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Aspirations & Concerns Related To Make-In-India Programme

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Abstract
Despite the implementation of economic reform measures, availability of cheap skilled and unskilled labour, good domestic demand and higher growth trend witnessed during the first decade of 2000s, India remains a marginal global player in the Indian machinery industry (IMI) due to unsatisfactory status of this industry. It faces serious disadvantage while competing with the countries like China, which has developed strong presence in this industry. The industry is beset with many external and firm-specific problems. IMI firms urgently need foreign equity with critical firm-specific assets for developing additional capacities as well as for achieving global efficiency and competitiveness in this industry. In the recent years, Government of India with its focus on "Make in India" has substantially improved the "Ease of Doing Business", creating new opportunities and taking specific measures to multiply growth in capital goods sector. It has also created level-playing field between domestic and foreign manufacturers. As a result, most of the macroeconomic parameters including foreign direct investment (FDI) inflow in Indian industries have substantially improved and IMI is expected to benefit from the opportunities and programmes of the Government of India.

Keywords: *Indian machinery industry, Make in India Programme, FDI*

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I. Introduction

The importance of developing strong machinery and machine tools manufacturing capability in a developing country has been adequately emphasized in the literature on technological change. Fransman (1985) and others offer the following rationales for developing indigenous machinery manufacturing industry in a developing country: First, all technical changes, whether product or process variety, require the development of new or modified machinery or equipment. Use of machinery improves labour productivity and replaces (wherever possible) subjective human judgments in the production process with more precise and controllable facilities. Secondly, machinery industry provides plants and equipmentto almost all the sectors of the economy including agriculture, manufacturing, services, infrastructure, construction, mining and energy. Thus, the presence of efficient and competitive machinery sector in an economy helps to improve the competitiveness and growth of its user sectors as well. Thirdly, the diffusion of improved vintages of machinery facilitates the process of technical change in the user firms as well. For example, when a capital saving innovation takes place in the machinery manufacturing industry, it not only contributes to the productivity of machinery manufacturing firms but also contributes significantly to the increase in the productivity of machinery user firms based in the economy. Finally, machinery industry also includes strategically important defense equipment industry; therefore, the development of this industry is vital from the point of national security and independence. Hence, it is in the interest of national governments to develop a vibrant and internationally competitive machinery industry domestically.

Recognizing these benefits, Indian government promoted machinery manufacturing through Public Sector Enterprises (PSEs) under the import-substitution regime with the help of heavy public investment and liberal import of technology from the developed countries. As a result, IMI recorded phenomenal growth during mid-1950s to mid-1960s and developed capacity to supply a large variety of machineries and equipment. However, as in the case of other industries, this industry too developed technological backwardness and inefficiency over a period of time. Besides, the Indian government in the aftermath of economic reforms measures implemented since 1991 has been gradually withdrawing from the machinery manufacturing sector. The expectation has been that the space created by the withdrawal of PSEs shall be taken over by the private sector enterprises including FDI enterprises. However, the investments by the private sector could not fill up the gap left by PSEs. Besides, the import of finished goods (even second had machinery) has increased greatly due to high demand of plant and machinery on account of higher growth generated in the economy due to the implementation of economic reforms. Further, although the Government policy on FDI and import of disembodied foreign technology was sufficiently liberalized, FDI inflow did not favour this industry.

Furthermore, as compared to other manufacturing industry, IMI experienced lower growth in its production, except during a short period of FY 2003/04-2007/08.

The current status of IMI remains unsatisfactory. It faces serious disadvantages while competing with the countries like China, which has developed strong presence in this industry. The industry is beset with several external and firm-specific problems. IMI urgently needs high-level of investment including foreign equity with critical firm-specific assets (FSAs)for developing additional capacities as well as for achieving global efficiency and competitiveness in the industry. In this backdrop, this article mainly aims to: i) discuss the implications of different economic policy regimes on evolution and performance of IMI, ii) identify the major issues and concerns of IMI, iii) examine whether the present Government can bring about positive changes in IMI with its focus on "Make in India" programme by attracting substantially higher amount of FDI and implementation of several fiscal, banking and institutional reforms.

