the scheme.

The primary source of info is the govt website on IDEX, IDEX.gov.in, which provides a comprehensive database of all existing policy provisions and details of various IDEX challenges. However, the information is not comprehensive and the stakeholders are required to refer to other policy documents in order to fully comprehend the process.

The principal policy document in this field is the Defence Acquisition Procedure, 2020, published by the Govt of India, Ministry of Defence, under the overarching theme of 'Atmanirbhar Bharat'. Chapter III of this document is dedicated to the 'Make and Innovation Category'. The chapter elucidates the procedures to be followed in projects originating

through IDEX, however, it does not cater exclusively to the Start-ups and MSMEs which operate under totally different constraints as compared to established defence industries.
Other govt policies and provisions are also sometimes too labyrinthine for the young inexperienced start-ups to navigate who may get frustrated by the complexities therein and the requirement of inordinate amount of time and paperwork in non-core activities. The document has undergone periodic amendments to streamline various procedures. The last amended version was released in March 2023.

'Advantage through Innovation', a document published by the Ministry of Defence, UK, lays down the framework for its Defence Innovation Initiative. The document lists out the modern day challenges being faced by the armed forces, core principles guiding innovation in defence, establishment of a defence innovation fund, the institutional framework to promote innovation as also the desired capabilities.

'Defence innovation Priorities (2019)', another document published by the Ministry of defence, UK, sets out the country's priorities for innovation. They are where their most pressing problems overlap with what can be addressed through collaboration with the civil sector. Not just technological innovation but also innovative policy, practice and process.

'Pushing Limits, Defence Innovation in a High Tech world (2021)', a paper published by the European Defence Agency gives a brief insight into emerging disruptive technologies in the field of defence, highlights importance of defence innovation, looks at member states' defence innovation strategies, including France, Netherlands, Estonia, etc and also talks about the need for the industry to adapt to this new strategy.

https://www.diu.mil, website of the Defence Innovation Unit (DIU), USA, gives an insight into the role of DIU, challenges being faced by it and also lists out the six key portfolios in the field of innovation. Its Annual Report for 2022 explains the successes achieved by it in the previous year, gradual increase in number of contracts awarded and opening of new offices across the country.

Upadhyaya (2023), in his article on 'Absorption of Emerging Technologies in Armed Forces' talks about the Changing Nature of Warfare in current scenario, the importance of Critical and Emerging Technologies in waging the modern war and the

need to establish Technology Structures within the defence establishment to promote innovation.

Samuel (2020), in his article on 'Heclping Start-ups Cross the Valley of death : Main Challenge for IDEX' brings out the main features of IDEX, in that it facilitates smaller entrepreneurs, has incorporated Incubators for handholding of inexperienced start-ups and established a good ecosystem for promoting innovation in defence sector. He very pertinently points out the pitfalls which challenge all stakeholders post selection of respondents and recommends that they need to be guided to navigate this complex web of defence procurements.

LK Behera (2014), in his IDSA paper on 'Defence Innovation in India : The Fault Lines' points out that despite self reliance being a core objective of all the policy makers in India since independence and existence of a huge establishment in both public and private sector, there have been very few notable achievements in this field, leading to a huge import bill. The term 'Innovation' has for the first time found a mention in 2003, as far as govt policies are concerned. He attributes this lacklusture performance to lack of a higher organizational structure to direct indigenous R&D, absence of a comprehensive R&D policy, meager resources, poor scientist to staff ratio in DRDO among other factors.

The same author, LK Behera (2021) in his ORF Issue Brief, 'Defence Acquisition Procedure 2020: Imperatives for Further Reforms' welcomes the newly revamped DAP 2020 but emphasizes the need for early fixing accountability in procurement delays, a dedicated acquisition cadre and fewer categories of procurement leading to increased in domain expertise and simplification of procedures.

Research Gaps. It has clearly emerged from the Literature Review that while IDEX is a pioneering step towards encouraging innovations in the Indian defence sector, the path is still strewn with a number of obstacles. While there are statements urging further reforms, no concrete analysis is available on the success/failure of various IDEX projects undertaken by the IA so far, reasons therein and need to amend/ streamline processes, if any.

Research Objectives

The research objectives of the study are :-

- To analyse the progress of various IDEX challenges projected by the Indian Army since the inception of the scheme and recommend the type of projects to be prioritised under this initiative keeping in mind their success rate and that the initiative is specifically aimed at MSMEs and Startups.
- To study the processes involved in selection/shortlisting of respondents and release of SPARK Grants and recommend improvements, if required, in order to make the process smoother and more effective.

Research Design

Given the complexity of the topic and the need for a comprehensive assessment, a **Mixed-Methods Research Strategy** will be adopted with **Convergent Research Design**. This approach combines qualitative and quantitative research methods to provide a holistic understanding of the efficacy of IDEX.

Qualitative Analysis will be carried out by Conduct of semi-structured interviews and focus group discussions with key stakeholders, to include Indian Army officers, Startups, MSMEs and Policy Makers, Analyzing relevant documents, reports, and policy papers related to IDEX and Qualitative data analysis to identify key challenges and perceptions related to IDEX.

Quantitative Analysis will include developing and administering surveys to a representative sample of Indian Army officers, defence industry professionals, and other innovation ecosystem stakeholders, quantify the perceptions and experiences regarding the impact and effectiveness of IDEX and statistical analysis, including descriptive statistics and inferential tests, to analyze survey data.

Thereafter, qualitative and quantitative findings will be synthesised to provide a comprehensive assessment of IDEX's efficacy in the Indian Army.

Methods to be Applied and Data Sources

To conduct this research, a mix of research methods will be employed to comprehensively evaluate the initiative's impact and effectiveness. Data Collection methods will be both Qualitative and Quantitative. Sampling will also be both Qualitative and Quantitative. The proposed research methods and techniques are as given below.

Literature Review. Conduct an extensive literature review to gain insights into previous studies, reports, and academic work related to innovation initiatives, and the Indian defence sector.

Qualitative Research Methods.

- **Semi-Structured Interviews.** Conduct interviews with key stakeholders to include Indian Army officers, Start-ups, MSMEs and policy makers. Probe for insights on the perceived impact of IDEX and challenges faced.

- **Document Analysis.** Analyze relevant documents, reports, policy papers, and official communications related to IDEX. Extract valuable information and insights from these sources.

Quantitative Research Methods. Develop structured surveys/questionnaires targeting Indian Army officers, defence industry professionals, and innovation ecosystem stakeholders. Collect quantitative data on perceptions, attitudes, and experiences regarding IDEX's impact and effectiveness.

Data Analysis.

- **Qualitative Data Analysis**. Use thematic content analysis to identify patterns, themes, and narratives from interviews, focus group discussions, and document analysis. Summarize and interpret qualitative findings to provide context.

- **Quantitative Data Analysis**. Utilize statistical analysis to analyze survey data. Employ descriptive statistics (mean, median, standard deviation) to draw quantitative conclusions.

Case Studies. Consider conducting in-depth case studies of specific projects or innovations that have emerged from the IDEX initiative. Examine the development process, outcomes, and impact of these cases on the Indian Army's modernization.

Policy Analysis. Analyze defence policies and regulations related to IDEX and its objectives. Evaluate the alignment between these policies and the practical implementation of IDEX.

Primary Data. Primary data would be sourced through interaction with key stakeholders, including military officials, defence industry representatives, policymakers, and experts in defence innovation.

Secondary Data. Since there is no previous research on the subject and neither have any books been authored on it, secondary data will primarily consist of various documents and records available with the Army HQs and IDEX project holders as also various govt policies on the subject. Considerable material is available on the IDEX related websites and the same will also be studied.

Research Questions

The research questions that would be addressed are as under : -

1. What is the rate of success of various IDEX projects undertaken by the Indian Army and are there any specific fields where such projects have a higher rate of success ?

2. What are the experiences of various stakeholders, to include Indian Army officers, Start-ups, MSMEs and policy makers regarding the impact and effectiveness of IDEX ?

3. What are the challenges and obstacles encountered in the implementation of IDEX, and how have they impacted its efficacy ?

4. What are the policy implications and recommendations for optimizing the effectiveness of IDEX in the Indian Army ?

Scope / Limitations/ Delimitations

The study deals with an ongoing issue related to national security which has multiple dimensions and interlinked issues, some of which fall in the operational and classified domains. The study is limited in scope to those aspects which are unclassified and available as open source information.

Chapterisation Scheme

The research exercise is proposed to be laid out as per following chapters:-

Chapter 1 : Introduction. This chapter will aim to introduce the reader to the topic. Aspects intended to be covered in this chapter include Background and Context, Research Problem and Objectives, Rationale and Significance of the research, Research questions, Scope of the Research and Dissertation structure.

Chapter 2 : Defence Innovation Ecosystem and IDEX. This chapter will provide an overview of similar such initiatives in other countries, describe the Shortcomings of the Defence Innovation Ecosystem in India prior to IDEX as also provide an Overview of IDEX including its Objectives and Strategies, Implementation Mechanisms, Key Initiatives and Policy Framework.

Chapter 3 : IDEX and Indian Army, Gains and Losses. This chapter will review the various IDEX initiatives launched by Indian Army and analyse the reasons for success or failure of a few projects as case studies. The chapter will also critically examine the related policy issues.

Chapter 4 : The Way Ahead. The chapter will analyse the findings of the previous chapters and recommend a way ahead in terms of recommending focus areas for IDEX projects to maximise its effect and policy changes, if required.

CHAPTER 2 : DEFENCE INNOVATION ECOSYSTEM AND IDEX

In today's rapidly evolving world, maintaining a nation's military edge hinges on one crucial factor: embracing the continuous integration of the latest technological advancements. Just as cutting-edge smart phones render their predecessors obsolete within months, military technology must constantly adapt to stay ahead of potential threats. Incorporating the latest tech innovations is a strategic imperative for national defence due to the following reasons :-

Enhanced Awareness and Decision-Making:

- Equipping soldiers with AI-powered sensors and exoskeletons enables real-time battlefield data access and enhances physical capabilities.
- Advanced drones and satellites provide unparalleled aerial reconnaissance, offering commanders a comprehensive battlefield view.
- Big data analytics and machine learning algorithms sift through vast information to predict enemy movements and optimize troop deployment.

Superior Communication and Coordination:

- Secure, encrypted communication networks facilitate seamless information exchange among troops, commanders, and intelligence units.
- Cybersecurity advancements protect critical infrastructure, preventing potential cyber attacks that could disrupt military operations.
- Collaborative platforms enable real-time sharing of tactical data and intelligence, promoting coordinated responses to evolving threats.

Increased Lethality and Precision:

- Next-gen weaponry like hypersonic missiles and directed-energy weapons deliver unmatched striking power and range.
- Autonomous systems such as drones and robotic vehicles engage in high-risk missions with minimal human involvement.
- Precision-guided munitions minimize collateral damage and civilian casualties, aligning with ethical principles of warfare.

Improved Soldier Protection and Performance:

- Advanced body armour and exoskeletons enhance soldier protection and endurance on the battlefield.
- Medical robotics and AI-powered diagnostics offer rapid and efficient medical care in combat zones.
- Biotechnologies have the potential to enhance human performance and resilience, pushing physical and cognitive capabilities.

Countering Emerging Threats:

- AI detects and counters cyber attacks, disinformation campaigns, and other emerging threats.
- Robotics and autonomous systems neutralize remotely detonated explosives and navigate hazardous environments.
- Investing in cutting-edge technologies ensures preparedness for unforeseen challenges and future conflicts.

Integration Challenges and Ethical Considerations:

- Despite undeniable benefits, new technology incorporation raises challenges.
- High development and implementation costs require careful resource allocation.
- Ethical concerns arise with the use of autonomous weapons and AI, focusing on accountability and potential misuse.
- Maintaining a human-in-the-loop approach remains crucial for oversight and control over critical decisions.

Despite challenges, integrating the latest technological advancements into national military technology is imperative. By embracing innovation, nations can enhance defence capabilities, safeguard national security, and protect citizens in an ever-evolving world. The choice is clear: adapt or be left behind.

Major global military powers recognize the importance of incorporating innovations into military technology. India is not alone in exploring modernization avenues for defence forces. Many developed countries have initiated reforms, gradually yielding positive results. Let's now examine other global initiatives in this regard.

GLOBAL SCAN

Innovation in the field of defence is not a new concept per-se, with military innovations having changed the face of warfare innumerable times in history. However, off late, many countries have initiated dedicated efforts to promote innovations in defence technology away from the traditional weapons industry and tried to harness the potential of young technical minds to incorporate cutting edge technology in this field. This section discusses three such initiatives by USA, UK and France, three of the leading defence industrial powers, in order to put India's efforts in the same field in context.

USA

The United States has consistently led in global military technology, driven by its significant financial and technical resources. The Defence Innovation Unit (DIU), initiated by the US Department of Defence in 2015 as the 'Pentagon's Innovation Experiment,' plays a crucial role in fast-tracking the integration of cutting-edge commercial technologies into military applications. With a focus on bridging the gap between the Department of Defence (DoD) and the commercial technology sector, DIU aims to harness innovations that enhance U.S. military capabilities.

DIU operates under six dedicated portfolios, addressing national security demands in AI/ML (artificial intelligence/machine learning), Autonomy, Cyber, Human Systems, Energy, and Space. Reporting directly to the Secretary of Defence, the current director, Douglas Beck, previously Vice President at Apple, brings a wealth of experience in business development and military service.

Key Aspects Defining DIU's Role are as under :-

- Technology Scouting: Actively seeking emerging technologies from private companies, startups, and research institutions to incorporate promising innovations into defence and national security applications.
- Rapid Prototyping: Focusing on facilitating rapid prototyping and experimentation to swiftly develop and test prototypes of new technologies, assessing their feasibility and military utility.
- Commercial Partnerships: Establishing partnerships with commercial companies to streamline the adoption of their technologies for military use, leveraging the agility and innovation of the private sector.

- Acquisition Reform: Working on reforming traditional defence acquisition processes to make technology procurement more agile, efficient, and responsive to technological advancements.
- Cross-Service Collaboration: Collaborating with various branches of the U.S. military to ensure innovative solutions address the diverse needs of different services.
- Focus Areas: Concentrating on various technology areas such as artificial intelligence, autonomy, data analytics, cyber security, and space to enhance the military's technological capabilities.
- Commercial Investment: Investing in promising commercial technologies through pilot programs, contracts, or other funding mechanisms to stimulate innovation in the private sector while providing the military access to cutting-edge capabilities.
- Prototyping and Field Testing: Supporting the development of prototypes and facilitating field testing to assess new technologies' performance in real-world conditions.

Challenges. Despite successes in technology adoption, agile prototyping, forging commercial partnerships, expanding innovation hubs beyond Silicon Valley, and focusing on key technological areas, the DIU faces challenges :-

- Resistance to Change: Traditional defence acquisition processes and bureaucratic hurdles hindering the rapid adoption of innovative technologies.
- Sustainability of Impact: Ensuring sustained impact over the long term requires ongoing commitment and support.
- Integration with Existing Systems: Complexities in integrating new technologies with existing military systems, posing challenges in effective deployment.
- Project Management and Oversight: Given the high-risk nature of many DIU projects, effective project management and oversight are crucial for long-term success.
- Transparency and Communication: Clear communication and transparency about the goals, progress, and outcomes of DIU initiatives are vital for building trust and support.

Success Stories. Specific success stories of the DIU are not publicly disclosed due to the sensitive nature of military technology. However, following notable examples and initiatives have been acknowledged by the DIU and the Department of Defence :-

- Project Maven (AI for Image Recognition): Project Maven, led by DIU, focused on leveraging AI for image recognition and analysis. The project aimed to enhance the military's ability to process and analyze large volumes of data, particularly from aerial

drones. While controversial, it highlighted the DIU's commitment to integrating AI into military operations.

