



Re-Imagining India's Defence Industry Base

Crystal Ball

The Two New Defence Industrial Corridors



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1. Executive Summary

India's defence manufacturing Industry has reached an inflection point and very large scale change is on the way.

The Government of India has now decided to construct two large Defence Industrial corridors (DICs) in Uttar Pradesh's Bundelkhand region and along the Chennai – Bangalore stretch. A sum of Rs 40,000 Crores has been committed in the Feb ' 2018 Union budget to be invested in these corridors with Rs 20,000 Crores allocated to each corridor.

Within this new defence corridor platform, Indian companies will, over the next 10 years, re-imagine and re-build the country's defence industrial base using new business models and collaborative operating models that will enable the nation to achieve a quantum jump in military equipment production.

Private Companies and the Defence PSUs / DRDO will also develop new collaborative models that maximize the use of existing infrastructure in ways that will surprise. It is therefore, definitely going to be a far more active industry.

Developing advanced military technologies in India will require Business model innovation and Operating model innovation and asset light configurations that maximize the knowledge element within the defence manufacturing business.

So, this is not just about import substitution and saving US \$ 200 Billion in foreign exchange over the next 10 – 15 years by producing military equipment locally. We will also begin thinking in terms of leapfrogging technologies and move to next generation Artificial Intelligence based weapon systems by re-imagining conflict itself and develop systems that are suited to the new types of security challenges that we are likely to face.

The article below is a strategic designers view on the future. It explores new ideas that could transform India's Defence Industry base by introducing a range of concepts such as deploying Design Thinking and fast prototyping in New Weapons development to re-configuration and re-wiring existing infrastructure to create an advanced Defence Industrial ecosystem in India over the next 10 years

All of this technological change will provide our military with the weapons to eliminate any threat to our security in any part of the world or outer Space by 2035.

Since X36 Falcon is the designer of the original concept of the Defence Economic Zones (DEZs) that was presented to Mr. Manohar Parrikar (the then defence minister) in May ' 2015, we think the industry may be interested in our Rev02 view of a possible future.

2. Article

In early 2014, when the X36Falcon team visited Pragati Maidan for DEFEXPO, It was immediately evident to us that the industry needed new paradigm changing ideas that could replace the inefficient Defence PSU's / DRDO and eliminate the touts and dealers who represented foreign defence contractor interests in India.

Within 2 hours of entering the DEFEXPO venue, our design team had started sketching on the pamphlets they had gathered at the EXPO and soon they had a Schematic design sketched out for what would later become the Defence Industrial Corridor Project . It may interest readers to know that when we had first thought about it, we had called it the Defence Economic Zone (DEZ) project.

We showed our rough sketches to Mr. Ratan Tata whom we accosted outside the Raytheon stall as he emerged from a meeting there. Mr. Tata very quickly understood what we were saying (About Industry Structure and the need for a Defence Economic Zone) . He gave us his card with the instruction that the project be sent to him once we had written it. Four months later we did as he had bid us to do and we did receive a very nice, thank you note from him.

The crucial investment decision by the Govt. of India happened a year later in May ' 2015 when we met Mr. Manohar Parrikar, the then defence minister. He was very supportive of the project and pushed it within the Government. It was with his initial support that the project got an investment commitment of Rs 40,000 crores from the Govt. of India in the Feb ' 2018 union budget.

Separately, pilots from the Indian Air Force helped identify the Bundelkhand region in Uttar Pradesh as a possible location for the Defence Corridor. Our design team wanted to inject an advanced military project into the most under-developed region of Uttar Pradesh and we had asked our friends in the air force to identify a location. Once they came back with Bundelkhand, all that was needed was a helping hand from Mrs. Meenakshi Lekhi (BJP MP) to give a final push to the project by speaking about it in Parliament. Many more discussions took place within the government before the prime minister announced the Bundelkhand defence industrial corridor. The Chennai – Bangalore corridor was chosen separately.