Academic studies focusing on IMI are only a few in numbers (Suresh 2004, Keshari 2011, 12, 13, and 16). These studies provide some material and insights for analyzing the problems faced by the IMI, role of FDI in IMI, firm-level determinants of efficiency and exportability in IMI, etc. For industry level analysis, however, the data available from official and other sources are also not adequate, comparable and precise. This article is therefore based on the findings of the academic studies, readily available data and information from some official (viz. Economic Survey) and non-official sources (e.g. Centre for Monitoring Indian Economy) and some published articles and reports focusing on Indian manufacturing and capital goods sectors (e.g.Ramana 1984, World Bank 1984, Lall 1987, CII 2007, EXIM Bank 2008, Desai 2001, Nagaraj 2003, McKinsey & Company 2016, etc.).

The study is organized in the following manner: Section-2 briefly offers the definition and coverage of IMI adopted in this article as well as describes the basic characteristics and structure of the industry. Section-3 reviews the evolution of the IMI up to 1991 against the background of industrial policies and development strategies followed by the Government of India (GoI). Section-4 discusses the economic policy reforms initiated since 1991 and their implications for IMI and developments and performance of IMI during 1993/94 to 2007/08. Section-5 discusses the major issues, concerns and status of IMI. Section-6 discusses the importance of Make in India programme for and its likely benefits to IMI. The last section-7 offers conclusions.

II. Definition, Coverage, Characteristics And Structure Of IMI

Definition, Coverage and Characteristics

IMI is defined for the purpose of this study as an industry manufacturing general as well as special purpose machinery, equipment, parts and components thereof, which are used in the process of production/service delivery in various sectors of economy such as agriculture, manufacturing, services, infrastructure, construction, mining, energy and power generation. As per this definition, IMI would include most of the products of Division 28 (manufacture of *machinery and equipment n. e. c.*), comprising of Group 281 (general-purpose machinery) and Group 282 (special-purpose machinery), of NIC-2008 (GoI 2008c). Thus, IMI is heterogeneous in terms of product range as well as user groups. In an important study, Pavitt (1984) classifies industries based on their technological characteristics, requirements of the users and appropriability regime. The study categorizes the entire industrial sector into four groups: i) supplier-dominated, ii) production intensive (scale-intensive), iii) production intensive (specialized-suppliers), and iv) science-based industries. In terms of this taxonomy, the IMI falls into the group of production intensive (specialized-suppliers), which holds the following major characteristics:

- The technology trajectory of this industry is more oriented towards performance improving product innovations and less towards cost-reducing process innovations.
- This industry involves medium R&D and often continuous R&D costs. The feedbacks of the customers and from the internal sources (viz. production engineering department) are considered important in the innovative process. The users may provide operating experience, testing facilities and even design and development resources to the suppliers of the machinery and equipment.
- The industry also requires close interactions with the user industries to identify and fulfill their specific needs with regard to the supply of spare parts, servicing, repairs and maintenance of machines and equipment.
- The IMI, whether general or special purpose machinery, is normally populated by the medium size firms. However, the innovative firms in the industry are relatively small in size.
- The competitive advantage of a firm in this industry depends to a large extent on non-price factors such as product design and development capability (and to a lesser extent on process innovation and production engineering). Besides, frequent improvements in the design of the product; reliability, precision, durability and finish of the machine and their components and the ability to respond quickly and responsibly to the users' requirements play important roles in determining the successful performance of a firm in IMI.

- The industry has strong forward and backward linkages with the rest of the economy and thereby is capable of generating productivity and technology spillovers to suppliers of the raw materials and component and to the users' industry.
- The barriers to entry in special purpose segment of IMI are quite high, mainly due to: i) higher level of technological expertise, product design and engineering skills required for production of various types of machines and equipment, ii) stringent norms for machine performance, iii) technical expertise needed for erection and installations of plants, iv) after-sales services needed for repairs and maintenance of the machinery.