- Secure Cloud Management (Project Eagle): DIU has worked on cloud computing initiatives to improve data management and access. "Project Eagle" aimed at developing a secure, cloud-based solution for managing and sharing geospatial data. This initiative reflects DIU's efforts to enhance the military's capabilities in data processing and collaboration.
- Collaboration with Tech Companies: DIU has successfully forged partnerships with various technology companies, both large and small. These collaborations have led to the adoption of cutting-edge technologies in areas such as cyber security, autonomy, and space.
- Agile Prototyping in Maritime Operations: DIU has been involved in projects related to autonomous maritime operations. One example is the development of autonomous vessels for various naval applications. The focus on rapid prototyping and experimentation has allowed the military to assess the feasibility and effectiveness of these technologies in real-world scenarios.
- Counter-Drone Technology: DIU has explored and adopted technologies to counter the threat of unmanned aerial systems (drones). This includes the development and testing of systems to detect, track, and neutralize hostile drones.

UK

Established in 2016, the Defence Innovation Initiative (DII) stands as a crucial effort by the UK Ministry of Defence (MOD) to maintain and enhance the nation's military superiority in the continually evolving global landscape. Its key objectives include :-

- Leveraging Non-Defence Expertise: This involves engaging academic institutions, industry experts, and notably, small and medium-sized enterprises (SMEs) renowned for their flexibility and innovative perspectives.
- Prioritizing Disruptive Technologies: The initiative places importance on areas such as artificial intelligence, robotics, autonomous systems, and cyber security, recognizing their potential to transform warfare.

- Cultivating an Innovation-Oriented Culture within the MOD: Encouraging a more open and risk-tolerant approach to problem-solving, promoting collaboration, and streamlining processes to expedite the realization of innovative ideas.

Supported by a dedicated £800 million Innovation Fund over a decade, the DII is complemented by five Defence Innovation Priorities issued by the Department of Defence. These priorities include integrating information and physical activity across all domains, delivering agile command and control, operating and delivering effects in contested domains, enhancing defence people's skills, knowledge, and experience, and simulating future battle space complexity. The fund aids various programs and activities, including the following :-

- Defence and Security Accelerator: Identifying and financing promising innovations with potential applications in defence and security.
- Competitions and Challenges: Regularly initiating themed competitions targeting specific areas of interest, inviting innovators to present their solutions.
- Collaborative Research Projects: Fostering partnerships among the MOD, academia, and industry to address complex defence challenges through joint research endeavors.

Challenges. In essence, the DII represents a significant commitment by the UK government to safeguard its military advantage amid rapid technological advancements and evolving global threats. Despite its potential to foster groundbreaking solutions and enhance the UK's defence capabilities, the DII faces certain limitations :-

- Constrained Budget: The £800 million allocated over 10 years is modest compared to the overall defence budget, raising concerns about its long-term impact and sustainability.
- Resource Competition: Funding competing with existing programs and priorities may impede its full potential.
- Risk Aversion: The traditional emphasis on proven solutions in the defence culture makes it challenging to embrace innovative yet potentially risky technologies.
- Bureaucracy: Prolonged procurement processes and intricate regulations can hinder innovation and deter participation from agile startups and SMEs.
- Talent Acquisition and Retention: Drawing and retaining top talent in the competitive tech sector pose challenges for the MOD.

- Fragmented Ecosystem: Integrating diverse stakeholders like academia, industry, and the military can be intricate, leading to communication gaps and inefficiencies.
- Metrics and Success Criteria: Evaluating the success of innovative projects beyond traditional military metrics is challenging, posing difficulties in demonstrating clear value and securing continued funding.
- Ethical Considerations: Navigating concerns about the ethical implications of emerging technologies like AI in warfare necessitates careful handling and robust safeguards.

Success Stories. While DII is still evolving, several promising projects showcase its potential impact. Here are some major success stories:-

- Directed Energy Weapons (DEWs): DII-funded research led to the development of prototype laser weapons for air defence, potentially offering high-speed, non-explosive options for future conflicts.
- Autonomous Systems: Projects like "Loyal Wingman" are exploring unmanned fighter jets that can support manned aircraft, enhancing airpower capabilities.
- Quantum Technologies: DII investments are accelerating research in quantum computing and communications, with potential applications in cryptography and navigation.Project PEGASUS: This initiative used AI to streamline logistics and maintenance, leading to significant cost savings and improved equipment availability.
- Medical Innovation: DII-backed projects have developed advanced prosthetics and diagnostics for wounded personnel, enhancing their recovery and well-being.
- Counter-Drone Systems: Funded projects have yielded effective solutions to detect and neutralize unauthorized drones, a growing security threat.

France

The French Defence Innovation Agency (Agence de l'innovation de défense, AID) stands as the primary catalyst for innovation within the French Ministry of Armed Forces, established in September 2018. Its pivotal role involves consolidating all national defence innovation initiatives, capturing and expediting innovation, and providing support across various levels and fields, including operational management, equipment, support, operations, and administration. The core functions of the AID include :-

- Identifying Upcoming Strategic Technologies: Actively engaging with universities, research organizations, and companies to scout for emerging technologies with potential defence applications.
- Issuing Calls for Projects: Regularly announcing proposals in specific areas of interest, inviting innovators to present their solutions.
- Funding and Supporting Innovative Projects: Offering financial and logistical support to promising projects, aiding in their development and deployment.
- Facilitating Collaboration: Fostering partnerships among diverse stakeholders, including the military, academia, industry, and startups, to leverage collective expertise and accelerate innovation.
- Promoting an Innovation Culture: Actively disseminating information about best practices and success stories to encourage a culture of openness and risk-taking within the Ministry.

Challenges. Over the last five years, the AID has demonstrated strengths such as being a centralized hub for innovation, focusing on disruptive and opportunity-based innovation, actively engaging with diverse stakeholders, emphasizing agile funding and support, and promoting an open and risk-taking culture. However, like other initiatives globally, the AID faces certain challenges :-

- Limited Scope and Impact: In comparison to its US counterpart, the AID's budget and focus may seem narrower, potentially limiting its transformative potential.
- Challenges in Navigating Bureaucratic Hurdles: Integrating innovative projects within existing military procurement processes can be slow and cumbersome.
- Effectiveness of Ethical Frameworks: While ethical considerations are highlighted, concerns regarding AI and autonomous weapons need robust and transparent safeguards.
- Accessibility for Non-Traditional Actors: SMEs and startups might encounter difficulties navigating complex application processes and securing funding.

Success Stories. Information readily available in English about specific success stories of the AID is limited. This might be due to the nature of their work, often involving sensitive technologies and projects still under development. However, based on the organization's website and some news articles, here are some potential areas where they might have achieved success:-

- Space Technologies: AID is heavily involved in French space programs, including the development of the Syracuse secure communication satellites and the CSO observation satellites. These projects contribute significantly to France's national security and space exploration capabilities.
- Unmanned Aerial Vehicles (UAVs): France is a leader in developing and deploying military UAVs like the Patroller and Watchkeeper. AID likely played a role in supporting and funding these projects, contributing to increased operational effectiveness.
- Cyber-security: France has a strong focus on cybersecurity, and AID likely supports research and development of advanced cyber defence technologies. However, specific details are hard to find due to the sensitive nature of this field.
- Project EXOCET: This program aims to modernize the French army's combat vehicles with new technologies. AID's involvement could lead to improved battlefield performance and soldier safety.
- Medical Innovation: Similar to the UK's DII, AID might support projects developing advanced medical technologies for military personnel, although specific success stories are not readily available.
- Logistics and Maintenance: While details are scarce, AID could be involved in projects optimizing logistics and maintenance processes within the French armed forces, leading to cost savings and improved operational efficiency.
- RAPID: This joint program with the UK and Germany aims to accelerate innovation in critical defence areas like robotics and artificial intelligence. AID's participation allows access to international expertise and fosters collaboration.

Inferences from Global Scan. The analysis of defence innovation organizations in the USA, UK, and France reveals both strengths and challenges. The USA's DIU benefits from substantial financial and technical resources, leading in global military technology with diverse portfolios and commercial partnerships. However, it faces challenges such as resistance to change, sustainability concerns, and the complexity of integrating new technologies. The UK's DII leverages an £800 million Innovation Fund and engages diverse stakeholders, emphasizing disruptive technologies. Yet, challenges include a constrained budget, resource competition, bureaucracy, and talent acquisition difficulties. France's AID serves as a centralized hub with strengths in funding support, an innovation culture, and partnerships. However, challenges include a perceived limited scope, bureaucratic hurdles, ethical concerns, and accessibility issues for non-traditional actors. The major common

inferences that can be drawn from the defence innovation efforts of these three leading armament producers are as below :-

- All the programmes are less than 10 years old and therefore in a nascent stage, evolving continuously.

- All the programmes are concentrating on unconventional start-ups away from the traditional armament industry.

- Most programmes have laid down specific focus areas within military technology to concentrate upon.

- Most of the success stories are from the fields of Software development, Cyber security, Quantum Computing, AI and Counter Drone technology.

- Most programmes except US to some extent, suffer from financial constraints.

- Biggest challenge for all these programmes seems to be the traditional bureaucratic mindset and complicated acquisition procedures.

DEFENCE INNOVATION IN INDIA : IDEX

As highlighted in the preceding sections of this chapter, the Indian defence innovation ecosystem encountered various constraints prior to the establishment of IDEX in 2018, prompting governmental intervention. The following limitations are elaborated upon :-

- Isolated and Bureaucratic Structure: Traditional defence procurement adhered to a rigid, top-down methodology with minimal engagement with external entities such as startups or research institutions. This approach resulted in sluggish and cumbersome development cycles, impeding innovation.

- Insufficient Funding and Support: Startups and MSMEs frequently faced difficulties in accessing the necessary funding and support mechanisms essential for the development and commercialization of their defence-related innovations. This constraint restricted the pool of potential innovators and discouraged early-stage ventures.
- Misalignment between Military Requirements and Innovative Solutions: The Indian military encountered distinctive challenges requiring specialized solutions, but the prevailing procurement process did not effectively identify and address these needs. Consequently, there was a discrepancy between innovative concepts and actual operational requirements.
- Limited Risk Tolerance: The traditionally risk-averse nature of the defence establishment often deterred experimentation and the exploration of unconventional solutions. This inhibited creative thinking and curtailed the adoption of disruptive technologies.
- Fragmented Industry Landscape: The Indian defence industry lacked a well-connected ecosystem comprising research institutions, startups, established companies, and venture capitalists. This lack of cohesion hindered collaboration and knowledge sharing, posing challenges to the innovation landscape.

Key Objectives of IDEX

These limitations collectively led to a stagnant defence innovation ecosystem, failing to exploit India's potential in the field. In order to overcome these limitations and in keeping with this spirit of innovation, IDEX or 'Innovations for Defence Excellence' initiative was launched in 2018 as part of the Defence Innovation Organisation (DIO) to fund and manage innovations in the field of defence and aerospace. DIO was established under section 8 of the Companies Act 2013 as a 'Not for profit' organisation. Defence Innovation Organisation (DIO) is a Section 8 company formed by Hindustan Aeronautics Limited (HAL) and Bharat Electronics Limited (BEL), both Defence Public Sector Undertakings. DIO implements the IDEX framework, which acts as a bridge between the requirements of the Armed Forces and the solution providers.

IDEX engages industries specially MSMEs, start-ups, individual innovators, and provides them funding and other support to carry out R&D which has good potential for future adoption for Indian defence and aerospace needs. The key objectives of IDEX as laid out by the govt are given below :-

- **Boosting Domestic Defence Innovation**:
  - India traditionally relied heavily on imported military equipment, making it vulnerable to supply chain disruptions and geopolitical pressures. IDEX aims to foster a vibrant domestic ecosystem for defence innovation, reducing dependence on foreign imports and creating sustainable high-tech jobs.
  - By encouraging startups and MSMEs to develop innovative defence solutions, IDEX seeks to tap into untapped potential and unlock India's hidden talent pool in the tech sector.

- **Addressing Indian Military's Specific Needs**:
  - The Indian Armed Forces face unique challenges due to its diverse geographical terrain, complex border disputes, and evolving threats. IDEX aims to identify and address these challenges by providing a platform for startups and innovators to develop solutions tailored to the Indian military's specific requirements.
  - This collaborative approach ensures that the developed technologies are directly relevant and impactful for the Indian defence landscape.

- **Strengthening The Defence Industry**:
  - By connecting startups and entrepreneurs with the Indian defence establishment, IDEX aims to bridge the gap between innovation and procurement. This facilitates technology transfer and integration, streamlining the process of bringing innovative solutions to the battlefield.
  - The initiative also encourages collaboration between established defence companies and startups, fostering the exchange of knowledge and expertise, ultimately leading to a more robust and competitive Indian defence industry.

- **Promoting Self-Reliance in Defence Technology**:
  - India's ambition to become a self-reliant nation in defence technology is a key driver behind IDEX. By nurturing indigenous innovation, the government aims to reduce dependence on foreign imports and enhance national security.
  - Developing advanced defence technologies domestically creates strategic autonomy and strengthens India's position in the global defence market.
  - Overall, IDEX represents a significant shift in India's approach to defence technology development. By promoting a culture of innovation and collaboration, the initiative aims

to empower startups, address the Indian military's specific needs, and ultimately pave the way for a self-reliant and technologically advanced Indian defence industry.

The underlying aim of IDEX is to make the country self-reliant and self sufficient in matters of Defence, through mastering of the fundamentals of identify, incubate, innovate, integrate, and indigenize. The core objective of IDEX is to create an ecosystem, essentially to foster innovation, entrepreneurship and technology development, specifically in the Defence and Aerospace sector. Fundamentally, IDEX fosters the culture of technology co-creation and co-innovation within the Defence and Aerospace sectors. The program focuses on facilitation for creating of prototypes and bringing of products/technologies to market (Defence or otherwise).

To execute the above functions, the IDEX undertakes following activities: -

- Setting up and managing of the IDEX network in the form of Independent Defence Innovation Hubs.
- Communicate with innovators/startups through the Defence Innovation Hubs regarding defence and aerospace needs.
- Organizing various challenges to shortlist potential technologies for defence and aerospace use.
- Evaluate technologies and products coming from innovators/startups in terms of their utility and impact on the Indian defence and aerospace setup.
- Enable and fund pilots, using innovation funds dedicated to the purpose.
- Interface with the military top brass about key innovative technologies and encourage their adoption into the defence establishment with suitable assistance (financial if required).
- Facilitate scale-up, indigenization and integration in manufacturing facilities for successfully piloted technologies.

IDEX Process

IDEX functions through launches of Defence India Startup Challenge (DISC), Open Challenges, IDEX PRIME and IDEX PRIME (Space) with problem statements from Armed Forces, DPSUs & OFB. These challenges spell out the requirements (Problem statements) of the military. The following categories can apply in response to these challenges:-

- Start-ups, as defined and recognized by Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India.
- Any Indian company incorporated under the Companies Act 1956/2013, primarily a MSME as defined in the MSME Act, 2006.
- Individual innovators are also encouraged to apply (research & academic institutions can use this category to apply).

