



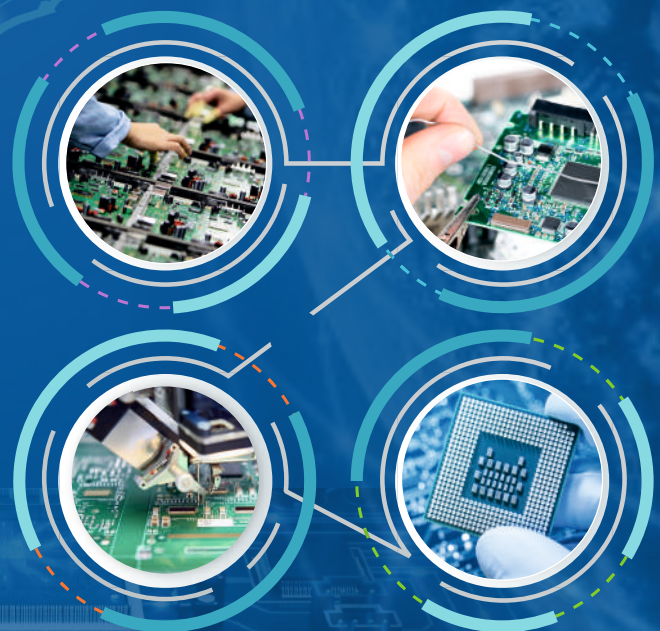
**WORLD TRADE CENTER®  
MUMBAI**



Study on

# Promoting Electronic Manufacturing in India

An MVIRDC Research Initiative





**MVIRDC**

M. Visvesvaraya Industrial Research and Development Centre



## **Bharat Ratna Sir M. Visvesvaraya**

(15 September, 1860 - 14 April, 1962)

MVIRDC World Trade Center Mumbai is the realization of the vision of one man - Sir M. Visvesvaraya - engineer, scientist, and a great son of India. Named after him, M. Visvesvaraya Industrial Research & Development Centre (MVIRDC) is a company registered and licensed under Section 25 of the Companies Act, 1956 (currently Section 8 of the Companies Act, 2013). MVIRDC is the promoter of World Trade Center Mumbai, which stands tall as a symbol of excellence in industry and trade services.



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## **Foreword**

It gives me immense pleasure to know that MVIRDC World Trade Center Mumbai is bringing out a research study on **“Promoting Electronic Manufacturing in India”**. The study identifies potential segments for investment and export-led growth in electronic manufacturing.

The expected shift in global supply chain following the outbreak of COVID pandemic will only strengthen India's growth in the electronics sector. India is well poised to capture the opportunities arising from the shifting global value chain in the electronics sector and this is evident from the overwhelming response received from global companies for the three schemes which were launched by the Ministry of Electronics and Information Technology (MeitY), viz. PLI, SPECS and EMC 2.0. Together, these schemes will lay the groundwork for a vibrant manufacturing ecosystem and pave way for a USD 400 billion Electronic System Design Manufacturing (ESDM) sector by 2025 as envisaged under National Policy on Electronics 2019.

I am happy to note that this report has been prepared at this historic moment when global forces and the local policy developments are working in sync to transform the face of the electronic manufacturing ecosystem. I am confident that the findings of this report will generate more public discussion on this subject and shape future course of policy actions to catapult India into the league of top nations in electronic manufacturing.

(Ajay Sawhney)

New Delhi

Dated: 14<sup>th</sup> September, 2020



**Professor V. Kamakoti**  
**ASSOCIATE DEAN, IC & SR**

September 14, 2020

#### FOREWORD

The modern digital world is seeing a rapidly increasing dependence of Human on Electronics for day-to-day living. The COVID lockdown is turning out to be a proof of how ICT products can indeed change the way of life. The world is witnessing how activities that were carried out by physical presence in the Pre-COVID era can be carried out as effectively or even better in a virtual mode. Post COVID world will certainly see an increasing adoption of these positive technological interventions, resulting in large consumption of electronic products. The quantum of consumption will be directly proportional to the population, and thus India, as in the past, will continue to be a major consumer of electronic goods. It has been frequently stated that the second largest imports by India, next to oil, is electronics. The "no-travel" life of the COVID era may make electronics imports exceed oil. This is the most appropriate time for our Country to promote indigenous electronic products of relevance to Indian Market, thus, decreasing the electronic imports, creating more jobs locally and developing robust products that could attract a global market.