Structure of IMI

The special-purpose machinery, as compared to the general-purpose machinery segment within IMI, has relatively higher barriers to entry, longer manufacturing process, longer gestation period and longer delivery schedule. Special-purpose machinery segment is also less fragmented, more oligopolistic. Table-1 shows that the general purpose machinery, as compared to special purpose machinery, is smaller in sales and market size, more export oriented but less import intensive.

Table-1: Export, Import, Sales, Market Size between GPM and SPM

Major Segment	Exports (E)	Imports (M)	Sales	Market Size (MS)	E as % MS	M as % MS
General purpose machinery (GPM) % IMI	55	29	45	39	16	28
Special purpose machinery (SPM) % IMI	45	71	55	61	8	44
IMI	100	100	100	100	11	37

Source: Calculated from data given in CMIE, Industry, Market Size, and Shares

Appendix on the market leaders in the major product groups of IMI shows that the large PSEs still have strong presence in some product groups of IMI (viz. BHEL over 60 per cent shares in boilers and turbines and BEML with over 50 per cent share in earthmoving equipment) followed by large domestic private companies and MNEs. Well known MNEsin IMI include Bellies India, Cummins India, Greaves Cotton, KSB Pumps, Sulzer Pumps India, Atlas Copco, Ingersoll-Rand, Fag Precision Bearings, JCB India, L&T Komatsu, Caterpillar India, Otis elevator, Stovec Industries and Kennametal India.

Product groups belonging to different ranges of market concentrations, as presented in Table-2, shows that the market structure of nine product groups are highly concentrated (i.e. 95% >CR4>70%), of seven product groups are medium concentrated (i.e. 65%>CR4>40%) and of the remaining the product groups are less concentrated (40>CR4>10%).

Table-2: Ranges of 4-firm Concentration Ratio (CR4) of Product Groups

Ranges of CR4 (%)	Product Groups
High: 70-95	Sugar machinery, Boilers, Cement machinery, Drilling equipment, Tractors, Lifts & Escalators, Construction machinery, Steam and hydro turbines, Earth moving machinery
Medium: 40-65	Chemical machinery, Environment control equipment, Valves, Engines of all types, Material handling equipment, Agricultural machinery, Bearing, Compressors of all types
Low: 10-40	Gears, Pumps of all kinds, Cranes, Printing machinery, Textile machinery, Metallurgical machinery, Machine tools

Source: Calculated from data given in CMIE, Industry, Market Size, and Shares

In respect of import dependence, that is measured as share of imports in market size of each product, Table-3 shows that import dependence of 7 product groups is quite high. Eight product groups have medium import dependence (in the range of 20-40% and the rest of the products has less than 20 per cent of import dependence.

Table-3: Ranges of Import Dependence and Product Groups

Import Dependence (%)	Product Groups
High: 50-90	Metallurgical machinery, textile machinery, printing machinery, machine tools, cranes and pumps of all kinds
Medium: 20-40	Material handling equipment, Gears, Bearing, Engines of all types, Compressors of all types, Lifts & escalators, Steam and hydro turbines, Agricultural machinery
Low: 0-20	Environment control equipment, Earth moving machinery, Valves, Drilling equipment, Sugar machinery, Construction machinery, Boilers, Tractors, Cement machinery, Chemical machinery

Source: Calculated from data given in CMIE, Industry, Market Size, and Shares

As far as the share of export earnings in the market size of each product group is concerned, 4 product groups belong a highly export oriented category (25-55 per cent), 6 product groups belong to the medium exported oriented category (10-20 per cent), and remaining 14 product groups remain in low export oriented category since they export less than 10 per cent of their market size (Table-4).