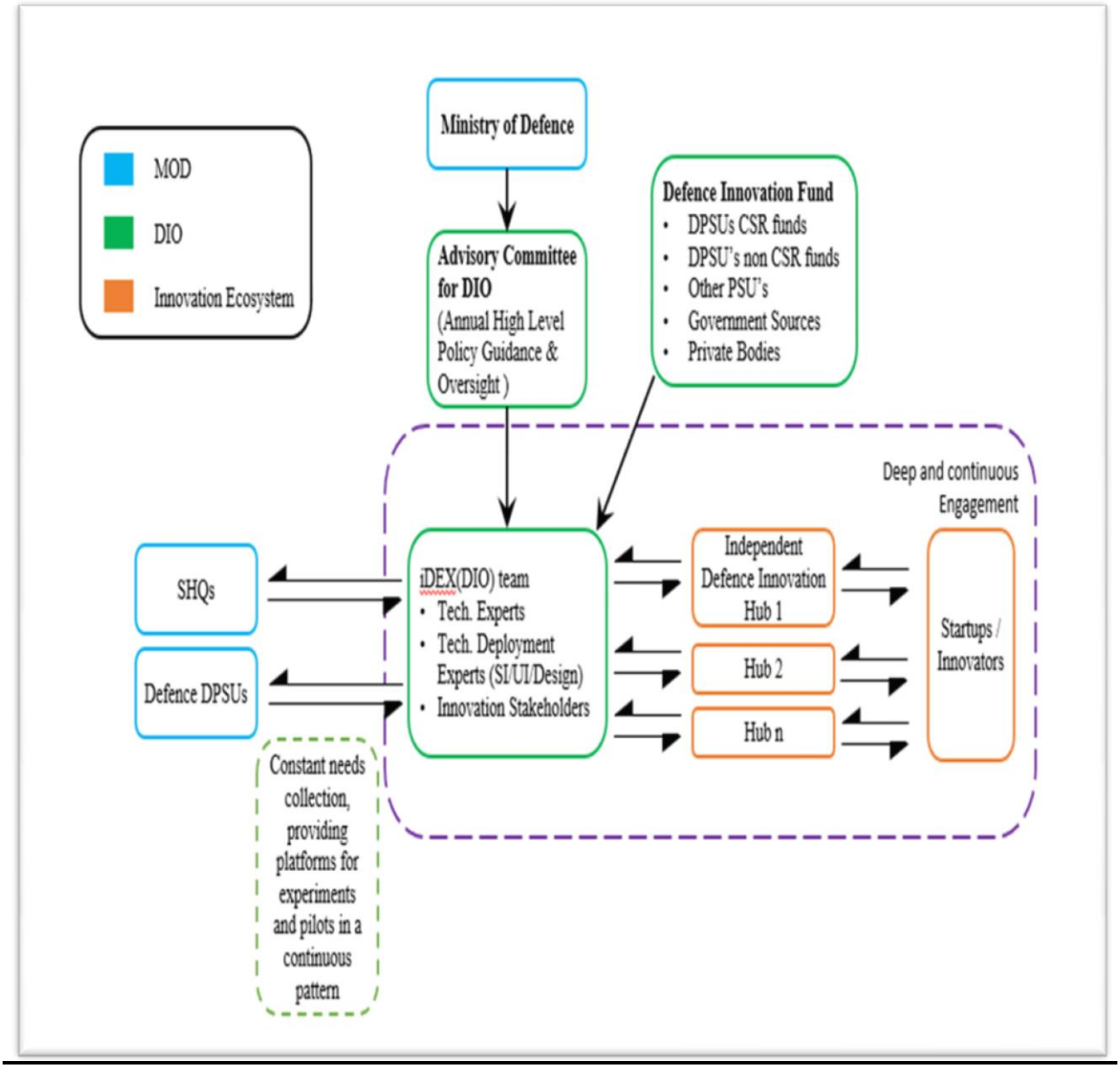

Fig 2.1 : IDEX Structure

Once a particular challenge is launched on IDEX website, it may consist of a number of problem statements from different entities. Startups and MSMEs then respond to the

specific problem statement through an online application process. After rigorous evaluation of the applications by a designated panel of experts, called HPSC, winners of each challenge are identified. They may be more than one winners for a challenge. Winner start-ups/ individuals receive innovation grants through the prototype funding guidelines called 'Support for Prototype and Research Kickstart' (SPARK). The exact amount and mode of each grant is decided by HPSC based on the application. Once a startup or innovator is selected as a SPARK Grant winner after a multi-stage process, the Technical Appraisal begins. The Technical Appraisal is an assessment of the proposed budget, technology / product details, work breakdown structures, and requirements and support required. Once the Technical Appraisal is prepared mutually between IDEX and the grant winner, an agreement is signed with supporting documents like certificate of incorporation, exclusive bank account statements for IDEX project etc. Individual innovators are required to form a startup before signing the agreement. The DISC winners are funded up to the max ceiling of Rs 1.5 crores (depending upon the costing of the project and matching contribution) while the maximum funding limit for IDEX PRIME is Rs 10 Cr. The funds are disbursed in tranches based on the milestones decided by a high-powered selection committee.

Apart from the fund, selected applicants may also be given entry to accelerator programs run by IDEX Partner Incubators, where they are supported in technology and business development through mentorship under the innovation and entrepreneurship experts. The selected applicants may also be supported in terms of access to defence testing facilities and experts for their product/technology development. The selected DAs are then involved in formulation of Product Definition Statement (PDS) and Product Requirement Unit (PRU). While PDS amplifies and elaborates the initial problem statement, PRU includes specifications of various technologies required. These two act as guidelines for the prototype to be developed and are subsequently used as a basis for formulation of PSQR. The entire process till this stage should complete in approx 12 weeks. Once all parties are satisfied and the DA conveys its willingness and capability to produce the desired product, a MoU is signed between IDEX and the DA, laying down all essential aspects of the product, timelines, certifications and procedures. The product development thereafter commences and goes through various stages from MS 0 to 5. These milestones help in continuous monitoring and periodic assessment of the progress and release of SPARK Grant tranches to the DA. The details of MS and parameters required to be achieved at each MS vary for each product however, broad parameters are are given at Appendix A. At the end of MS 5, a production

ready prototype is to be provided. The entire process from signing of MoU to MS 5 is to be completed in upto 24 months. Post SSCT and General Staff Evaluation, AoN is accorded and the normal acquisition procedure is followed till signing of the contract for limited quantity (MOQ) for field exploitation. This stage is expected to take upto 14 weeks to fructify.

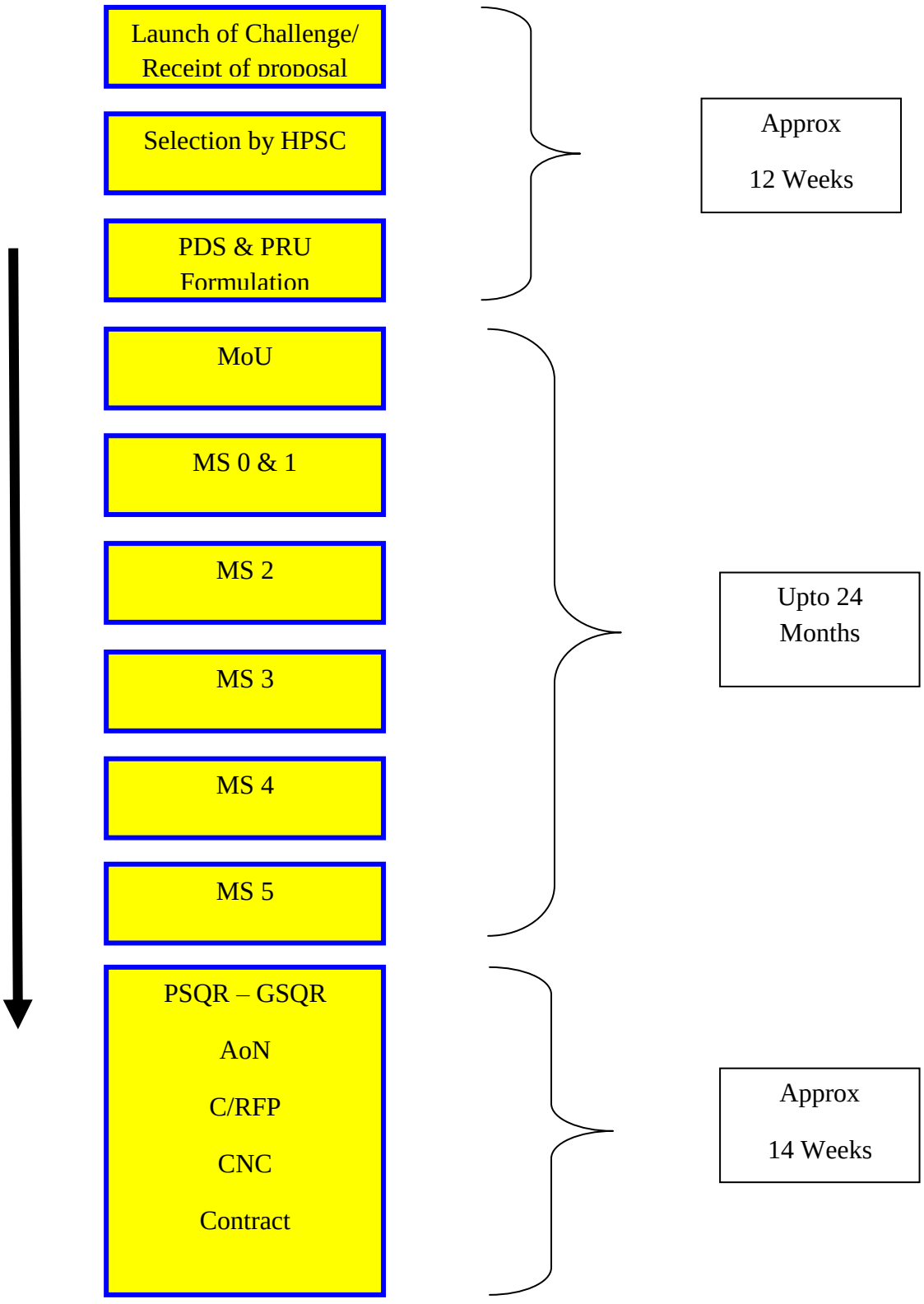

Fig 2.2 : IDEX Process Flowchart

Types of Challenges Launched by IDEX

- **DISC**. Under this programme, services give out problem definitions for which they are seeking solutions. In the IA, problem statements are sought from the field formations and training institutes in order to solve the issues concerning the cutting edge. These problem statements are vetted at multiple levels and undergo a final scrutiny at the service HQ before being forwarded to IDEX/DIO. The IDEX organization compiles and vets the problem statements from all the services as also other stakeholders and periodically publishes a list of these statements as challenges to the start-ups and MSMEs on their website. Since 2018, a total of ten such DISCs have been launched with the latest, DISC X having been launched in December 2023. IA has participated in DISC 1, 4, 5, 6, 9 and X. A SPARK of max Rs 1.5 Cr can be granted to a DISC winner, subject to a matching contribution from them towards R&D and development of a prototype.

- **Open Challenge**. While DISCs pertain to specific problem statements by the services, through the IDEX Open Challenge, IDEX is casting the net wider, creating opportunities for innovators to propose ways for harnessing their technology capabilities to strengthen our nation's military superiority. If an innovator/developer/inventor has an idea, technology or a product that has use in defence and aerospace, then they can pitch their ideas directly to the services through periodic open challenges being launched by IDEX, facilitated by DIO and Partner Incubators. Selected applicants are offered a chance to pitch to the IDEX grand jury and qualify for grants and investments. If any of the services accepts the idea being pitched, it is then further developed on lines similar to that of DISC. IA has participated in all six open challenges launched till date.

- **IDEX PRIME**. While rest of the process is similar to DISC, challenges launched under this scheme are eligible for a maximum SPARK grant of Rs 10 Cr. Within this category, IDEX PRIME (Space) has also been launched which is aimed at developing technologies addressing every stage of a space mission – from mission planning to satellite data analytics. IA currently has nine projects in this category. Indian Navy has also launched another category of challenges called IDEX PRIME (SPRINT) within the overall ambit of IDEX PRIME.

HPSC. HPSC stands for High Powered Selection Committee. Its primary function is to evaluate technologies and products submitted to IDEX in terms of their utility and impact

on the Indian defence and aerospace setup. HPSC composition varies depending on the specific challenge or technology domain. Experts from relevant fields, defence personnel, and other stakeholders may be involved. Broadly, HPSC for IA projects is composed of the Additional Director General Army Design Bureau, Representative from DIO, Representative from the sponsoring directorate in Army HQ, Nodal officer for each project, Representative from DPSUs and Partner Incubators. The key activities carried out by the HPSC are :-

- Screening Applications: The HPSC reviews initial applications to ensure they meet eligibility criteria and align with the program's goals and specific challenges.
- Conducting Technical Evaluation: Subject matter experts within the committee assess the technical feasibility, originality, and potential of the proposed technologies or products. This can involve reviewing documentation, conducting interviews, and seeking external expert opinions.
- Evaluating Operational Impact: The HPSC considers the potential benefits the technology or product could bring to the Indian defence forces in terms of improved performance, efficiency, cost savings, or strategic advantage.
- Recommending Funding And Support: Based on the combined evaluation, the HPSC recommends whether to proceed with a proposal and what level of funding or support (e.g., Spark grants, prototype development, testing facilities access) to grant.
- Providing Feedback: Beyond simply approving or rejecting proposals, the HPSC offers constructive feedback to applicants, allowing them to improve their ideas for future consideration or other avenues.

In essence, the HPSC serves as a critical gatekeeper within the IDEX program, ensuring valuable resources are directed towards truly innovative and impactful technologies that can benefit the Indian armed forces. This function is crucial for achieving the IDEX program's overall objective of fostering a vibrant defence innovation ecosystem in India.

SPARK Grant. As earlier explained, IDEX initiative is aimed at harnessing the potential of start-ups and MSMEs in the field of defence innovation. While these entities operate at the cutting edge of technology, they are constrained by limited finances. Hence, in order to support them, IDEX includes provisions for financial grants as well. These grants are known as SPARK. There are two categories of SPARK – projects under DISC and Open Challenge are eligible for a SPARK grant of upto 1.5 Cr, while projects under IDEX PRIME

including IDEX PRIME (Space) are eligible for a grant of upto 10 Cr. Following conditions apply for the SPARK grant :-

- The grant is based on five specific milestones (MS) to be achieved during product development. The amount of grant to be released at each MS subject to laid down parameters required to be achieved/displayed by the DA is given at Appendix A.
- The achievement of milestones by the DA is judged by a committee consisting of the Project Facilitation Team/Nodal Officer, IDEX Representative and the Partner Incubator.
- The DA has to match the SPARK grant by an equivalent contribution on their own. This ensures that they also have a stake in the success of the project.

ROLE OF PARTNER INCUBATORS

In order to help in discovery and exploration of Startups/MSMEs that can perform the function of co-creation by hand holding the inexperienced start-ups and MSMEs, IDEX has also partenered with India's leading incubators, tracking upcoming Startups/MSMEs and Innovators, and investing in them opportunistically, from the Defence Innovation Fund. The DIO has signed MoUs with these incubators nominated as IDEX Partner Incubators to mentor entrepreneurs and MSMEs to create, deploy and commercialise technologies and products for the Indian military and DPSUs. These incubators include a number of IITs and other leading research and development hubs in India. The Partner Incubators play an important role in the entire IDEX process by handholding the start-ups and providing them various types of support. They also play an important part in taking Milestone related decisions and provide technical and financial closure to the start ups

One of the foremost research and innovation hubs in India and a major Partner incubator of IDEX is the Foundation for Innovation and Technology Transfer (FITT) at IIT Delhi. As part of the research process, a visit was carried out to this facility and detailed discussions were undertaken with both the Incubator staff and some od the Das being incubated at that location. Subsequent few paragraphs describe this Incubator in detail.