3. Designers Brief ... Need for an Alexandrian Solution

It all starts with a design brief and so in March ' 2014, we asked ourselves a simple question : “ What can we possibly do, so that **India** (a newcomer in the worlds weapons Industry) could become a leader, by changing the structure of the Industry ... if necessary ? “

Firstly, it was clear that the Defence industry in India (in 2014) lacked an over-arching concept that could put industry players into project mode. So that was the first challenge.

Secondly the designed solution had to be large enough and innovative enough to overcome the massive inertia within Defence PSUs and DRDO and vested interests in the Arms lobbies and their political networks.

In fact what was required was an Alexandrian solution if we were to attempt an indigenisation of **75 % - 80 %** of defence equipment production by 2030 thereby saving US \$ 200 billion in foreign exchange.

It may be recalled that in 333 BC, Alexander while wintering in Gordium had attempted to untie the knot which held an ox-cart to a post within the palace of the former kings of Phrygia. When he could not find the end to the knot to unbind it, he sliced it in half with a stroke of his sword, producing the required ends (the so called “ Alexandrian Solution ”).

The other factors that went into the design exercise were (1) The need to create a large number of jobs (2) The need to create an innovation ecosystem in the country by designing a structure for it. The defence industries cluster design which emerged from this thinking had the following deliverables on the Macro Economic front :

4. Macro Project Benefits

1. The two Defence Industrial Corridor projects, together had to save India US \$ **200** Billion in Foreign Exchange over the next 10 years
2. New Job creation on account of the two projects had to be of the order of **5,00,000** Jobs in hi-tech defence manufacturing and allied industries
3. The largest benefit of the project however is the creation of a National Innovation Backbone Infrastructure and the creation of nearly **5,000** small yet highly specialised vendor companies with a

strength of just **20 - 40** employees each which will form the backbone of India's High-Tech manufacturing ecosystem in line with the Mittelstand (mid - sized company) model that exists in Baden-Wurttemberg in Germany.

5. Project Design Reference Frame

It has to be remembered that India is at a critical stage in its development. For instance, the Defence Industrial Corridor has been conceived at a time when India is revving up ... to take a Giant leap ... to Triple the size of the economy from US \$ **2.5 Trillion** in 2018 ... to US \$ **7.5 Trillion** by 2032 at a projected GDP growth rate of 8.75 %.

Given the shortage of private capital for strategic national investments it was necessary for the Govt. to create an initial enabling ecosystem by providing a sound regulatory environment on the one hand while also investing in the creation of basic infrastructure such as roads, power transmission and distribution facilities, military equipment testing facilities, airstrips etc.

The Govt. has now rightly decided to invest Rs 20,000 crores in the creation of this basic infrastructure in each DIC, to set the ball rolling and to catalyse private sector investment.

All of this Govt. investment will help the private sector to set up their facilities at reduced cost and help them achieve an earlier break-even on their investments.

6. Enabling Asset Light Business Models

The Defence Industrial Corridors as per the original design, have been structured in a manner that allows for various Business Plans and Monetisation strategies, depending on how individual companies want to participate in the project.

Each Defence Manufacturing Corridor will accommodate several large defence Contractors (i.e Anchor participants) and around 2500 smaller vendor companies. There are also three broad categories : Land Systems, Naval systems and Air Defence in which both Indian and foreign defence contractors and companies can participate.

The project has been specifically designed to accommodate a large variety of Business Models that can be deployed in a plug and play fashion ... depending on the risk - return profile of potential investors.

Asset Light business models can be designed and structured to allow companies to keep upfront capital costs low while maximising their long term returns ... in the form of a dominant long term presence in the Defence corridor and the Defence Knowledge Network which is a critical aspect of this project.

The most profitable Business models will be those which are designed as Knowledge plays. These business models will be sophisticated, asset light and will take maximum advantage of the Network and the Collaborative opportunities provided by the Defence Cluster which is what the Corridor represents.