Table-4: Export Share in Market Size and Product Groups

Share of Exports in Market Size (%)	Product Groups
High:25-55	Valves, Metallurgical machinery, Pumps of all kinds, Agricultural machinery
Medium:10-20	Compressors of all types, Printing machinery, Bearings, Tractors, Machine tools, Engines of all types
Low:0-10	Steam and hydro turbines, Gears, Boilers, Material handling equipment, Cranes, Textile machinery, Environment control equipment, Drilling equipment, Construction machinery, Sugar machinery, Earth moving machinery, Lifts & Escalators, Cement machinery, Chemical machinery

Source: Calculated from data given in CMIE, Industry, Market Size, and Shares

In sum, although IMI is considered a single industry, which produces machinery, equipment and components for use in every sector of the economy, its different segments and product groups differ in terms of their characteristic features, structure and openness to the world economy.

III. Economic Policy Regime Until 1991: Implications For IMI

Policy Regime and Environment

The evolution and growth of the IMI can be seen in the context of Government's strategy to promote investment and growth in capital goods sector. Development of machinery manufacturing capability within the country has been a major objective of India's import substitution industrialization strategy initiated in the mid-1950s. Since the second five-year plan (1956-61), Government of India (GoI)emphasized on building up strong machinery and machine tools manufacturing sector in the economy. As a result, the Mahalanobis Model of industrial development emphasized on self-reliance growth through building of machinery industries (Krishna 2001).

The private sector firms were largely unwilling to step into the capital goods sector due to inadequate finance, lack of entrepreneurship, low profitability and long gestation period of investment. Therefore, GoI took upon itself the responsibility to build this sector by undertaking heavy public investments through Public Sector Enterprises (PSEs).Industrial Policy Resolution, 1956 granted exclusive right to the State for setting up new units to manufacture 17 groups of products and services (Schedule A), including heavy plant and machinery required by basic industries like metallurgical, mining, machine tools manufacture GoI.

During the decades of 1950s and 1960s, GoI established many PSEs [e.g. Hindustan Machine Tools (HMT), Heavy Engineering Corporation (HEC), Bharat Earth Movers Ltd. (BEML), Bharat Heavy Electricals Ltd. (BHEL), and Bharat Heavy Plates & Vessels (BHPV)] for manufacturing heavy electrical and non-electrical machinery, mining and earthmoving machinery, machine tools and other specialized equipments. Departmental undertakings of the Government comprising of railways, post and telegraph, defense, irrigation, drainage, power projects and PSEs in steel, cement and fertilizer industry also acted as the major source of demand for machinery and equipment produced by the PSEs. Public investment thus played a dual role. On the one hand, it served as primary source of demand for capital goods; on the other hand it alleviated constraints on the supply side through capacity creation (Jha and Tulsayan 2005). Gradually private capital supplemented the Government's efforts to develop this industry.

Given the negligible technological capability and machinery-manufacturing base, GoI followed import substituting industrialization (ISI) strategy for development of IMI that depended on protection from imports of capital goods but envisaged liberal import of (disembodied) technology. Some scholars (e.g. Desai 1984) have opined that the machinery manufacturing capacity in the country was built up almost totally with the deployment of imported technology. It was expected that this strategy would lead to building of strong diversified machinery manufacturing capability within the country.

Since the mid-1960s, partly in response to foreign exchange crisis of late 1960s, oil crises of mid-1970s and also due to ideological influences, GoI sought to secure increasing controls on the domestic economy. This was mainly accomplished with the help of various Industrial Policy Resolutions and Statements, tightening of existing Industries (Development and Regulation) Act, 1951 and promulgations of new Acts [viz. Foreign Exchange and Regulation Act, 1973 (FERA), Monopoly and Restrictive Trade Practices Act, 1969 (MRTPA)], protective foreign trade policy and relatively restrictive FDI regime and even ad hoc discretionary measures (Majumdar 2007).

The controls through industrial licensing system included obtaining license before operations of an enterprise and establishment of a plant, adding a new product line to an existing plant, substantially expanding

output, or changing a plant's location. Besides, the right to manufacture various types of industrial goods was also distributed among PSEs, small-scale industrial sector, private sector, mixed sector, etc. MRTPA, along with other provisions, acted as deterrent to enhancement of production capacity and growth of firms (beyond certain threshold limit of assets) either by organic or inorganic (merger, amalgamation and takeover) methods. Import was restricted through the requirement of obtaining license before effecting imports and through the imposition of high levels of customs duty on raw material, intermediate goods, capital and finished goods. Due to the GoI's focus on achieving self-sufficiency in production and general attitude of export pessimism, improvement in international competitiveness of the industries including IMI was not given due importance.