FITT, IIT Delhi

FITT at IIT Delhi has been the vanguard of knowledge transfer activities from academia since its inception in 1992. FITT provides superior program management services and is steadily increasing its operational landscape. The varied roles of FITT can be seen in enabling innovations and tech-preneurship, business partnerships, technology development, consultancy, collaborative R&D, technology commercialization, development programs, corporate memberships etc. These roles are necessitated by the key agenda of the Foundation to showcase the Institute's "intellectual ware" to industry, and thereby unlock it's knowledgebase and inculcate industrial relevance in teaching and research at IIT Delhi.

FITT manages the IIT Delhi Research and Innovation Park which is a facility with focus on innovation and product development where IIT Delhi, industry, entrepreneurs and government agencies interact and enable creation of advanced technological solutions in order to to accelerate research translation, provide avenues for IIT Delhi students and faculty to interact more closely with industry and bring to market technological breakthroughs through incubation, amplify technological and societal impact of R&D at IIT Delhi and galvanize entrepreneurial aspirations. Facilities Available here include an Auditorium, Board and Meeting Rooms, fully equipped Laboratories, Conference Hall, Training rooms, Cafeteria and suite rooms for accommodation.

Mentoring. The FITT initiated the implementation of the Startup Incubation program at IIT Delhi in 1999-2000, as one of the earliest academia-based incubators in the country. The Institute's incubation program aims converting technology-based innovative ideas into commercially viable products. Over the years, the Incubator has nurtured startups at a high success rate and has evolved into an ecosystem with its scale-up at the Research and Innovation Park of IIT Delhi, which has facilities to house more than 125 startups. The incubator offers following types of support to the startups :-

- Access to prototyping facilities.
- Access to a vast mentor network.
- Access to various funding programs for various stages(competitive).
- Access to FITT's network of tech companies and R&D facilities.

Lab Facilities

Working Spaces

3D Printer

PCB Printing Machine

Facilities for Mentee Startups at FITT, Delhi

- Access to FITT's network of deep-tech investors.
- Strong visibility and chances to showcase at most relevant platforms.
- An ecosystem surrounded by like-minded entrepreneurs.
- Subsidized working space.
- Business support services, including IPR management, legal and financial guidance.
- Training, workshops and networking events.

Third Party Service Providers. In addition to academic and research facilitation, FITT has also coordinated with organizations such as the State bank of India, Amazon Web Services (AWS), Microsoft and Altair to further support these startups in their pioneering efforts.

- **SBI**. SBI is is providing complete banking services exclusively to the startups, customised to their business model. It helps them to connect with partners of SBI, VCs, PE Firms, Policy Makers and other stakeholders, provision of FOREX and Treasury-Trade finance, import and export bills, bank guarantee, inward and outward remittance.

- **AWS.** AWS Activate Portfolio is a free program designed for startups and early-stage entrepreneurs that provides AWS credits, AWS Support credits, training credits, exclusive offers, go-to-market support, and more. These benefits are designed to give the right mix of tools, resources, and expert support to quickly get started on AWS and grow their business. Activate Portfolio Benefits include $10,000 in AWS Cloud credits valid for 2 years, $1,500 in AWS Business Support plan credits valid for 1 year, 80 free credits for self-paced labs and other special offers from trusted organizations such as Freshworks, Notion, Paytm, Airtable, Segment, HubSpot, and Chargebee.

- **Microsoft.** Microsoft has partnered with FITT and is extending the following services to the startups : -

    - Exclusive Access to MS leadership and expert guidance from Microsoft Valuable Professionals
    - Access to Azure community program and ongoing developer campaigns: Azure developer league.
    - Get the benefits of Free Fundamental certification.
    - The selected startup under the Microsoft Founder's hub initiative, an initiative developed by Microsoft India to meet the tech needs of Cloud tech start-ups, and digital natives will help start-ups to remove traditional barriers to building a tech company by democratizing.

- **Altair.** Altair Simulation Software is a suite of powerful simulation tools used for product design and optimization. It includes tools for Computer-Aided Engineering (CAE) such as FEA, CFD, and EM simulations, as well as optimization and data management tools. It can be used to analyze and optimize product design, predict performance and improve efficiency. To help businesses take advantage of outside resources and boost awareness, Altair maintains relationships with a number of key players in India's startup ecosystem, including investment organisations, industry experts, homologation organisations, renowned professors, and Startup India/Invest India.

Corporate Donors. FITT has a number of corporate donors which fund this initiative of IIT Delhi. The major donors include Samsung India Electronics Private Limited, Pfizer Inc, Engineers India Limited, The Boeing Company, Facebook India Online Services Private Limited (Meta), Housing Development Finance Corporation Limited and United States Agency for International Development.

The Mentoring Process. Through one-on-one masterclasses and mind-opening workshops, FITT gives its mentees a supportive and collaborative environment where they can work together to achieve specific goals and objectives. The mentorship process at FITT-IIT Delhi begins with the selection of suitable mentors from the industry who have relevant experience and skills. The program is designed to be flexible with the mentor and mentee determining the frequency and format of their meetings. Mentors and mentees are also encouraged to provide regular feedback to ensure that the program is meeting their needs and achieving its objectives.

As far as IDEX is concerned, the Partner Incubator (FITT in this case) gets involved once the preliminary short listing of respondents to a challenge has been carried out by IDEX in coordination with the services. FITT examines the shortlisted proposals with the help of domain experts and provides feedback to the IDEX for second stage short listing. The short listed proposals are then presented to the HPSC which selects the DAs for the challenge. Once selected, the DAs requiring support of the partner incubator are connected to a mentor with domain expertise. They are also allotted office space in the FITT building if required and are provided access to the diverse facilities available not only within the FITT but the entire IIT Delhi. The access to labs and other facilities is free and the mentees only have to pay for the consumables therein. The support provided includes documentation, budgeting, project planning techniques, financial planning, as pertaining to the IDEX programme. FITT

also monitors and helps in assessing the project progress as per specified MS, in coordination with the Nodal Officer from the services.

IDEX is a unique initiative launched by the MoD, GoI to harness the potential of the country's burgeoning start-up ecosystem and create reverse brain drain in order to incorporate cutting edge technology in to the armed forces. It aims at overcoming the inertia in larger organizations such as PSUs and Def Industry. These larger organizations suffer from rigid work culture and tend to be process oriented rather than output oriented. At the same time, the start-ups, while innovative and agile, are hampered by a pronounced lack of resources and are unaware of the labyrinthine rules and policies which clutter the streets of defence procurement. IDEX aims at exploiting the strengths of the start-ups while hand holding them to navigate the turbulence where they have inherent weaknesses.

CHAPTER 3 : IDEX AND INDIAN ARMY, GAINS AND LOSSES

IA has always pursued innovation in all its endeavours. IA troops are arguably the most innovative by nature as they have always strived to give their best despite a continuous paucity of resources caused by limited defence budget. Those who have had the privilege of serving in the IA, specially in the toughest of field areas will bear testimony to the ingenuity of the Indian soldier, be it in the aspects of surveillance, weapon handling, field craft, logistics or routine administration. The Indian soldier is capable of producing wonders with extremely limited resources in most inhospitable conditions.

The IA has also been conducting Innovation Melas at formation levels for decades now. These melas give an impetus to innovative thinking amongst all ranks have been responsible for many operational upgrades to the existing equipment which enable IA to tackle diverse threats in an optimal manner. These in-house innovations are duly compiled and executed across the army on need basis, again mostly by in-house engineering effort. However, as enumerated in the previous chapter, IDEX is a formal policy by the MoD, which aims at harnessing the diverse capabilities of the country's talent in the field of cutting edge technology.

IA has actively supported this policy initiative and created structures and conditions for it to fructify. Army Design Bureau, established in 2016, is the nodal agency at the service HQ level which is tasked to operate as a link between the field formations (user), the product developer and the DIO. Specific staff is dedicated for coordinating all matters related to IDEX. Commencing from DISC 1 in 2018, IA has till date participated in six DISCs and six Open Challenges, in addition to IDEX PRIME and IDEX Space. Various types of challenges through which IDEX is being implemented in IA are explained below :-

IDEX Projects of IA

Commencing from DISC 1 in 2018, IA has till date participated in six DISCs and six Open Challenges, in addition to IDEX PRIME and IDEX Space. A total of 57 projects have been launched under this initiative out of which four have been foreclosed for various reasons, four contracts have been signed post successful completion while and 49 more are at various stages of development. List of all the IA projects under IDEX is attached at Appendix B. These can be summarized as under :-

- All projects which have been completed are from DISC 1, which indicates an approximate duration of five years for a project to fructify. However, the process is expected to speed up now as teething problems are resolved.
- The breakdown of 49 projects in various stages of development is :-
    - MS 5 – 01
    - MS 4 – 03
    - MS 3 – 04
    - MS 2 – 11
    - MS 1 – 02
    - Pre MS 1 - 05
    - Pre MOU – 19
    - Initial Processing – 04

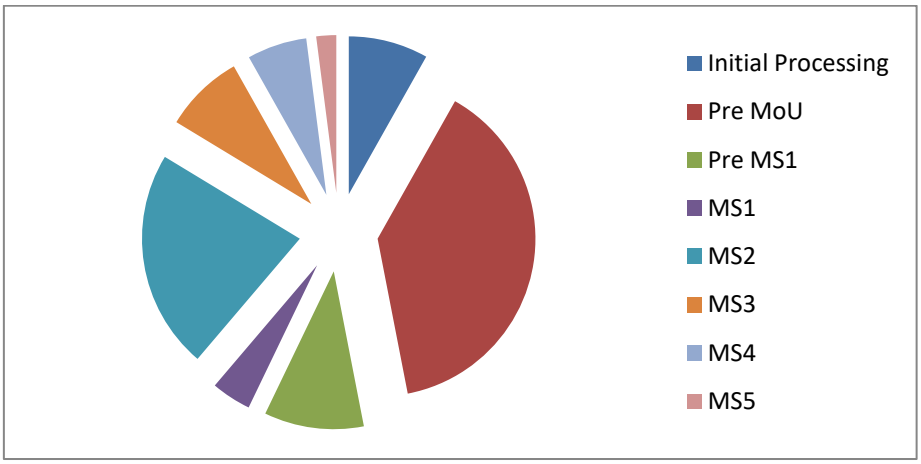

Fig 3.1 : MS Wise Breakdown of 49 IA IDEX Projects

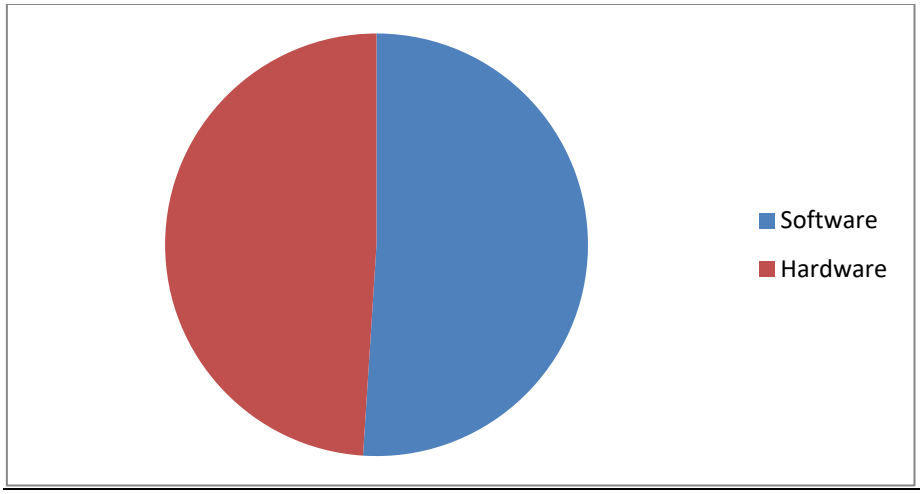

Fig 3.2 : Software vs Hardware Oriented Projects

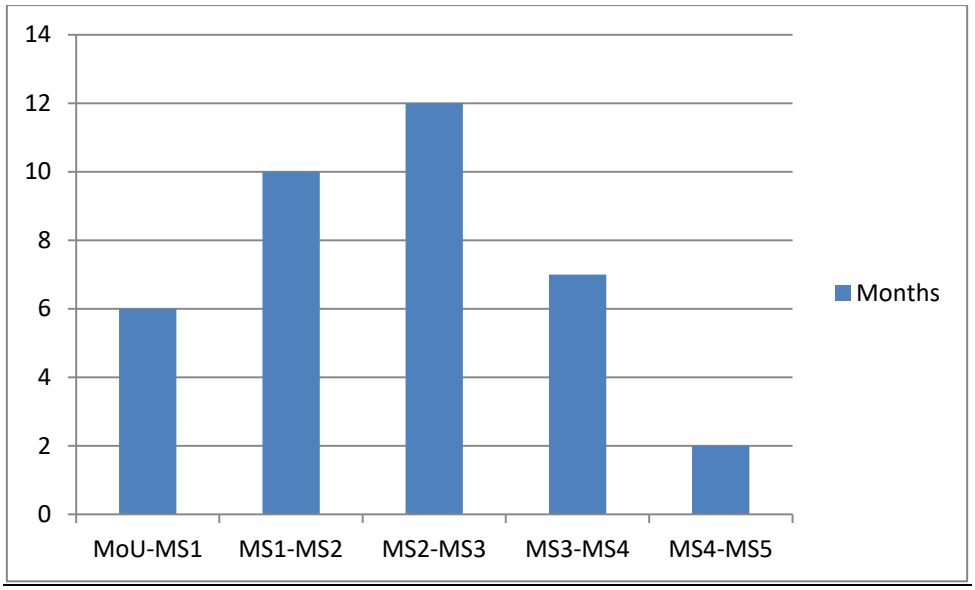

Fig 3.3 : Average Delay at Various Stages

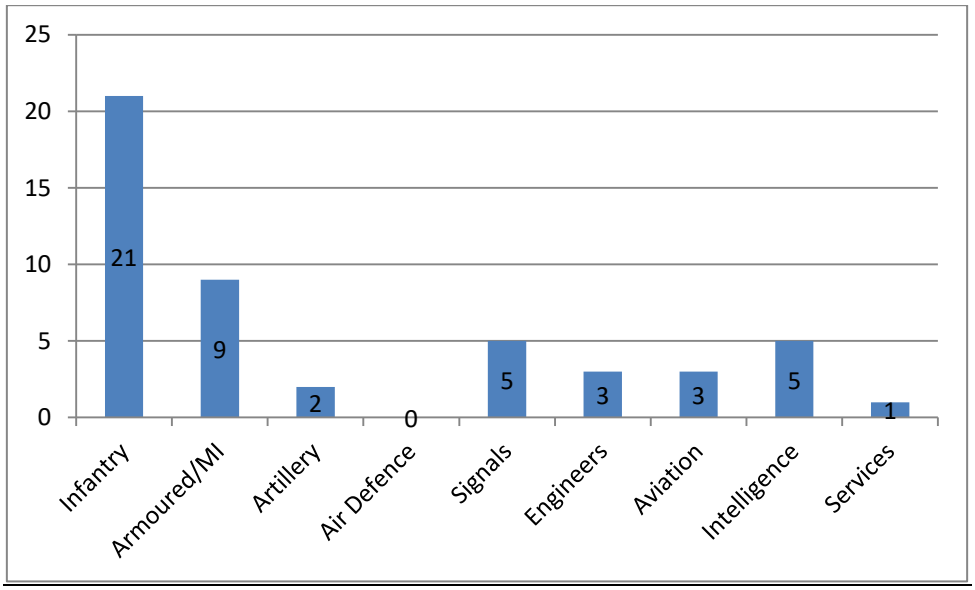

Fig 3.4 : Arm Wise Distribution of IA IDEX Projects

- Out of the seven projects undertaken in DISC 1, three have been contracted, while three have been delayed by a duration ranging from 20 to 41 months from their Projected Date of Completion (PDC). However, all three contracted projects were completed before their respective PDCs.
- Similarly, in case of Open Challenge 1, one of the three projects has been contracted while other two are delayed by 10 to 16 months.