The next-generation India is poised to witness a massive deployment of Cyber Physical systems. Petabytes of data are going to be generated, many of those would be sensitive both from individual privacy and National Security perspectives. Thus, another important pressing need for a trusted delivery chain is National Security. With the type of cyberattacks witnessed by the world, there is a need for a complete end-to-end control of the systems inducted into our communication networks and data centers. While indigenization provides the most trusted delivery chain, this need to be supported by a very vibrant local and global markets that consume these electronic goods in large numbers. The numbers are crucial for competitive pricing.

The report prepared by MVIRDC World Trade Center Mumbai is very comprehensive and has covered all the issues mentioned above. It has provided detailed statistics of the electronics market segment wise along with specific concerns arising from the manufacturing ecosystem, investments, Government policies, dependence on imports and international supply/competition perspectives. The report gives a deep insight into what are the most needed products from the Indian/Global consumer segment, so that a suitable ecosystem can be conceived at the earliest to enable design, manufacture and market these products from our Country.

The report lists a set of 5 challenges faced by the electronics industry and 10 policy suggestions to the Government to address those.



Overall, the report is being released at the most appropriate time. I congratulate the MVIRDC World Trade Center Mumbai for this meticulous job. I am sure this report will be put to good use by the stakeholders.

Thanking you.

With Best Regards



(V. Kamakoti)

प्रो. वी. कामकोटि

Prof. V. KAMAKOTI

सह-डीन / ASSOCIATE DEAN

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## FOREWORD

I am honored to be associated with MVRDC World Trade Center Mumbai's excellent Study on 'Promoting Electronics Manufacturing in India'. I also wish to take this opportunity to applaud the Center's fine tradition of national service in trade promotion and research, which resulted in far-sighted initiatives since its inception in 1970s.

The Study analyses what held back India's electronics industry and suggests measures to revitalize it. It recalls that India's electronics sector, poised to take off in the 1980s, could not recover - after India joined ITA-1 in 1997 and signed multiple FTAs granting duty-free entry to electronics imports. The resulting import dependence rendered India dangerously exposed, as electronics and digitisation are key verticals underlying development of every important sector including defence, space, power, automotive, information and communications technologies, machine tools, and even entertainment. Lack of indigenous capacity in electronics is therefore not only a grave economic issue, but equally a serious National Security concern. The Study's analysis and conclusions are therefore exceptionally relevant in the context of Hon'ble Prime Minister's call for Atmanirbharta amidst the perilous challenges India is confronted with on its borders and from the Coronavirus Pandemic.

Other countries too understood the importance of reinforcing the resilience of electronics supply chains and cybersecurity. The United States launched a Clean Network and Decoupling initiative to secure its ICT infrastructure and electronics supply chains. Decoupling therefore presents another historic opportunity for India - estimated by Credit Suisse at \$350-550 billion dollars - for relocation of electronics supply chains to India and participation in building secure international networks through indigenous capabilities, which we have aplenty.

At the same time, India needs to protect its critical infrastructure and rebuild its electronics industry through domestic resources. The Government has taken concrete steps to secure national telecommunications networks, cancel tenders with adverse security implications in the power and infrastructure sectors, and also revoke permissions to adversarial nations for participation in critical domestic tenders. The Government is also trying to reform the anomalies in the domestic procurement system which led to indigenous companies being excluded from orders. Domestic procurement plays a strong role the world over in driving economic growth, creating high-tech jobs and encouraging investment in domestic innovation. The Government has moreover recently mandated that indigenous solutions be found including for the prestigious BSNL national 4G tender, thus opening the way for the expansive growth of India's domestic electronics and telecommunications industry.

The Study, moreover, advocates a feasible, R&D intensive Action Plan for reviving India's latent technological capabilities, and address the structural disabilities faced by domestic companies. Thus, foreign companies have asked for incentives that offset the 8-10% cost disadvantage vis-a-vis Vietnam, Thailand, Philippines and China. These incentives should first and foremost be given to domestic, Indian companies.

An integrated Industrial Policy encompassing FDI, Trade Policy and R&D incentives for investing in new high-tech capabilities - is required. We must aim at design and manufacture, not low-level assembly, which current schemes are focused on. India's R&D intensity has been decreasing over the years and stood at only 0.62% as per US Science & Engineering Indicators, in contrast to China's 2.19%. The share of the high-tech manufacturing sector in GDP is also declining.

This decline can be arrested only if the State resumes an active role in shoring up R&D, Science & Technology. The State has played an active role in national technological development in all advanced countries - the US, Japan, South Korea and lately

in China. The unique role of state policies in USA in supporting the aircraft, space, computers and semiconductors industries, the Internet and GPS- underlines its leadership in the development of cutting-edge, transformational technologies. India must learn from these examples and fashion a more proactive role for a Science State which helps in fulfilling India's latent scientific and technological potential. The key is to work with the domestic private sector, not against it.

