Make It The Indian Way

(The editorial is based on the article “Make It The Indian Way” which appears in The Hindu for 21st November 2018. It analyses the opportunities in 3D printing.)

If ‘Make in India’ is to succeed, it needs to encompass ‘Make it the Indian Way’. Developing countries are fortunate to be in a historic moment when the manufacturing sector is about to go through a transformation run by disruptive technologies — the country like **India should find a way of making it work in its** favour **rather than against it.**

Disruptive technologies are those that significantly alter the way businesses or entire industries operate. Often times, these technologies force companies to alter the way they approach their business or risk losing market share or becoming irrelevant. Recent examples of disruptive technologies include smartphones and e-commerce.

3D printing is one such new technology which has many dimensions. But, it has not yet entered our everyday lexicon, and even people who have heard of it view it as a toy technology that geeks play with, creating prototypes of robots using small machines that create moulds using materials such as plastic and photosensitive resins.

What is 3D printing?

- 3D printing is a manufacturing process that creates a three-dimensional object by incrementally adding material until the object is complete (this contrasts with subtractive manufacturing techniques such as carving or milling, in which an object is created by selectively removing parts from a piece of raw material).
- The term "3D printing" is increasingly used as a synonym for **Additive Manufacturing.**

How Does It Work?

The 3D printing process turns a whole object into thousands of tiny little slices, then makes it from the bottom-up, slice by slice. Those tiny layers stick together to form a solid object.

Background

- Additive manufacturing started out as a technology for nerds and geeks trying to build an arm of a robot or a body of a drone in their garages.
- Rapid progress in technology over the last five years has diversified the functions and usage of the technology.
- Today it is possible to build an entire shoe, including shoelaces, in a university laboratory.

Uses

- This technology is used to build helmets, dental implants, medical equipment, parts of jet engines and even entire bodies of cars.
- In some industries, nearly all hearing aid manufacturers now use additive manufacturing.
- This is also used in improved spare part management for shipbuilding, creating beautiful and durable models for conception and promotion of the construction industry.
- Enlargement of molecular structures and mechanical parts for laboratory tooling can also be done through 3D printing.
- Examples of tools and machinery can be seen in the food industry like 3D printed sugar.
- 3D printing has its application in the education sector, Aeronautics, and Space components as well.

Need for 3D printing

- Traditional manufacturing of mechanical parts involves making a mould and then stamping out parts by thousands every day. The equipment to make these parts and moulds is expensive, thus the cost of the first hundred units is high. Per unit costs decline only when they are mass produced. Because of limitations of how this technology works, one typically builds many small parts, which are later on assembled on an assembly line using unskilled labour or robots to build an entire system.
- Traditional manufacturing leads to high inventory costs of multiple parts that need to be produced and stored before being assembled. This makes the design phase complex and costly, rendering it expensive to redesign, to correct initial mistakes or innovate to meet changing consumer needs.

Overview

- Industrial 3D printing has begun to transform manufacturing in Western countries.
- One recent survey of U.S. manufacturers shows that about 12% have started using

additive manufacturing for their products and expectations are that this will result in about 25% of products in the next three-five years.

Opportunities in India

- **It eliminates large capital investments.** Machines are cheaper, inventories can be small and space requirements are not large. Thus, jump-starting manufacturing does not face the massive hurdle of large capital requirement and the traditional small and medium enterprises can easily be adapted and retooled towards high technology manufacturing.
- **The Indian software industry is well-established, and plans to increase connectivity are well underway as part of 'Digital India'.** This would allow for the creation of manufacturing facilities in small towns and foster industrial development outside of major cities.
- **It is possible to build products that are better suited for use in harsh environmental conditions.** Products that required assembly of fewer parts also implies that they may be better able to withstand dust and moisture prevalent in our tropical environment and be more durable.
- **In a country where use-and-throw is an anathema, maintaining old products is far easier** because parts can be manufactured as needed and product life-cycles can be expanded.
- **Maintaining uniform product quality is far easier** because the entire system is built at the same time and assembly is not required.

Consequences

- **It decreases reliance on assembly workers** and bypasses the global supply chain that has allowed countries like China to become prosperous through export of mass-produced items.
- **This may lead to the creation of software-based design platforms** in the West that distribute work orders to small manufacturing facilities, whether located in developed or developing countries, but ultimately transfer value creation towards software and design and away from physical manufacturing.
- This would imply that labour-intensive **manufacturing exports may be less profitable.**
- For countries that have already invested in heavy manufacturing, **this shift to adaptive manufacturing will be difficult and expensive.**

Way Forward

- The "Make it the Indian Way" approach **needs public-private partnership** and multi-pronged efforts.

- There is a **need to accelerate research at our premier engineering schools** on manufacturing machines and methods and encourage the formation of product design centers so that the products built to suit the Indian environment and consumers.
- **There is a need for government support** to provide incentives for distributed manufacturing in smaller towns, and for the IT industry to work on creating platforms and marketplaces that connect consumer demands, product designers and manufacturers in a seamless way.

However, a combination of science and art, with a pinch of Indian entrepreneurship thrown in, will allow to develop a manufacturing ecosystem that will not only allow India to compete with global manufacturing, it will also create products that are uniquely suited to Indian conditions.