- An analysis of the delayed projects reveals that maximum delays occur between MS 1 – 2 and MS 2-3. This is due to the fact that maximum effort in a project, right from conceptualising the product, production of prototype, initial testing and refinement as per military requirements takes place in these stages, thus making them the most crucial stages.
- 25 of the 49 projects (> 50%) are software predominant, while balance 24 are hardware predominant, thus indicating an equal spread in both domains and displaying the all round capabilities of the developing agencies.
- Infantry is the leading arm in posing challenges under IDEX with a total of 21 projects while Armoured Corps and Mechanised Infantry combined are distant second with 9 projects. Technology intensive arms like Signals, Artillery, Army Air Defence and Engineers are far behind while services find no representation. There is thus a need for introspection within IA to investigate low level of response by these arms and services.
- Project costs under DISC are varying generally from Rs 1.16 Cr to 5.71 Cr, with one project going upto Rs 21.46 Cr. At least 14 DAs have a cost of more than Rs 3.0 Cr, thus indicating that they plan to meet more than 50% of the funding requirements (SPARK grant limited to Rs 1.5 Cr for DISC). The range for IDEX PRIME is Rs 11.47 to 18.87 Cr till now.

CASE STUDIES

In order to further derive some lessons regarding the strengths and weaknesses of IDEX programme, two case studies have been studied,ie, a successful and an unsuccessful case.

Success : Integrated Mobile Camouflage System (IMCS)

Intro. A part of Open Challenge 1, the project has reached culmination stage and a contract for the same was signed in March 2023. The system aims at enhancing the stealth and camouflage of Armoured Fighting Vehicles (AFV) by reducing their signature across the spectrum. The challenge for this project was initiated by the Armoured Corps of IA and it has been executed by Hyper Stealth Technologies Pvt Ltd with support from the Defence Laboratory at Jodhpur.

Project Highlights. The project includes a combination of active and passive camouflage measures to include measures against opto-electric and infra red detection. It requires a

modular design with adaptive camouflage circuit and consists of a mix of paint, fabric and other modules/panels. The deliverables included reduction in detection range by 55% or above, attenuation of radar transmission upto 6 db, blending with natural environment and coverage from all sides except the bottom. The project budget was Rs 2.95 Cr and the timelines were as under :-

- Signing of MoU November 2021
- MS 1 February 2022 (03 months)
- MS 2 July 2022 (05 months)
- MS 3 August 2022 (01 month)
- MS 4 December 2022 (04 months)
- MS 5 January 23 (01 month)
- Contract March 2023 (02 months)

Project Details. The project is one of the success stories of IDEX with it being the first contract to be signed by the IA under this programme. The entire process from signing of MoU till contract took about 16 months which is far less than the stipulated duration. The project was initially planned as 'Adaptive Stealth Measures for AFVs' but no responses were received which could meet all the requirements. Hence in May 2021, Armoured Corps Centre and School (ACC&S), nodal agency for the project recommended its foreclosure. During a review of all projects by the Defence Secretary, it emerged that the project can be implemented with a few minor alterations. It was therefore renamed as IMCS and relaunched with a revised problem statement in July 2021. ACC&S remained the nodal agency with Commanding Officer of the Automotive Wing as the nodal officer. The revised PDS and PRU were formulated in August 2021 and the MoU was finally signed in November 2021.

The entire path was not without its impediments but each stage, all the stakeholders combined to resolve all difficulties resulting in fructification of the project before PDC. Some of the impediments faced and successfully overcome are as under :-

- Initially, the problem statement thrown to the startups was too ambitious and could not be handled by anyone, however, instead of shelving the project, minor alterations were done under the guidance of the Defence Secretary which gave a fresh lease of life to it.
- The DA, Hyper Stealth Technologies Pvt Ltd, faced delays in release of SPARK grant at MS 1 due to their inability to reach one of the deliverables of that stage. However, since all other major deliverables for the stage were ready, all stakeholders displayed the kind of flexibility

required in such projects and ensured timely release of grant by shifting that deliverable to MS2.

- Procedural delays were also faced when the DA wanted two tanks for initial testing of their equipment but active intervention of the IDEX staff at ADB ensured that the DA was provided two T-72 tanks.
- The usual procedural delays in provision of security clearance to the DA team visiting IA units were also dealt with pro-actively to minimize their effects.
- During the conduct of SSCT, the request from the DA to permit use of same set of tanks which had been provided for earlier tests was also acceded to thus reducing the overall time required for equipment preparation.
- The SSCT was getting delayed due to non availability of the DGQA member. This problem was overcome by asking the vendor for written certification of all parameters which could then be vetted by the DGQA member subsequently who was re-designated as associate member.

Thus, ingenuous thinking, flexibility and prompt reactions by all stakeholders combined to achieve one of the major successes of IDEX in IA till date.

Failure : Active Protection System

Intro. A part of DISC 1, the challenge was launched in November 2018 and MoU was signed with Kinetic Engineering, Bengaluru as the DA, in September 2019. The challenge for this project was also initiated by the Armoured Corps of IA.

Project Highlights. This project involved development of quick acting sensors and actuators for the development of an Active Protection System for vehicles. It was to prevent line-of-sight guided anti-tank missiles/projectiles from acquiring and/or destroying the target and include both soft kill (electronic countermeasures) and hard kill(counter attack) features.

Project Details. The project comprised both hardware and software components with majority of hardware being explosive in nature. The project continued for almost four years before being finally shelved in July 2023. Though the failure can be majorly attributed to litigation and COVID pandemic, it still provides certain lessons to be learnt. Post MoU in September 2019, by January 2020, the DA had prepared the software component of the project but further progress was delayed due to the following factors :-

- Some radar components, being imported from USA were stuck as the necessary approvals were not yet given
- Assistance to be provided to the DA by High Explosives and Materials Research Laboratory of DRDO was not forthcoming.
- The project was severely hampered by the onset of COVID pandemic and associated lockdowns.
- Some progress did occur after a delay of more than a year and the DA team visited ACC&S for testing their equipment on tanks in June 2021, however, thereafter there was no communication from the DA and ultimately in June 2023, they withdrew from the project at MS 3 stage, citing litigation problems which had caused their accounts to be frozen.

Though the challenge was still kept alive, due to inability of Kinetic Engineering and lack of any other respondent to the challenge, it was foreclosed in July 2023. In addition to the DA getting adversely affected by litigation and the COVID pandemic, some other factors also contribute to delays and the foreclosure :-

- The problem statement of the project might have been too ambitious for a startup/MSME. It involved extensive hardware and software coordination with state of the art technology. The requirement of explosive ammunition and associated procedures in handling and testing of explosives further complicated the issue.
- The govt agency required to support the DA, HEMRL could not provide the level of hand holding due to bureaucratic procedures.
- There was a lack of coordination and dynamism on part of all the stakeholders including the nodal agency.
- Some components required to be imported again suffered from procedural delays which could have been resolved by inter ministerial coordination.

Thus, an ambitious and rigid problem statement, bureaucratic red tape and lack of initiative and dynamism on part of all stakeholders resulted in the project being foreclosed.

Survey Summary

In addition to interviews and discussions with IDEX/DIO staff, two surveys were also carried out, one for the IA stakeholders in IDEX and second for the DAs currently engaged in IDEX projects. The surveys had multiple choice based answers wherein the respondent had to select the answer closest to his opinion. In order to encourage truthful responses, the surveys were conducted anonymously. The details of surveys including questions, responses and their graphic analysis are attached at Appendix C and D respectively. The responses can be summarized as under :-

Survey of IA Stakeholders in IDEX. A survey containing 13 questions was conducted for the IA officers involved in IDEX in various capacities, such as staff at HQ, Nodal officers or officers part of PFTs. Since these officers are handling current IDEX projects, they may be considered to be well aware of the subject. A total of 35 responses were obtained. The inferences that came out are as under :-

- 75% of the respondents were aware of the IDEX procedures while 25% were not very sure.
- Only 66% of the respondents were confident of handling various procedural and documentary aspects of the programme.
- More than half the respondents did not find the laid down timelines very realistic.
- Almost one third of the respondents found the funds being provided inadequate.
- More than half of the respondents found the process of release of funds complicated.
- 40% of the respondents found motivation levels of the DAs not very high.
- More than 41% were of the opinion that the DAs find it difficult to comprehend the procedural aspects of IDEX.
- Only 6% of the respondents found the technical prowess of the DA low.
- Almost 65% of the respondents felt there was scope for further improvement in support and mentoring being provided by the Partner Incubators.
- 86% of the respondents rated the response of DA to their suggestions as good.
- 15% of the respondents felt that they were not able to devote much time and energy to their role in IDEX due to other professional commitments.
- 47% of the respondents felt that it was hard to make the DAs understand peculiar requirements of the Army.

- In the opinion of the respondents, the biggest factor responsible for delays in projects was lack of understanding of requirements of defence forces by the DAs.

Survey of DAs Currently Engaged in IDEX Projects. Similarly, a survey containing 12 questions was conducted for the DAs currently working on IDEX projects.. A total of 31 responses were obtained. The inferences that came out are as under :-

- More than 93% of the respondents agree that The current Defence Innovation Ecosystem in India motivates the start-ups and MSMEs to innovate.
- While 100% of the respondents profess awareness of the IDEX procedure, almost 16% confessed their inability in understanding and handling the procedural and documentary aspects of IDEX.
- More than half the respondents found the timelines associated with the process unrealistic.
- Two thirds of the respondents found the funding inadequate with almost a similar proportion claiming that the process of release of funds under this initiative was complicated.
- More than half of the respondents also found the infrastructural support from IA as barely adequate.
- The level of mentoring support provided by the PIs and the support/advice by the PFTs/Nodal officers was found to be of a good standard.
- The two major causes of delay highlighted by the respondents were complicated procedures and paperwork and frequent changes in project definition/requirements.
- Most of the respondents believe that IDEX is a good initiative which can succeed with a few policy changes.

Interview of the Changemaker

The IDEX Programme was winner of the Prime Minister's award for Excellence in Public Policy under the Innovation category for 2021. The award was received by the then Secretary Department of Defence Production, Shri Sanjay Jaju, IAS. He is currently Secretary, Ministry of information and Broadcasting. Efforts were made to obtain time from him for an interview but no response has been received till date. Efforts to interview Mr Vivek Virmani, IOFS, COO DIO were also equally fruitless. Therefore, since the dissertation deals with the efficacy of IDEX in IA, The officer heading the IDEX programme from IA,

Major General CS Mann, AVSM,VSM, Additional Director General of the Army Design Bureau was interviewed. The transcript of the interview is attached at Appendix E.

Bureaucracy and IDEX

For any govt initiative to succeed, it is imperative that the '*steel frame'*,ie, the bureaucracy, is fully supporting it. IDEX is now more than five years old and evolving into a game-changer as far as innovation in Indian defence forces is concerned. The Indian bureaucracy has played a key role in adoption and evolution of this initiative through several key aspects :-

- Policy Framework: The Indian bureaucracy (in this case, Department of Defence Production, MoD) played a crucial role in developing and implementing the policy framework for IDEX. This included creating guidelines, rules, and regulations to facilitate the participation of private entities, startups, and innovators in defence projects. It is also constantly obtaining feedback on the process and introducing amendments to the procedures, helping in further evolution and simplification.

- Collaboration with Industry: DIO from the Department of Defence production actively engages with the defence industry, startups, and research institutions to promote collaboration. This involves creating a conducive environment for partnerships and joint ventures between the public and private sectors. It organizes various seminars and conferences to promote interaction and collaboration.

- Funding and Support: DIO works on providing financial support and incentives to participants in the IDEX initiative. This includes grants, funding, and other resources to facilitate the development and implementation of innovative defence solutions. It has introduced IDEX PRIME with increased funding to facilitate larger projects in IDEX.

- Streamlining Processes: The bureaucracy (MoD) is constantly working to streamline administrative and procedural processes to make it easier for innovators and startups to participate in IDEX projects. This involves reducing bureaucratic hurdles, simplifying approval processes, and ensuring timely disbursement of funds. The DAP 2020 has already undergone two sets of amendments to facilitate IDEX projects.

- Monitoring and Evaluation: DIO is actively involved in monitoring and evaluating the progress and impact of the IDEX initiative. This involves assessing the effectiveness of implemented policies, identifying challenges, and making necessary adjustments to improve the initiative.

- Promotion of Innovation Ecosystem: The DIO works on creating an innovation-friendly ecosystem by promoting research and development, encouraging the establishment of innovation hubs, and fostering a culture of creativity within the defence sector.

- Engagement with Stakeholders: Bureaucratic bodies such as DIO engage with various stakeholders, including industry representatives, academia, and the defence research community, to gather feedback and ensure that the IDEX initiative aligns with the evolving needs of the defence sector.

The bureaucracy in MoD and in particular, DIO has been responsible to initiate and progress the IDEX programme in an efficient manner despite the organizational drawbacks of inertia, red tape and complicated procedures. It has actively addressed the concers put forth by various stakeholders and carried out relevant amendments in the process. In this regard, the role of armed forces officers deputed to the DIO for IDEX needs special mention. They have been the catalysts in implementing and evolving IDEX into a potential game-changer for the Indian defence industry.

IMPEDIMENTS IN THE IDEX PROCESS

IDEX is a relatively new initiative barely more than five years old. It is yet too early to pronounce a final verdict on it but if the early indicators are to be believed, there is a massive response from the startups and MSMEs and there is no dearth of respondents to the challenges launched under IDEX. In fact, multi stage sifting is required to be carried out in order to select only the most competent and deserving cases.

During the period of this study, interactions were carried out with a number of stakeholders across the spectrum. While some were personally interviewed, some responses

were obtained through mailed questionnaires. This section will summarise the perceived impediments in ideal exploitation of this novel initiative in order to subsequently propose a further set of measures to streamline the process. The major conclusions derived from the interviews, surveys, case studies and other related documents are enumerated in subsequent paragraphs.

- **Bureaucratic Mindsets**. The biggest roadblock is created by the bureaucratic mindsets which are abundant both in the civil administration and services as well. In order to make the IDEX a success, all the stakeholders in the armed forces and MoD have to unlearn their years of experience in the field of procurement. They need to understand that start ups unlike PSUs or established vendors do not have a huge organization and are quite in-adept at paperwork. Unfortunately, the same parameters with some changes are being applied leading to delays and frustration at all levels. There is also an inherent tendency to play safe and function from 'fear of failure' which prevents timely and judicious actions/decisions.

- **Approvals**. Equipment acquisition is a complex process and efforts to make it transparent and corruption free have resulted in incorporation of large number of approvals at each stage. These approvals result in project delays both within the services as also in the ministries concerned.

- **Procurement of Raw Material**. This is another challenge for a young and inexperienced start up. There is too much red tape involved in procurement of some military grade raw materials and high grade electronic chips, specially if these have to be imported. There have been instances when import shipments have been stuck for months due to customs procedures and IDEX officials had to use linkages in other ministries to expedite their release.

- **Funding Constraints**. Startups unlike PSUs and recognized vendors are always short on funds. Despite the IDEX grant, they need huge amount of funds (by their standards) to match the grant and their sources are often their own savings, family and friends. It has been observed that the Venture Capitalists are also wary of funding defence related startups as they are not sure of viable returns. Moreover, Venture Capitalists tend to be

- more company centric than project centric which is the very anti thesis of IDEX programme.