Indian is now again faced with an opportunity which she cannot afford to miss. Anomalies need swift solutions; support must be extended to build a high-tech electronics sector second to none in India, with Indian-designed and India-made products incorporating maximum high domestic value addition.

It is hoped that the Study will contribute to laying the path for such a partnership in which 'Designed in India' and 'Made in India' products rule the market.

Smita Purushottam  
Amb (rtd.) / Chairperson SITARA

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## FOREWORD

I am very happy to see MVIRDC World Trade Center creating this report on Electronics.

Electronics has been in my DNA since I started my career with DCM Data Products 1972. In 1976, I went on to create Hindustan Computers Ltd. (HCL) with my friends. And we designed and manufactured our first commercial Computer in 1977 at the same time as Apple.

I have also been involved in many committees formed by the Government of India from 1999.

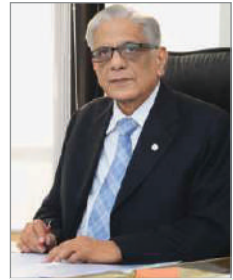
I absolutely agree that we need a vibrant electronics industry in India from semiconductors to designing and manufacturing of products. And the current geopolitical situation - specially with China there is serious concern about trusted value chain. How do we protect our critical infrastructure from backdoor and spyware sitting on imported hardware?

It is good to see that this report has inputs from a wide spectrum of the industry. And it shows the way to a great opportunity to be the next hub of electronics manufacturing in the world.

Ajai Chowdhry  
Founder - HCL

# Preface

Government of India's vision of Aatma Nirbhar Bharat or Self-Reliant India is a clarion call for aspiring entrepreneurs to promote indigenous design and development and restore the industrial glory of the country. History has proved that Indian entrepreneurs are adept at finding new opportunities amidst challenges and in responding to such policy initiatives. In 1942, when the then Indian government banned import of paints, four enterprising youngsters started manufacturing paints in a garage in Mumbai, which subsequently became one of the top 10 paint makers in the world under the name of Asian Paints. Arvind Mills, which became the world's top three denim manufacturers by 1990s, had a humble beginning in 1931 in response to Mahatma Gandhi's call for Swadeshi movement. One of the world's top 10 generic pharmaceutical firms Cipla was founded in a rented bungalow in Mumbai by Dr. K.A. Hamied with a vision to make India self-reliant in pharmaceuticals in 1935.



**Mr. Y. R. Warkerkar**  
Director General  
MVRDC World Trade  
Center Mumbai

I am confident that the current wave of Self-reliance movement will give rise to more such champion entrepreneurs to spearhead the next frontier of industrial development in this age of fourth industrial revolution. In the last few decades, automobiles and pharmaceuticals have emerged as champion sectors of manufacturing-led growth and exports in India. The time has come for India to position electronics manufacturing as a fulcrum for the next phase of industrial development.

Electronic manufacturing is a critical sector not only for the industrial development of a country but also for its enormous contribution to defence, space technology, atomic energy and other strategic sectors. Recognizing its strategic importance, Government of India established a separate division, Department of Electronics (DoE), as early as 1970 to support the electronics industry following the recommendation of noted atomic scientist Homi Bhabha led Committee. In the following years, the government focused on indigenous development of computer hardware through its public sector undertaking Electronics Corporation of India Ltd. (ECIL), set up in 1967 under Department of Atomic Energy. In late 1970s, domestic production of computers picked up with many private companies joining the race after IBM exited India. The boom period (1978-86) saw many private companies, viz. DCM Data Products, Wipro Systems, Patni Computers, Hindustan Computers, ORG Systems and Zenith Computers engaging in indigenous design and manufacturing of computer hardware. However, the country could not sustain this momentum in computer hardware manufacturing as the liberalization policy of 1984 encouraged cheap imports and shifted the policy focus on IT software development. In the ensuing years, the government promoted software exports through software technology parks and providing satellite connections to Indian software establishments catering western markets. Even though electronic manufacturing did not see notable progress in this period, India attracted multinational companies willing to set up global design centres by hiring the vast talent pool of design engineers in the country. Since late 1980s, global electronic majors such as Texas Instruments, Cadence, Motorola, Microsoft, GE, Philips, HP, Accenture, DELL, CISCO, Oracle, Adobe, SAP, and Google set up technology development centres in India.