Secondly, setting up the Corridor is actually a large Negotiation and the Innovation lies in the way the Negotiation is organised and executed. Within this, the design of the Knowledge network is a critical aspect as it effects how companies Collaborate in one area while they compete in other areas ... so as to reduce their common costs while maximising their revenues.

It may interest readers to know that the collaborative model for the DIC project came from "Project Deep Star " which is a collaborative technology development model in the deepwater Gulf of Mexico by companies such as Chevron, Shell and others.

7. Revenue Potential ... Ballpark Estimates

For potential participants and investors in the Bundelkhand and Chennai – Bangalore corridors, the revenue projections are critical from a business perspective. The potential revenue numbers for Each of these is as follows :

1. Defence Offset based revenue (alone) : US \$ **5.0** Billion / Year
2. DPP Quota based * : US \$ **5.0** Billion / Year
3. Defence Engineering : US \$ **4.5** Billion / Year
4. Components & Spare Parts : US \$ **7.5** Billion / Year

Total : US \$ 22 Billion / Year

* DPP Quotas [Buy (Indian) and Make and ... Buy and Make]

How companies in the corridor achieve these numbers depends on how they plan and operate their business models.

Each Defence Manufacturing Corridor therefore represents a potential revenue opportunity of US \$ **22** Billion each year for participants depending on whether the Govt. also includes conditions for preferential procurement from factories located within the corridors.

Companies will need to decide whether they should focus their efforts on the Bundelkhand Corridor **or** in the Chennai - Bengaluru Corridor ... Or Both.

Therefore how a company designs its Business model will also be a critical determinant of how much of the \$ **44** Billion / Year in revenue (for both corridors) they will be able to capture for themselves and their business partners.

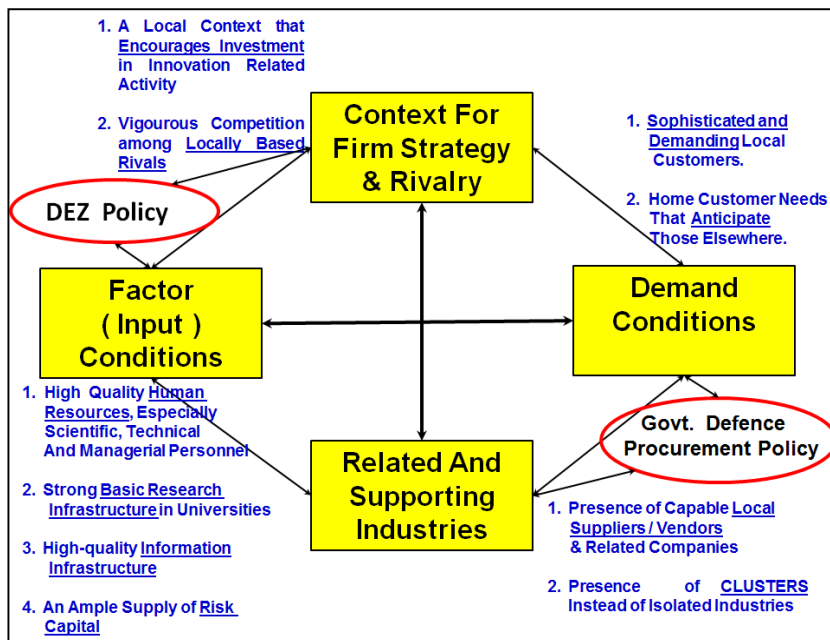
Business Model design is therefore a critical determinant of success.

Readers may please note that the \$ 44 Billion / Year number forecast as the potential size of the Indian Defence Equipment and Services market (circa 2025) is real ... as India's economy is getting set up to double in size by 2025 and then triple in size over 2018 levels by 2032 and the national defence budgets will only get larger as we expand and modernise our armed forces.

8. Strategic Innovation Framework

An essential part of the DICs design is its Innovation framework that had to be self sustaining . The Defence Manufacturing Corridors have therefore been conceptualized as industrial clusters based on the diamond model developed by Prof. Michael E. Porter of Harvard University.