- **Timelines**. The project timelines are formulated as per stages of development of a product and do not take into account the approval time required at each milestone. At times, the timelines are deliberately optimistic in order to spur the developers towards better performance. These approvals often take very long, delaying the release of funds and ultimately the project itself, sometimes making it unviable. Practically, the IDEX officials are of the opinion that a project is on time if it reaches MS3 by the designated PDC.

- **Benchmarking**. The requirement of benchmarking creates problems as no similar equipment exists. There exists no criteria for evaluation of R&D cost, leading to demotivation amongst startups and MSMEs.

- **Payment Milestones and Bank Guarantees**. Long payment milestones and strict regulations pertaining to bank guarantees lead to high capital requirements and liquidity crunch for the startups and MSMEs.

- **Lack of Committed Quantity for Procurement**. There is no commitment on part of the services/ govt to procure a minimum quantity of the developed product which leads to uncertainty and economic demotivation of the DA.

- **Integrated Projects**. It has been experienced that startups are not very proficient when it comes to integration with other startups/organisations. Products requiring integration of technology from more than one startup often face long delays and fail to deliver optimal performance. It is therefore desirable that stand alone systems be preferred for the time being till this ecosystem attains maturity.

- **Focus Areas**. Unlike some of the foreign defence innovation programmes, IDEX has not laid down any focus areas for itself. As a result, the services forward all kinds of projects to this programme, some of which test the limited resources and capabilities of the start-ups, specially the hardware intensive projects.

- **Trial Directives**. The armed forces tend to be very exhaustive in their approach which results in lengthy and complex trial directives. There are very few weapon systems in the

- world which can function equally well in across the diverse terrain and climatic conditions of our country. Even some of the well established weapon systems have sometimes failed in our trials. Our tendency to look for a perfect solution often results in getting no solution at all. Therefore we need to clearly define some acceptable levels of ambiguity for the equipment being developed through IDEX. Also the preparation and approval of trial directives takes unduly long time, resulting in avoidable delays.

- **Support for Conduct of Initial Tests and Trials**. Armed forces are averse to providing their equipment for trials due to the fear of operational equipment being rendered unserviceable. A start up, unlike a PSU or an established vendor, functions on a shoe string

  budget and does not have any linkages which may provide access to the equipment. The budget for a trial sometimes exceeds that for product development. This leads to avoidable delays. While the concern of the field units is understandable, the environment has to be sensitized that there is no separate equipment for conduct of trials and in case we want to innovate, some amount of risk has to be taken in this field.

- **Additional Requirements post Finalisation of PSQR**. Despite laid down rules and policies, sometimes the services indulge in frequent changing of product definition/ requirements at subsequent stages post fixing of PDS/PRU. The start-ups, being heavily invested in the project often try to meet these changed requirements, leading to avoidable delays in projects and sometimes resulting in failure. Though the pursuit of a perfect solution to any problem must continue but adding further requirements not only delays a project but also makes it financially unviable for the DA.

- **Transparency**. There is a lack of transparency between the services and the DA regarding actual product requirements and test data. While services have to adhere to the security requirements, they also need to understand that in order to correctly envision and develop a product, the DA requires extensive understanding of the conditions in which the product is expected to operate. The situation becomes specially grim in development of AI models where if realistic data is not made available, the model may not operate correctly.

- **Role of Nodal Officers and PI**. Sometimes the nodal officers may not be fully aware of the rules and procedures themselves or may not be able to devote the required amount of

- time to the project due to their other professional commitments. Similarly, the standard of mentoring provided by some of the PIs may not be upto the desired standards.

- **Lack of Capability/Intent of Startups**. A few startups tend to incorrectly portray their competence and capabilities trying to ensnare a few projects for the SPARK grant, just to try it out or to build up their resume. Such startups lose steam very soon resulting in undue delays to the projects and even their shelving.

At the conclusion of this chapter, we can summarise that the IDEX programme in IA has done reasonably well so far despite encountering teething problems and initial impediments in the form of long established bureaucratic mindsets. While undoubtedly, there have been delays in most of the projects, that is to be expected from a nascent programme that is still evolving at all stages and at all stakeholder levels. It is indeed encouraging to see the response of the startup ecosystem to this programme and in that field IDEX has already achieved its aim of igniting a spark of innovation in defence technology within the country. As we will see in the next chapter, the programme is flexible and amenable to change for better. The efforts to better this programme in order to make it simpler for the Das and more fruitful for the services and the govt need to continue and will be a never ending process due to continuous change in the operational environment.

CHAPTER 4 : THE WAY AHEAD

IDEX aims to bring its various stakeholders on a common platform for achieving the national goal of giving an impetus to Innovation in Defence Technology. While the common goal remains same, all stakeholders have their particular objectives from this programme. In order for the programme to emerge successful, all stakeholders must get optimal amount of satisfaction in order to maintain them on this platform. The major stakeholder objectives can be summarized as under :-

- Govt – Returns on public spending, Adherence to policies
- Services – Latest technology in defence
- DA (Startups/MSMEs) – Opportunity for business, Financial returns
- Academia – Knowledge, Technology development
- Venture capitalist – Return on investment

The response to this initiative has been overwhelming and the startups have eagerly grabbed this opportunity. Each of the challenges launched by IDEX has found a number of respondents and a thorough and transparent screening process has been evolved to shortlist the best among them. The enthusiasm in the ecosystem is of a very high degree and there are instances where individual innovators, even school going children have approached the IDEX with some fantastic ideas. Some of these ideas may not be practical but they prove the fact that there is no dearth of innovators in the country. The success of the project can be judged from the fact that in the first two years, a total of 14 AoN were granted to IDEX projects.

The current acquisition system focuses on the procurement of capital items from established vendors and does not provide a conducive support ecosystem for the procurement of technology based advanced products through IDEX winners. The procurement of advanced technology being developed under the innovation category requires simplifications and relaxations in the process so that the startups and MSMEs can be promoted for procurement of such advanced and critical technology and products by services and other defence procurement agencies. Startups are usually budding entrepreneurs with a significant technology development competency but low on financial and clerical resources. The technical and financial risks taken by the startups need the attention of the government as these critical technologies are essential for a country’s capability development, national security and self reliance. The sustainability of the startups and MSMEs is also crucial to motivate the next generation of innovators to come forward. Chapter 3 of DAP 2020 aims to encourage the indigenization and increase the involvement of the startups and MSMEs. But at

the same time the existing financial methodologies are less agile compared to the changing technology world. These are more suitable and focused on conventional vendor management methodologies.

Since IDEX is a new initiative, it is still in the process of maturing. The impediments described in the previous chapter have been observed and experienced by all the stakeholders and it needs to be appreciated that the IDEX organization is very flexible and open to changes. A number of amendments have already been carried out to DAP 2020 to streamline acquisition of equipment through the IDEX programme and more are being planned. The changes already implemented in DAP 2020 are as under :-

- In order to expedite the trial process, it has been stipulated that the trial directive must be issued within two weeks of the TEC. UTRR and User Trials have been replaced by Single Stage Composite Trials (SSCT). To reduce time taken, the trials have to be ratified within one week of their completion and the trial report accepted within three weeks by the SHQ. Trials where prototype of only one vendor has been cleared, will also be processed as single vendor.

- For smoothening the process of approvals required, quantity vetting and scaling can be dispensed with for initial procurement subject to the same being within delegated powers.

- The RFI based SQR formulation process which led to delays has been dispensed with. Instead, since the development of prototypes under IDEX is based on the Project Definition Statements (PDS) and the Product Requirement Units (PRU), articulated by the Services, the PRUs will be converted to PSQRs prior to the SSCT, which will then be conducted on the PSQRs and if found acceptable, the PSQRs will be automatically converted to SQRs. Case for AoN is to be processed based on these SQRs.

- Earlier, RFP was issued prior to User Trials and anybody could bid for the project. However, now it is to be issued to the IDEX winners only on clearing the SSCT under Buy (Indian-IDDM) category seeking commercial offer, thus concentrating only on the successful cases as also providing a level playfield to the start-ups as they do not have to compete against larger armament manufacturers.

- To obviate the requirements of field trials in diverse terrain and climatic conditions, multiple Field Evaluation Trials have been dispensed with. Instead MOQ will be procured on successful SSCT and further refinement of the product can be undertaken in a two stage spiral development.

The above mentioned measures address some of the impediments highlighted earlier and will contribute in smoothening the IDEX process to an extent. However, the process of evolution is constant and there is a desire and efforts to further amend the procedures in order to facilitate early and meaningful fructification of projects under IDEX. Currently, efforts are on to overcome the following impediments :-

- **Relaxation in Financial and Technical Eligibility Criteria**. Since the startups and MSMEs are not established business entities, there is a proposal to relax the financial and technical eligibility criteria as also to reduce the amount of penalties in case of a late delivery.

- **Benchmarking and Cost Computation**. Since the items being developed are innovative in nature, thereby implying that similar products do not exist in the environment, the process of benchmarking becomes difficult. Moreover, since the item is being produced for the first time post considerable R&D, the cost of R&D as also the risk factor in innovation needs to be taken into account during the benchmarking. Currently, no such provisions exist in DAP 2020. It is therefore proposed that the benchmark price of an item should cater for R&D costs in terms of raw material, manpower, components, testing, software development and infrastructure set up for the same. It should also cater for the degree of risk in innovation.

- **Initial acceptance and Spiral Development**. IDEX initiative is focused on innovation and getting hitherto unavailable technology into the armed forces. Since the equipment is being produced from scratch, including R&D, there are limited chances of getting it exactly right in the first instance. Equipment development the world over follows a pattern of spiral development with each subsequent version overcoming the deficiencies of the previous one. In order to encourage the innovators, it is recommended that an equipment being procured in the field of unavailable critical technology, be accepted for SSCT initially, even if it meets 70-80% of the laid down criteria, subject to it meeting 100% of the critical ones. Post SSCT, MOQ may be procured while a specific number of

stages of spiral development be accepted for product improvement and further refinement. This will provide the DA with some returns on investment and keep them in the hunt.

- **Approval Timelines**. There is a need to expedite the development process by reducing the paperwork required for approvals at various stages. This may be achieved by combining a few stages and expediting the processing of documents at each stage in a time bound manner. Any deviations from the specified timelines need to be viewed seriously.

- **Payment Schedule**. Most of the startups and MSMEs operate on a shoe string budget and as earlier discussed, funding is a major factor that delays their activities. There is a proposal to introduce intermediate milestones for release of SPARK grant during the R&D stage. Further, on signing of contract, 15% of base contract value may be paid to the innovator in an earlier timeframe than the current 30 days of signing the contract. Some additional amount may also be considered as cost of procuring raw material, which may then be adjusted against future payments. However, some checks and balances need to be incorporated to ensure judicious use of the advance payments being made.

- **Transition from IDEX to Make-Indian Category**. Most of the innovators face difficulties in the contract and post contract phase, which has aptly been described as the 'valley of death'. There is a requirement to extensively support this nascent ecosystem by bringing in changes in Make-Indian category specifically applicable to the IDEX projects, wherein there may be provisions to issue RFP directly to the IDEX winners as also relax the eligibility criteria of financial and other parameters. It may even form a separate category – Make IDEX, in the subsequent versions of DAP.

Throughout the duration of this research endeavour, a myriad of valuable insights has been garnered from stakeholders regarding the challenges they face and potential solutions. While concerted efforts are already underway to tackle many of these issues, certain domains demand heightened attention from policymakers and other stakeholders, particularly the services. These areas include:

- **Mindsets and Simplification of Procedures**: The primary imperative is the eradication of bureaucratic mindsets, ushering in a culture of innovative thinking. This necessitates a decoupling of the IDEX program from the conventional DAP 2020, instigating a paradigm shift in the procedures governing the development and acquisition of products under IDEX. This entails a reduction in approval requirements and an augmented delegation of authority. Proposing the establishment of a distinct vertical structure within the acquisitions wing exclusively dedicated to IDEX cases can mitigate the persistence of antiquated mindsets.

- **Funding for Startups/MSMEs**: Despite SPARK Grants, startups often encounter challenges in securing additional funding due to the uncertainties inherent in defence technology R&D. Active engagement with banks and venture capitalists by IDEX/DIO is recommended to facilitate seamless credit availability for startups. Exploring the establishment of a dedicated Venture Capitalist Fund for IDEX and considering full funding for select IDEX projects while retaining Intellectual Property Rights (IPR) could further bolster financial support.

- **Increase in SPARK Grant**: Given the significant funding gap between DISC and IDEX PRIME, an exploration of the feasibility of increasing the maximum SPARK Grant under DISC to Rs 3.0 Cr is warranted. A revised funding distribution of 60:40, with IDEX assuming the larger share, and the allowance of Open Challenges under IDEX PRIME, which offers up to Rs 10 Cr of SPARK grant, could provide additional incentives for startups.

- **Import Clearances**: The procedural impediments and approvals required for importing raw materials or advanced electronic components for IDEX startups need modernization. Coordination between IDEX/DIO and relevant ministries/departments is essential to devise streamlined procedures, preferably through a single-window clearance mechanism.

- **Leveraging Premier Research Institutes**: Proactive engagement by the services with premier research institutes is advocated, either through the establishment of a permanent cell or by organizing conferences, visits, and seminars. This approach can

facilitate exploration and funding of breakthrough research projects with potential applications in defence technology.

- **Defining Focus Areas**: Considering the sixth year of the program, IDEX is advised to delineate specific focus or priority areas, aligning with the observed expertise of startups and MSMEs in software-predominant projects. This strategic move aims to channel energy towards niche technologies within the capabilities of startups.

- **Ambitious Problem Statements**: Careful preparation and vetting of problem statements are deemed essential to ensure feasibility and prevent unrealistic expectations. The MoU stage should articulate all technological requirements, certifications, and avoid subsequent additions unless absolutely essential and agreed upon by all parties involved.

- **Equipment for Trials**: Clear definition of the equipment version with which IDEX projects' modules are designed to function is crucial from the outset. In-service equipment must be readily available for tests during the R&D stage, necessitating explicit inclusion in the problem statement.

- **Support for Trials**: Recognizing the resource constraints of startups and MSMEs under IDEX, a nuanced approach is recommended, integrating tests/trials with training events to alleviate financial burden and logistical stress.

- **Handholding**: The critical stages of project development (MS1 to MS3) demand heightened support and guidance from all stakeholders involved, including the PFT, Nodal Officer, and PI, especially for inexperienced start-ups.

- **Encouraging Projects from Other Arms/Services in IA**: Encouragement of active participation from other arms and services in IDEX projects, beyond the currently predominant ones, is proposed. This fosters greater integration of niche technologies across various branches of the armed forces.

- **Facilitating Data**:The sharing of realistic military data at the development stage is indispensable for projects requiring military data analysis through analytical tools and AI.

Evolving methods for sharing such data while maintaining its confidentiality is a priority for IA and other services.

- **Add-on Requirements**: While the introduction of PDS/PRU and procurement based on PSQR offers flexibility, alterations to original specifications must be minimal and restricted to critical aspects to maintain the integrity of the process.

- **Role of Nodal Officers and PIs**: Nodal officers should possess comprehensive knowledge not only of project requirements but also of all procedures and policies. They should function as a singular point of contact for DAs. Periodic reviews of PIs' performance are crucial for retaining the most effective mentors.