In 1980s, Indian consumer durable companies such as Mirc Electronics (Onida brand), BPL, Weston and Dynavision started manufacturing colour televisions, washing machines and other electronic goods to cater to the demand of emerging middle class households. Some of them entered into technology partnership with Japanese and German companies. However, as India liberalized its economy in 1990s, these local companies faced competition from LG, Samsung, Sony and other foreign brands. The same story of local companies being outcompeted by foreign brands repeated after 2010, in the mobile and smartphone sector. Indian companies such as Micromax, Intex, Lava and Karbonn lost market share to Chinese brands such as Oppo, Vivo, Onplus, Xiaomi and others. Meanwhile, India tried to attract investment in fabrication for chips, solar cells and LCD, LED, OLED display panels through the National Semiconductor Policy 2007. However, the country could not attract any investment in foundry, which is a highly capital intensive manufacturing segment because of ensuing Global Financial Crisis. Currently, two Government-owned organizations have fabrication facilities in India. One is Semi-Conductor Laboratory (SCL), which is an autonomous body under Department of Space, Government of India. The other is Society for Integrated Circuit Technology and Applied Research (SITAR). These two organizations cater to the aerospace and defence requirements of the country and do not operate on commercial scale to meet the needs of the electronic manufacturing industry.

It is popularly commented that India, the seventh largest country does not have even a single commercial scale foundry for manufacturing chips, while Taiwan, which is as small as the entire city of Delhi, has 25 world class foundries. Global

semiconductor manufacturers such as Samsung Electronics, Intel, Texas Instruments and STMicroelectronics have design centres in India, but none of them have a foundry in the country. India houses the second largest development center for the world's leading semiconductor design and manufacturing firm Texas Instruments outside USA. The India Center has contributed around 1,000 patents out of the 19,000 patents developed by the firm. Semiconductor foundry is a capital intensive business requiring billions of investment, uninterrupted power supply and huge amount of pure water supply, conditions which are difficult to fulfill in India.

Today, India depends on imports to meet more than 40% of its electronic goods demand, although this share has declined from 54% in 2014-15. India has made considerable progress in domestic manufacturing of mobile handsets & accessories, LED lighting, set top boxes, medical devices and other electronic goods. However, India continues to depend on imports for components such as printed circuit boards, SMT components, memory, microprocessors and other components used in electronics. As a result, India's trade deficit in the electronic sector is second largest after crude oil and it has increased from USD 34 billion in 2015-16 to USD 41 billion in 2019-20. There is a need to control this burgeoning trade deficit by progressively increasing domestic value addition in electronic manufacturing. In order to develop a robust manufacturing ecosystem, government needs to provide fiscal incentives to offset local manufacturing disabilities, large scale cluster development, world class testing facilities and skilling ecosystem, to name a few.

In the last two decades, Government of India has taken several policy measures to kickstart electronic manufacturing in India. These include promoting electronic manufacturing clusters, special package of incentives to support large scale investment in manufacturing, setting up electronic development fund, preferring domestic manufacturers in public procurement etc. National Policy on Electronics, 2019 (NPE, 2019) aims to transform India into a global hub for Electronics Systems Design and Manufacturing (ESDM). Since April 2020, Government notified three schemes, namely, Production Linked Incentives (PLI), Scheme for Promotion of Electronics Components and Semiconductors (SPECS) and Electronic Manufacturing Cluster (EMC 2.0). With these schemes, electronic manufacturing has once again received heightened policy attention in recent months.

State governments have also taken various measures to promote electronic manufacturing in their regions. Recently, Government of Karnataka announced special incentives to promote Electronic System Design Manufacturing (ESDM) in the state. Uttar Pradesh introduced Electronics Manufacturing Policy 2020 to attract global investors in this sector. Other states such as Gujarat, Haryana, Punjab, Maharashtra and Andhra Pradesh, to name a few, also have dedicated policy for electronic manufacturing. The central and state governments are taking various measures to promote indigenous manufacturing of electronic products in the country. However, the industry continues to face various challenges that make electronic manufacturing unviable in the country. Some of these challenges are lack of availability of components locally, competition from cheap imports, high cost of power and lack of finance at competitive interest rate, to name a few. A coordinated action between the central and state governments can go a long way in addressing these challenges and making India an attractive destination for electronic manufacturing. The shifting global value chain post COVID 19 will also help India attract investment in this sector if we take timely policy actions to secure the confidence of the global investors.