Since the mid-sixties the inflow of FDI in the industrial sector was restricted by banning of FDI in certain sectors; following discretionary case-by-case approach for FDI approvals; limiting foreign equity participation normally to 40 per cent from a single entity; not permitting FDI in other than the High Priority Industries (HPI)[1] and without technology content; implementation of FERA and trade related investment measures (TRIMs)[2](Keshari 1990). Imports of (disembodied) technology were restricted by following case-by-case approach and imposing strict terms and conditions on payment of royalty and technical fee, etc. Besides these restrictions, firms were also not allowed to use foreign brands and trademarks while selling their products in the domestic market.

IMI experienced limited liberalisation in 1975, when GoI de-licensed a few segments of IMI, notably industrial machinery and machine tools. During the decade of 1980s, GoI gave further impetus to IMI by undertaking liberalisations and other measures, the following aspects of which are worth mentioning. First of all, it offered broad-banding facility, which gave an opportunity for firms to change product-mix in various industries, including machine tools, earthmoving machinery, agriculture machinery, industrial machinery, ball and roller bearings. Secondly, it launched a technology up-gradation fund in August 1987 that was applicable to five groups of capital goods sector including machinery industry. Thirdly, GoI significantly raised asset threshold for MRTP companies and permitted them to operate in a number of industries (including industrial machinery and machine tools) by directly seeking a license under the IDR Act without obtaining prior clearance from Department of Company Affairs. Finally, policies for import of capital goods, technology and FDI were liberalized and streamlined, and terms and conditions for imports were made easier (Ahluwalia 1988).

Implications for IMI

In view of the growth in IMI over 40 years' period during 1950/51-1990/91, its share in the value of total output of the registered manufacturing sector increased from 2.1 per cent in 1955/56 (Ramana 1984) to 6 per cent in 1990-91 (Suresh 2004). However, IMI could not increase its share in the export basket of the country due to its inward domestic orientation (Suresh 2004).

The literature on industrial performance has highlighted that the industrial growth in general was hampered between the mid-1960s to late 1970s on account of the import substitution policy, slowdown in public investment, poor growth in the agricultural output and income, inadequate infrastructure, unfavourable domestic terms of trade and limited demand, but among all the factors demand side constraints were relatively more important (Krishna 2001). IMI also suffered a severe setback during 1964-65 to 1975-76, as its growth came down to less than 5 per cent (Suresh 2004).

Despite general tightening of FDI and technology import policy, since the HPI included many important segments of IMI[3], FDI and import of technology continued to grow in the IMI. The stock of FDI in machinery and machine tools industry in rose from Rs. 25 crore at the end of 1969 to Rs. 71 crore at the end of 1980. During the same period, the share of machinery and machine tools industry in the total stock of FDI in the manufacturing sector rose from 6.4 per cent to 8.8 per cent. Out of total 1594 numbers of foreign collaboration approved during 1976 to1980, IMI constituted 35 per cent (Suresh 2004).

As far as the role of pre-1991 policy regime on development of technological capability and diversification in IMI is concerned, it has attracted both compliments and criticism. India's protectionist trade regime with liberal import of technology and FDI policy have been identified by some scholars as responsible for developing productionising capability in the IMI firms (at least in larger ones), creating large assured market domestically and ultimately achieving high level of diversification in IMI. Lall (1987) has reported that the Indian machinery-manufacturing firms developed considerable depth and diversity in technological capability for manufacturing numerous products suited for Indian conditions, which were mainly brought about by

[1] The Industrial Policy Statement of 1973, inter alia, identified 'High-priority Industries' (HPI) in which investments from large industrial houses and FERA companieswere permitted on case-by-case basis.

[2] Major TRIMs in India included local content and dividend balancing requirements and export obligation on the part of foreign firms.