The IDEX program exhibits promise in fostering innovation and collaboration within the defence sector. Launched to harness the potential of startups and MSMEs in developing cutting-edge technologies for the Indian military, IDEX aims to promote self-reliance in defence manufacturing. The program's efforts to engage with the private sector, academia, and startups reflect a positive approach toward incorporating diverse perspectives and solutions. IDEX has facilitated rapid prototyping, engaged a diverse pool of innovators, and secured investments through the IDEX Investor Hub. However, some critical aspects include the need for more streamlined procurement processes, clearer guidelines on intellectual property rights, and sustained financial support to ensure the longevity and effectiveness of the program. Additionally, concerns exist regarding scalability due to limited funding compared to defence needs, and the potential challenge of transitioning promising prototypes into mass production. Ensuring effective integration of innovations into existing defence systems and addressing bureaucratic hurdles will be crucial for IDEX to fully realize its potential and contribute substantially to India's defence capabilities.

Appendix A

MILESTONES FOR PROJECT MONITORING AND RELEASE OF SPARK GRANT

MS	**SPARK Grant Tranche**	**Aim**	**Parameters**
MS 1	10%	Kickoff	Validation of production concept to address desired scope of Problem statement Validation of functional fitness of core technology
MS2	20%	Delivery of functional testing prototype	Validation of production concept to address desired scope of Problem statement Lab testing and demo of the feasibility of solution to address core areas of the qualitative requirements
MS3	30%	Delivery of integration or validation ready prototype	Phase 1 of co-development of quality assurance/ certification plans with nodal agency & review by DGQA /DRDO labs System integration of feasible design with target platform or early usage trials for advanced functionality testing
MS4	30%	Delivery of user trial/ quality assurance ready prototype	Phase 2 of co-development quality assurance/certification plans reviewed and validated by DGQA/DRDO labs Completion of usable prototype User trials (SSCT) as per planned procedures
MS5	10%	Delivery of production ready design	Complete certification of the product as per QR Ensure technology applied matching with latest trends and advancements, address obsolescence if any

Appendix B

SUMMARY OF IA IDEX PROJECTS

DISC

Challenge	Ser	Project	SW/ HW	Sponsor Directorate (SD)	MOU	Cost (Cr)	Status	Original PDC	Delay in Months
DISC 1	1	RPAV	HW	INF	AUG 21	5.68	Cont Jul 23	AUG 23	-1
	2	AI BASED SATL IMG ANALYSIS	SW	MI	AUG 21	1.16	MS4 Oct 23	JUN 23	7
					AUG 21	3.1	Cont Jul 23	JAN 24	-6
	3	TAC LAN SOL	SW	SIGS	JUN 21	2.93	Cont Jun 23	JUN 23	0
	4	SEE THROUGH ARMR	SW	MECH	AUG 19	5.71	MS5 JUN 22	OCT 22	15
					AUG 19	4.67	MS5 JUN 23	AUG 20	41
					DEC 20	2.92	MS5 DEC 22	DEC 21	25
	5	INDL PROT SYS	HW	RR	SEP 20	2.7	MS4 MAR 23	NOV 21	26
					JUL 21	2.5	MS4 MAR 23	MAY 23	8
	6	IFF	SW	AC	JUL 20	3.07	MS2 MAR 22	MAY 22	20
					AUG 20	3.09	MS3 MAR 23	MAY 22	20
					AUG 20	4.22	MS3 AUG 23	MAY 22	20
					OCT 20	3.15	MS2 OCT 21	MAY 22	8
	7	ACTIVE PROT SYS	HW	INF	OCT 20	21.46	MS2 JAN 23	OCT 22	3

Challenge	Ser	Project	SW/ HW	SD	MOU	Cost (Cr)	Status	Original PDC	Delay in Months
DISC 4	8	FOLIAGE PEN RDR	HW	INF	JUL 21	2.95	MS2 JAN 23	MAY 23	8
DISC 5	9	SIT AWARENESS MECH COLNS	SW	AC	MAY22	4.5	MS3 JAN 23	MAY 23	8
	10	SILENT OVERWATCH ICV	HW	MECH	APR 22	1.8	MS2 SEP 23	DEC22	13
					JUN 22	2.0	MS1 APR 23	MAY 23	8
	11	AI BASED FREQ SPECTRUM MGT	SW	MECH	JUL 22	2.0	MS2 JUN 23	JUN 23	7
	12	PGK FOR MOR	HW	INF	APR 22	3.04	MS2 MAR 23	MAR 23	10
					JUL 22	3.57	MS2 OCT 23	AUG 23	5
	13	AR/VR SORTIE PREP FOR HEPTRS	SW	AVN	MAY22	3.04	MS2 SEP 23	AUG 23	5
					JUN 22	2.85	MS2 AUG 23	MAY 23	8
DISC 6	14	UNMANNED SVL SYS TIED	HW	AC	DEC 22	2.57	MS1 AUG 23	FEB 24	-
					FEB 23	3.9	MS1 AUG 23	FEB 24	-
DISC 9	15	GUI BASED SM MONITORING	SW	INF	-	-	PRE MOU	-	-
	16	WEBSITE DEFACEMENT DET	SW	ACG	-	-	PRE MOU	-	-
	17	DRONE FORENSICS	SW	ACG	-	-	PRE MOU	-	-

Challenge	Ser	Project	SW/ HW	SD	MOU	Cost (Cr)	Status	Original PDC	Delay in Months
DISC 10	18	AUTO EXTRACTION OF TOPO	SW	MO	-	-	PRE MOU	-	-
	19	AUTO ACTIVATION COMB FF	SW	INF	-	-	PRE MOU	-	-
	20	INTEG DIGI COCKPIT	SW	AVN	-	-	PRE MOU	-	-
	21	USER FILLED EXPL CH	HW	AVN	-	-	PDS/PRU FORM	-	-
	22	DRONOCOPTER	HW	INF	-	-	PDS/PRU FORM	-	-
	23	INDOOR LOITERING MUNITION	HW	INF	-	-	PDS/PRU FORM	-	-
	24	HARDKILL CM FOR SWARM	HW	INF	-	-	PDS/PRU FORM	-	-
	25	AIR SOLAR DRONE	HW	INF	-	-	PDS/PRU FORM	-	-
	26	JET PACK SUIT	HW	INF	-	-	PDS/PRU FORM	-	-

OPEN CHALLENGES

Challenge	Ser	Project	SW/HW	SD	MOU	Cost (Cr)	Status	Original PDC	Delay in Months
OC 1	28	IMCS		AC	NOV21	2.95	Cont Mar 23	MAY 22	20
	29	NEXT GEN COMN	SW	SIGS	JUL 21	2.7	MS2 SEP 22	SEP 22	16
	30	LONG END AE SVL PLATFORM		INF	JUL 21	3.1	MS2 SEP 22	MAR 23	10
OC 2	31	QUANTUM SECURE KEYS	SW	SIGS	FEB 22	3.43	MS3 OCT 23	NOV 22	14
	32	INF ASLT BR		INF	FEB 22	2.8	MS4 OCT 23	JAN 23	12
OC 3	33	DEFENDER	SW	MI	APR 22	2.55	MS3 APR 23	SEP 23	4
	34	AMPH CRAWLING ROBOT		CE	JUL 22	2.65	MS2 MAY 23	JUN 23	7
OC 4	35	MSN PLANNER	SW	INF	MAY23	3.75	MS1 SEP 23	AUG 24	
OC 5	36	INT FUSION CENTRE	SW	MI	DEC 22	2.51	MS2 SEP 23	SEP 23	4
	37	OSINT FRAMEWORK	SW	MI	DEC 22	2.56	MS4 JUL 23	SEP 23	4
OC 6	38	NANO DRONES	HW	INF	JUN 23	2.43	-	SEP 24	-
	39	ECHO VTOL UNMANNED SYS	HW	INF	JUL 23	3.18	-	JUL 24	-
	40	DRONE WITH GUN	HW	INF	SEP 23	2.76		SEP 24	
	41	MICRO UGV SWARM	HW	INF	AUG 23	1.95	-	DEC 24	-
	42	SATL SLEEVE	SW	-	-	-	-	-	-
	43	SATL SDR	SW	-	-	-	-	-	-
	44	FAST RELIABLE, ECO AE TPT	HW	-	-	-	-	-	-

PRIME & DEF SPACE

Challenge	Ser	Project	SW/HW	SD	MOU	Cost (Cr)	Status	Original PDC	Delay in Months
PRIME	45	ADV TRUSS BR	HW	CE	JAN 23	18.87	MS2 AUG 23	FEB 24	-
	46	AI BASED MINE DETECTOR	SW	CE	DEC 22	11.47	-	OCT 24	-
DEF SPACE	47	AUTO INFO BROADCAST SYS	SW	INF	-	-	PRE MOU	-	-
	48	MULTIPURPOSE SATPHONE RX	SW	INF	-	-	PRE MOU	-	-
	49	ANTI JX CCTS SATPHONE	SW	MECH	-	-	PRE MOU	-	-
	50	ANTI SPOOF CCT SATPHONE	SW	MECH	-	-	PRE MOU	-	-
	51	CVY MOV MGT PLATFORM	SW	ST	-	-	PRE MOU	-	-
	52	STRAT FACILITIES MONITORING	SW	ARTY	-	-	PRE MOU	-	-
	53	CLOUD BASED GEO AI SW	SW	ARTY	-	-	PRE MOU	-	-

Appendix C

SUMMARY OF RESPONSES : QUESTIONNAIRE FOR IDEX STAKEHOLDERS IN INDIAN ARMY

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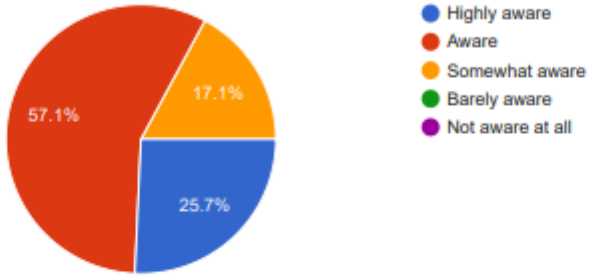
1. What is your awareness level of the IDEX procedure?

35 responses



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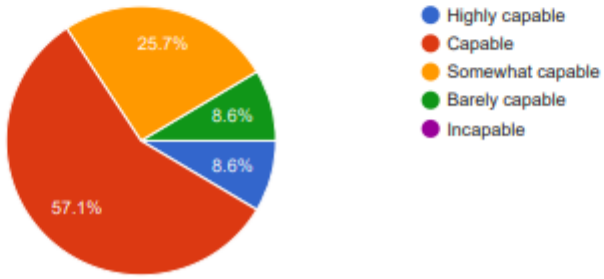
2. How capable do you find yourself of understanding and handling the procedural and documentary aspects of IDEX?

35 responses



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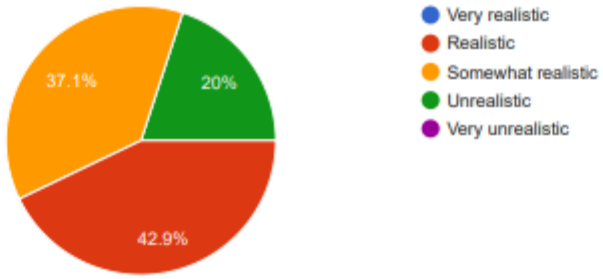
3. In your opinion, are the timelines laid down for design and development through IDEX realistic?

35 responses



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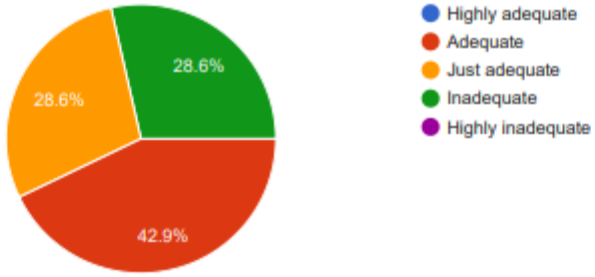
4. How would you rate the amount of funds being provided under this initiative?

35 responses



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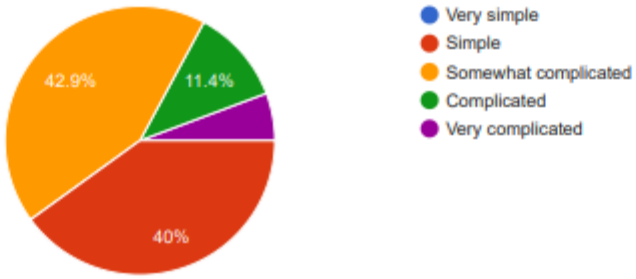
5. How do you rate the process of release of funds under this initiative ?

35 responses



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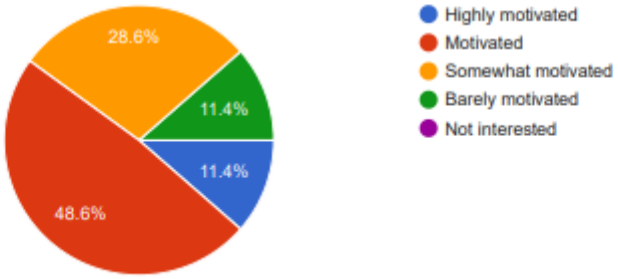
6. How would you rate the motivational levels of the Development Agency (DA) ?

35 responses



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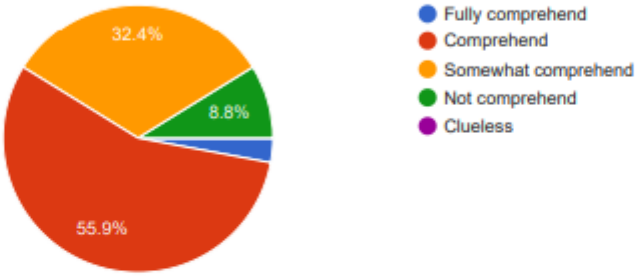
7. In your opinion, is the DA able to comprehend the procedural requirements under this initiative?

34 responses



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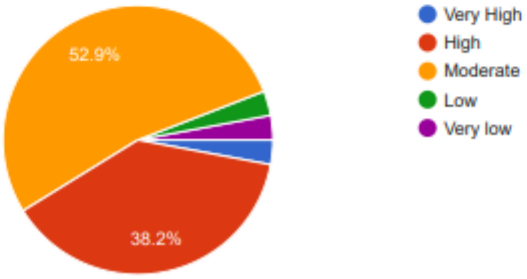
8. How would you rate the technical prowess of the DA ?

34 responses



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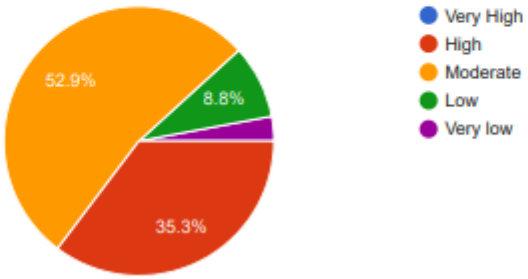
9. How would you rate the infrastructural support and mentoring being provided by the incubators?

34 responses



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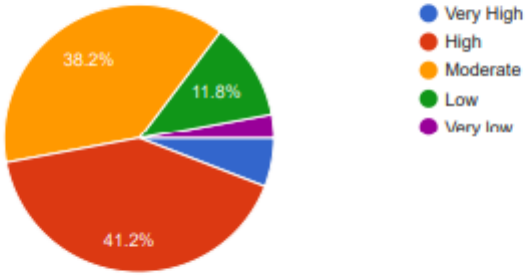
10. How would you rate the response of the DA to your suggestions/ recommendations ?

34 responses



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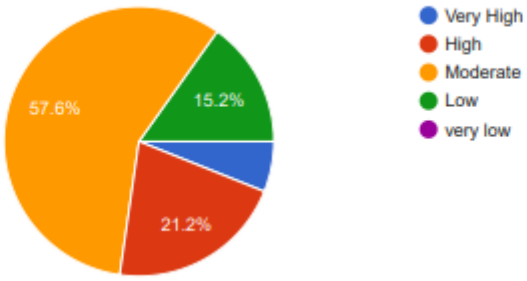
11. How much time and energy are you able to devote to your role as PFT/Nodal Officer, alongwith your other commitments ?