In this backdrop, MVRDC World Trade Center Mumbai prepared this report to examine the opportunities and challenges facing the electronic manufacturing ecosystem in India. The report combines meticulous data analysis with a comprehensive primary survey involving leading manufacturers, industry associations, Electronic Sector Skill Council, policy analysts, independent consultants and other stakeholders. Based on interaction with these stakeholders and granular analysis of data, the report presents market opportunities and policy suggestions to benefit from these opportunities. I am confident that a progressive policy regime and the enterprising spirit of our entrepreneurs will join forces to transform India into a trade surplus country in electronic sector. I take this opportunity to thank all the organizations for participating in this research initiative and enriching the content of this report. I am confident that this report will be a useful source of reference for policymakers and will stimulate public discussion on developing a world-class electronic manufacturing ecosystem in India.

This report is dedicated to eminent engineer and statesman Bharat Ratna Sir. Dr. M Visvesvaraya whose visionary idea of 'Prosperity Through Industrial Development' continues to be relevant even today as we strive to attain Aatma Nirbhar Bharat. MVRDC World Trade Center Mumbai was born out of the vision of Sir. Dr. M. Visvesvaraya to establish an iconic institution for promoting trade and industrial research. His seminal contribution to trade and industry not only laid the early foundation for industrial development in the then Mysore state, but it continues to serve as an illustrious model of industrial development for entire India even today.

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## Executive Summary

Electronic manufacturing is a highly risky venture as rapid growth in technology and innovation leads to shorter product life cycle and loss of market share. Technology advancement and new entrants have challenged and outcompeted firms that were once market leaders. In this highly risky sector, many investors are hesitant to invest in research and development without access to adequate risk capital and marketing support.

Although there are indigenously designed electronic products, they have not attained commercial success because of lack of marketing efforts or competition from cheap imports. For instance, Indian Institute of Science, Bangalore, and Encore Software Ltd., Bangalore developed a multilingual handheld low cost computer called Simputer in 2000. The institute also developed a low-cost tablet computer called Mobilis in association with Encore Software Ltd in 2004. However, the product did not meet commercial success because of inordinate delay in bringing it to the market and inadequate financing, points out Padma Bhushan Prof. Rajaraman, Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore in his book on History of Computing in India.

"Speed of execution of hardware projects is vital. It is faster and cheaper to outsource production to countries like Taiwan and China which have specialized in computer hardware services. It is also not advisable to embark on hardware product manufacture without adequate finance and excellent marketing abilities," remarks Prof. Rajaraman in this book.

This study is the outcome of a comprehensive survey conducted with start-up enterprises, large scale manufacturers, industry associations, market research agencies and policy analysts about potential for indigenous design and development in the electronic sector. Majority of them made one common remark, "When everything can be imported cheaply from China, Taiwan and other countries, Indian enterprises do not want to invest in new product design and innovation as there is no certainty about return on such investments?" Some respondents said companies in advanced countries such as USA, Germany and Japan are able to invest in research and development because of availability of risk capital, which is lacking in India. Often, banks are reluctant to fund research and development ventures in electronic sector as it is perceived to be highly risky.

On being asked why India has not attracted significant investment in electronic manufacturing, most of the respondents cite one thing: "Indian government is unable to provide as much fiscal incentives as is provided by Government in China. Also, the cost of finance is lower in China, compared to India, which makes manufacturing unviable."

Despite existing challenges, most of the respondents feel there is scope for attracting foreign investment in the current circumstance as many electronic manufacturing companies are looking for alternative destinations to diversify their supply chains. According to them, India can be a hub for export-oriented electronic manufacturing if the central government and state governments coordinate to provide right policy environment.

The size of global exports in electronics goods is second largest after trade in fuel and mining products. World export market for 330 electronic goods (at HS code 6 digit level) stood at USD 2.45 trillion as of 2019, of which India's exports was hardly USD 15.8 billion or 0.6%. Thus, there is huge potential to develop export-led manufacturing investment in this sector. In the information technology (IT) and datacom (Computers, laptops and servers) sector itself, there is export opportunity worth USD 360 billion.

India can recreate the success it achieved in bringing large scale manufacturing in automobile, power and heavy engineering, where leading global companies such as Cummins, ABB, Ford India, GE and others have made India a global hub for manufacturing and exports.

This study identifies challenges and opportunities in developing a viable electronic manufacturing ecosystem in India. India has the potential to maintain the impressive growth witnessed in electronic production in recent years. Since 2013-14, India's electronic production across seven categories grew at a CAGR of 20%. These include consumer electronics, industrial electronics, computer hardware, mobile phones, strategic electronics, electronic components and Light Emitting Diodes. However, most of the components and sub-assemblies used in these products are imported from China, Taiwan and other countries. Therefore, the goal of electronic manufacturing has shifted from import-and-assemble to local manufacturing of