Specifically, the approach is to provide the necessary Infrastructure and a policy framework that encourages unprecedented innovation in Defence technologies. Such industry specific clusters are found in Baden-Württemberg in Germany (Precision Machinery), Boston in the United States (Biotechnology) and Florence in Italy (Leather industry).



Michael Porter Four Forces Model

Professors Michael Porter and Scott Stern found that the striking innovative output of Israeli firms is due, not just to more effective technology management, but also to Israel's favourable environment for innovation, including strong university-industry linkages and a large pool of highly trained scientists and engineers.

The Defence Industrial Corridors (DICs) are therefore designed to apply these concepts by bringing together a number of large Indian companies and their foreign JV partners in a vertically integrated structure comprising of nearly 2500 vendors and small scale industries within each Corridor . The foreign holdings in the JVs will vary between 49 % and higher depending on the technology area and other factors.

This vertically integrated structure and its numerous players will then develop deep linkages with a large number of IIT / University departments offering degree courses in Inter-disciplinary defence engineering related disciplines.

In fact each DIC will have a designated IIT or group of IIT's as partners who will together set up 6 IIT Research departments and start Inter-disciplinary courses that will admit its first batch of 500 Inter - disciplinary Military Technology Graduates by 2021. This first batch will graduate by 2025-26

and be immediately deployed within the companies setting up facilities within the DICs.

This diverse group from Industry and academia will in turn interact with Government representatives and actual users from the Armed Forces (Army, Navy and Air force) to design and develop new defence technology and most importantly work to adapt advanced technologies from foreign sources to make new weapons with next generation technologies including Artificial Intelligence ... In India.

IIT Kanpur is the designated technology partner for the Bundelkhand DIC and IIT Chennai is the technology partner for the Chennai – Bangalore corridor.

9. Using Design Thinking to Create New Weapon Systems

The Defence Industrial Corridors and the ecosystem that they create will bring the latest ideas in Design to new weapons development.

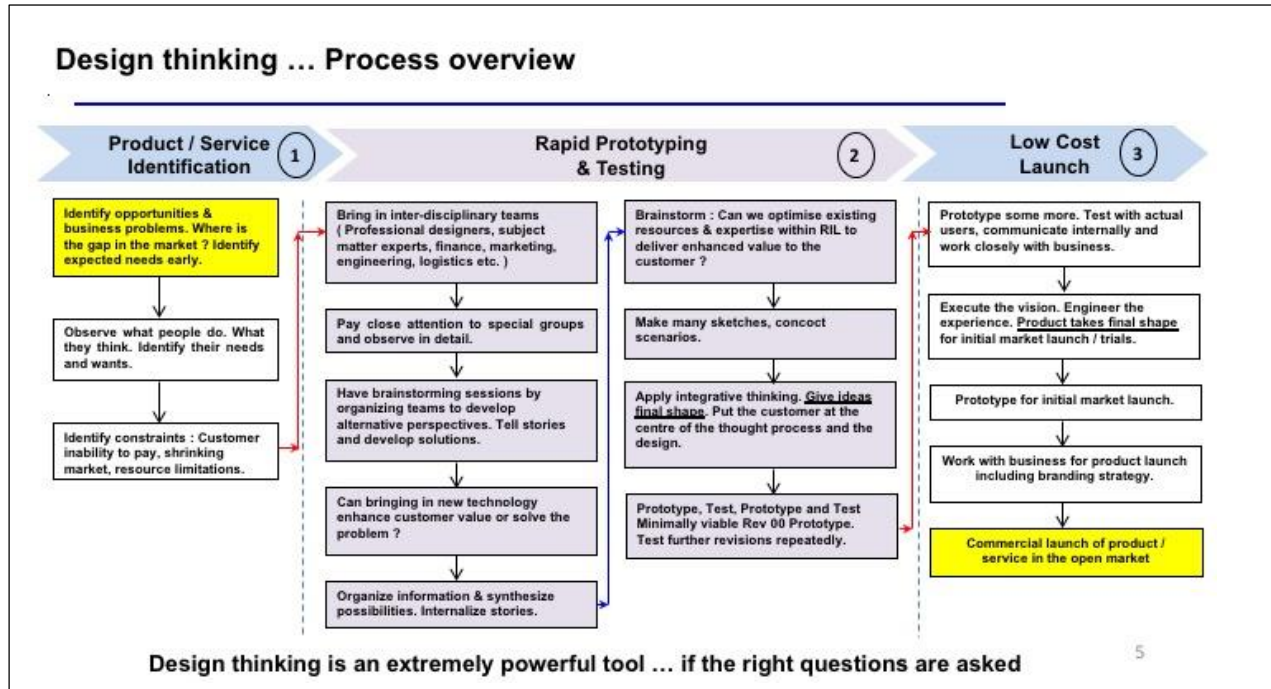
Design Thinking is User Centric in nature. All major defence contractors around the world depend on design thinking in the development of New weapon systems and new weapons. The DIC's have been designed to incorporate these ideas.