33 responses



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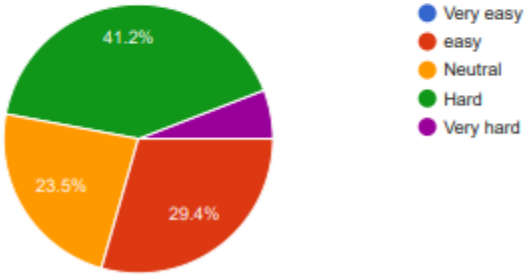
12. How easy is it to make the DAs understand peculiar reqmts of Army?

34 responses



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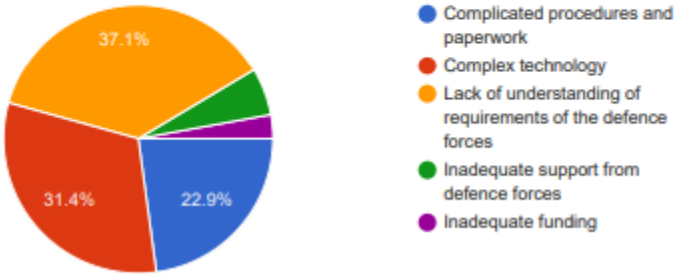
13. The delays in projects are most attributable to

35 responses



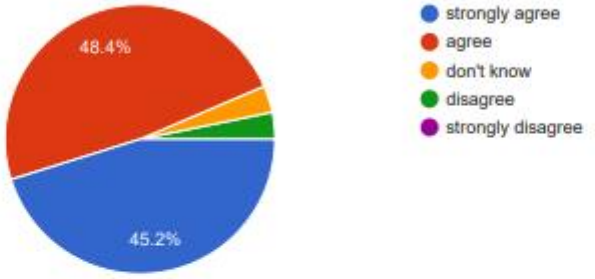
Appendix D

SUMMARY OF RESPONSES : QUESTIONNAIRE FOR IDEX DEVELOPMENT AGENCIES

Copy

1. The current Defence Innovation Ecosystem in India motivates the start-ups and MSMEs to innovate.

31 responses



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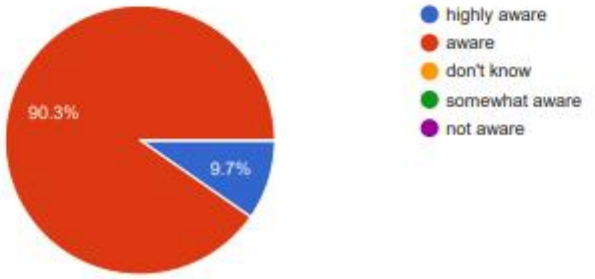
2. What is your awareness level of the IDEX procedure?

31 responses



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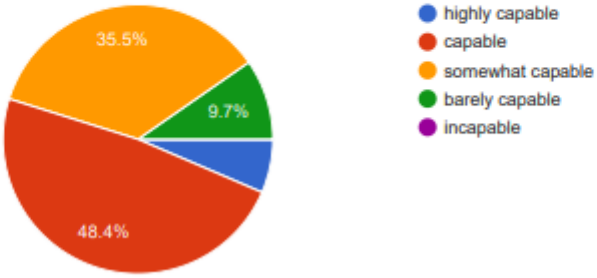
3. How capable do you find yourself of understanding and handling the procedural and documentary aspects of IDEX?

31 responses



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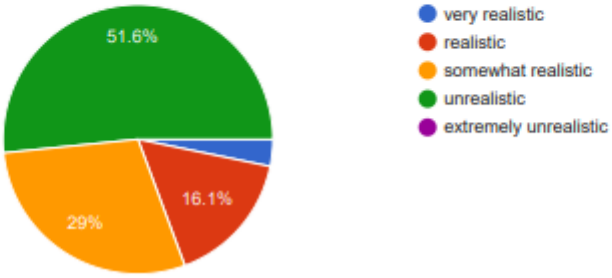
4. In your opinion, are the timelines laid down for design and development through IDEX realistic?

31 responses



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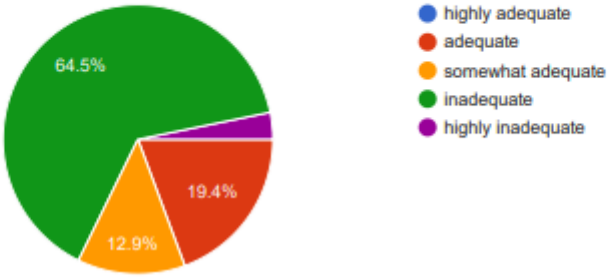
5. How would you rate the amount of funds being provided under this initiative?

31 responses



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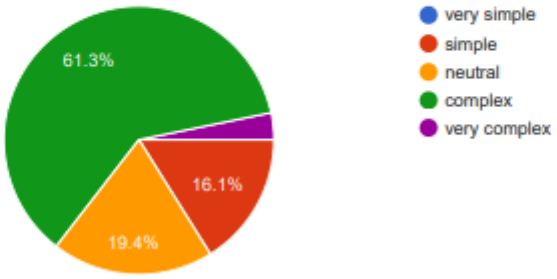
6. How do you rate the process of release of funds under this initiative ?

31 responses



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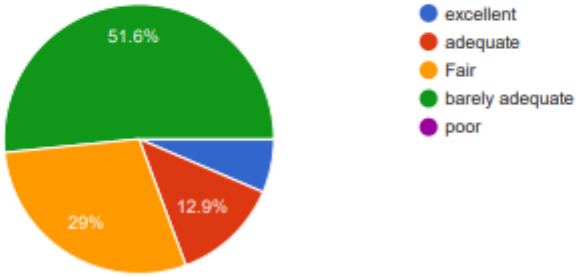
7. How do you rate the infrastructural support being provided to you by the Army?

31 responses



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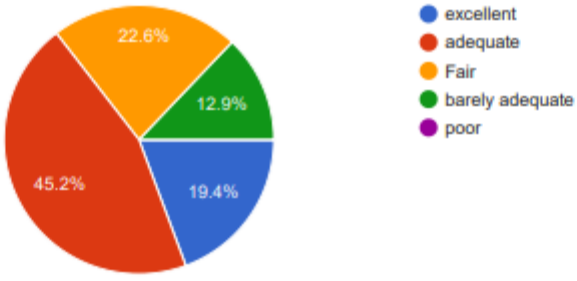
8. How do you rate the, mentoring support being provided to you by the Incubators?

31 responses



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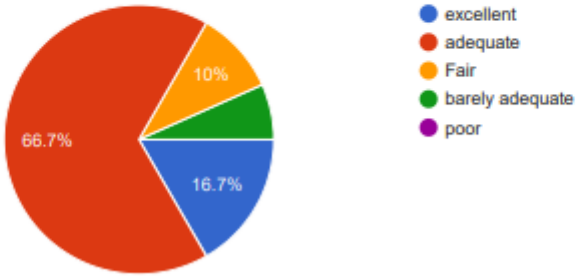
9. How do you rate the advisory/support role of the Project Facilitation Team / Nodal Officer?

30 responses



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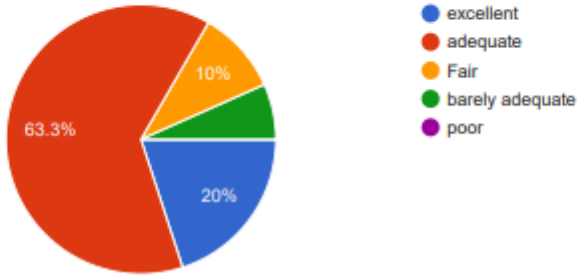
10. How do you rate the domain knowledge of the Project Facilitation Team / Nodal Officer in technology field & IDEX procedures ?

30 responses



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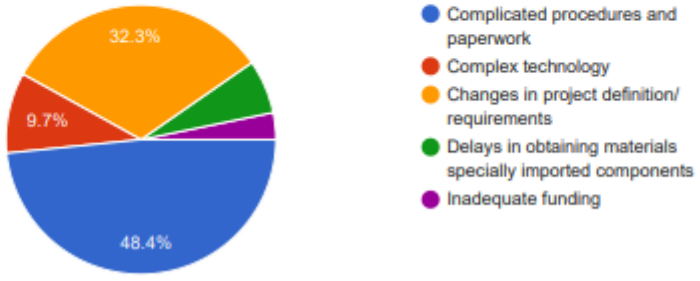
11. The delays in projects are most attributable to

31 responses



12. Following statement best describes my opinion of IDEX

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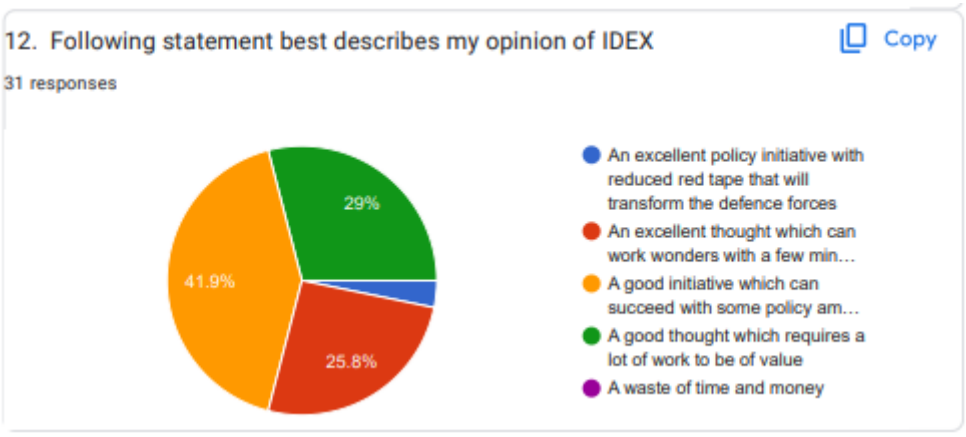
31 responses



Appendix E

TRANSCRIPT OF INTERVIEW WITH CHANGEMAKER
MAJOR GENERAL CS MANN, AVSM, VSM
ADDITIONAL DIRECTOR GENERAL, ARMY DESIGN BUREAU

Question1: How long have you been at the helm of affairs as far as IDEX in IA is concerned ?

Answer: Its been almost 18 months now since I assumed this appointment and started leading the IA's efforts in the field of defence innovation.

Question 2: What is your impression of the IDEX programme to include, responses to challenges posted by the IA ?

Answer: IDEX has really broken new ground and spurred the growth of an innovation ecosystem in the field of defence. Earlier only huge and established industries with decades of experience in the field were engaged in producing defence equipment but now all that has changed and young entrepreneurs are working on cutting edge technology in the field of defence out of nondescript garages and sheds. The IDEX programme has grown substantially over the last five years and we see lot of motivated startups responding to our challenges. There have been instances where more than 80 startups have responded to a single challenge.

Question 3 : How would you assess the enthusiasm about this programme within the IA? As far as distribution of IA IDEX projects amongst arms and services within the arms and services is concerned, it does not seem to be uniform with maximum projects attributable to Infantry and the Mechanised Forces (Armoured Corps and Mechanised infantry).

Answer : IDEX projects, being smaller in scale are most suited for infantry and that explains your above statement. In the case of mechanized forces, the projects are mostly for add-on items to the existing equipment. Other arms such as Artillery, Air Defence mostly have low population imported equipment which is prohibitively expensive to develop and not financially viable for any

startup. As far as services are concerned, they are mostly concentrating on development of software to ease their functioning but there is definitely a scope for larger participation by other arms and services in IDEX. I am sure with increased awareness and more so with success of the ongoing IDEX projects, more will get motivated to participate.

Question 4 : In your experience of IDEX over the last 18 months you would have seen certain projects being successful while others may not be proceeding as desired. Can you say what kind of projects are likely to be more successful under this programme ?

Answer : Yes, there is definitely a dividing line. I have observed that projects which do not involve large scale hardware manufacture, but concentrate more on smaller add-on equipment as also software oriented projects are more likely to succeed simply because of the limited manufacturing capabilities of the young startups/MSMEs. However, in the field of software, AI is quite challenging as it requires realistic data which we find difficult to share due to security concerns. We are working on this and should be able to evolve a policy on this aspect soon.

Question 5 : IDEX is modeled on similar defence innovation programmes in countries such as US, UK and France among others. A study of these programmes in other countries reveals that most have laid down specific priority areas for defence innovation by startups which correspond to their niche capabilities. We in IDEX have not laid down any such priorities. What is the reason for doing so ?

Answer : We must keep in mind that these western countries have an established and well evolved private defence industrial complex for a long time, while we in India are newcomers to this field. The private industry was kept away from the field of defence production for most of our history and the area has just been opened to them especially after the *Atmanirbhar* push since 2020. One of the aims of IDEX being to encourage formation of a new defence innovation ecosystem, it is essential that we do not limit their endeavours by laying down any priorities at this initial stage and let the private industry and startups innovate and evolve. Perhaps once this

programme has matured, we may look at laying down certain priority areas more suited to IDEX projects.

Question 6 : As of now, there is a significant number of projects which have been delayed. What do you feel are the reasons for delay in IDEX projects ?

Answer : Currently most of the delays are an aftereffect of the COVID pandemic which caused large scale disruptions including a worldwide shortage of high-end micro and nano chips. However, the delays can also be attributed to over ambitious startups taking on more projects than they can handle, as also some of our complicated procedures. But being a new programme which is still evolving, delays are bound to be there. Moreover, delays have to be acceptable wherever R&D is concerned as you are entering uncharted waters.

Question 7 : As you yourself agree, our acquisition procedures are complex and difficult to fathom for young and inexperienced startups. Combined with this is the drawback of old bureaucratic mindset which tends to treat these projects on the same lines as conventional defence procurement. Though, IDEX programme is mentioned separately in DAP 2020, post production of prototype, it follows the same procedures laid down vide DAP 2020. While there have been a few amendments to facilitate 'ease of doing business' with IDEX, do you feel there is scope for more easing of these procedures and can we have a dedicated manual of procedures for IDEX separate from DAP 2020 which is focused on conventional procurement ?

Answer : You are absolutely right when you mention our conventional procedures and the bureaucratic mindset. Till date we have succeeded in amending the DAP 2020 twice as far as provisions for IDEX are concerned. But there is a definite requirement of not only having a separate procurement manual for IDEX and similar such cases (Technology Development Fund of DRDO is another such example), it must be combined with creation of a separate vertical in the procurement chain. Otherwise the conventional procurement chain is too weighed down by their

conventional procedures and the mindset can only be changed by separating the two and inducting fresh blood.

Question 8 : Interaction with the IDEX startups has revealed that despite the SPARK grant, they find it difficult to find balance of the funding. The venture capitalists are hesitant to invest in a defence innovation projects due to lack of knowledge and apprehensions related to complicated govt procedures. There is also a demand to increase the SPARK grant. What is your opinion on firstly, increasing the SPARK grant and secondly, establishment of a venture capitalist fund exclusively for IDEX projects ?

Answer : There is definitely a need to increase the SPARK grant of Rs 1.5 Cr in order to keep up with the inflation since its inception and also to encourage the startups further. We can also look at sharing the funding with the startups in the ratio of 60:40 instead of the current 50:50. There is also a case in point to permit Open Challenge under the IDEX PRIME scheme which provides upto Rs 10 Cr as SPARK grant. The idea about establishing a venture capitalist fund is a good one and we must think about it in near future.

In the end, we concluded that IDEX is indeed a pioneering initiative of the govt which is evolving and if early indicators are anything to go by, it will surely usher in an era of cutting edge innovation in IA.

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