The following international defence contractors use design thinking to bring un-precedented innovation to weapons design :

1. Lockheed Martin
2. Raytheon
3. Boeing
4. Rolls Royce
5. United Technologies
6. Thales
7. Northrop Grumman
8. US Department of Defence

The IIT Technology partners in each DIC will help each of the Companies setting up facilities within the corridor to start their own design thinking cells.

These will be dynamic brainstorming units which will rapidly prototype and test new and innovative ideas for components and weapon systems.



Engineering units from the Army, Navy and Airforce will set up an Joint inter-disciplinary command in each DIC where serving military engineers and actual users of the equipment (field regiment personnel for instance or special forces) will be consulted while developing the designs of new weapons.



Weapon design Workshop in progress involving both Special forces personnel and Military Scientists

Special weapon testing units from the Armed forces staffed with actual users (Artillery or Missile unit personnel for instance) will be set up in both the Bundelkhand and the Chennai – Bangalore corridors and they will work directly with private companies to develop new weapon systems.



US Military Engineers and Special forces troops provide “ Actual User “ inputs to scientists and weapon designers from private companies to test a New bomb disposal Robot that uses Artificial Intelligence

Software companies will also set up units within the Defence Corridors to develop dual use software and Artificial intelligence applications for the Indian Military.

10. Employing Foreign Military Scientists within the DICs

Soon after the collapse of the Soviet Union the Chinese Government moved fast and hired over 5000 Russian military scientists who were without work.

The hiring of these 5000 Russian experts led to massive advances in the development of the Chinese military machine and China’s technology base.

China has gained immensely from employing Russian experts in areas such as advanced avionics, material science and most importantly metallurgy.

It would therefore be a good idea for the Govt. of India to allow Indian companies to employ foreign experts in areas such as Metallurgy to begin with and then move on to other areas as we get more used to deploying this strategy.

Today no Indian company has some of the more advanced knowledge in the areas of Material Science and especially in the area of Military alloys.

Retired military scientists from Russia and Eastern Europe as well as the United States represent huge promise. All roadblocks towards hiring of foreigners and foreign military scientists should therefore be removed.

11. The Innovation is in the Contracts ... Not in the Technology

Setting up a successful Defence Industrial Corridor is actually a large negotiation and the innovation is in the contracts, not necessarily in the technology.

There is also huge potential to think about New Business Models that capture and retain value for companies setting up units in the Defence Industrial Corridors.

12. Conclusion

The two Defence Industrial Corridors will employ 2,50,000 people each and transform the Industrial landscape in the state of Uttar Pradesh and along the Chennai – Bangalore corridor.

Technologically they represent a huge technology leap for India. All of this is possible if we as a country focus more on the value that can be added by good Design.

- Concluded –