[3]For instance prime movers, boilers and steam generating plants, industrial machinery and machine tools, agricultural and earthmoving machinery belong to HPI.

adaptation and absorption of imported technology. By the end of 1970s, India achieved the capability to produce wide range of machinery needed byuser industriesin the domestic market. The market structure in the industry was dominated by PSUs in machine tools, earth moving machinery, prime movers and boilers and private sector in industries like textile, dairy, cement, chemical machinery, etc. In many constituent segments of IMI, a few large firms accounted for the bulk of the output in the segment.

A World Bank's (1984) study also noted that the Indian machinery industry in the late 1970s was capable of supplying complete, economic size units to the cement, sugar and thermal power industries. It was also able to meet about 80 per cent of the machinery requirements for large sized paper and pulp plants and 50 to 60 per cent of the machinery to the chemical industry. The study concluded that the situation would have been better, had there not been net disincentives to the sector because of greater protection on inputs than on outputs.

While studying the technological capability of firms/industries in capital goods sector in developing countries, a few studies (Chudnovsky and Jacobsson1983) have pointed out that the ISI strategy did not offer incentive for Indian firms to develop product design and other innovation capability for producing quality products, therefore, Indian capital goods or machinery sector produced low quality and un-sophisticated products suitable for use only in developing countries.

A study by expert group set up by GoI (1987) reported that the performance of Indian machinery industry suffered from various limitations and problems due to interlinked external and internal factors including:

- Industrial licensing restrictions on MRTP companies in various segments of industry,
- Facility to import second hand machinery and import of equipment under "tied aid" programmes,
- Restrictions on terms of import of technology and FDI,
- Use of outmoded technology of production and lack of incentive for modernisation of industry, product design capability, etc.
- Irrational structure of domestic taxes and tariff as well as higher level of excise duty and import tariffs,
- Higher input cost per unit of output due to higher prices of basic inputs like ferrous and non-ferrous metal and steel and infrastructure facilities,
- Gross under-utilisation of capacity as compared to international standards, due to unfavourable demand conditions.

While studying the performance of Indian engineering industry, to which IMI forms an important part, Jacobsson (1991) found that the engineering firms depended more on imported technology and thereby directed less efforts toward in-house R&D due to the FDI and technology import policies in the 1980s. He concluded that the phase of liberalization in 1980s could not enable engineering firms to be more innovative. This was largely on account of easier access to imported technology and intense competition for capturing fragmented local market that did not justify investment in R&D.

The decade of 1980s could be considered as the beginning of the transition of IMI from a protected policy environment to an open market economy. Consequent to the economic reforms, which started in July 1991, coupled with India's signing of GATT-94 and fulfilling its commitments towards WTO, the Indian manufacturing sector including the IMI began to face a new set of challenges. We therefore discuss in subsequent two sections, nature of economic reforms initiated in July 1991, nature of India's commitments towards WTO and their implications for the Indian manufacturing sector and IMI.

IV. India's Economic Reforms Since July 1991 And Their Implications

Major Reforms in the Economic Policies

GoI launched a series of intensive economic reforms in July 1991 in the wake of balance of payment crisis. These reform measures are broadly categorized as stabilization and structural reform measures. The broad aim of these reform, particularly the structural reforms, has been to meaningfully address the inefficiencies in India's policy frameworks inhibiting its macro-economic performance (e.g. sustainable balance of payment and fiscal deficits and GDP growth) as well as micro economic performance (e.g. enhancement in productivity and exports at firm or industry level). The reform measures implemented since July 1991 applicable to the manufacturing sector included the following set of major policy changes (Kumar 2000, GoI 2008ab).

Industrial policy reforms: This set of reforms focused on the abolition of licensing requirement for all industries, except a few *specified ones*, irrespective of investment levels; removal of the minimum economic scale of output in almost entire industrial sector for creation and expansion of production capacities; repeal of

the provisions of MRTP Act restricting growth and diversification in companies[4]; opening up of the various sectors (power, telecommunications, roads, ports, airports, etc.), reserved for production by PSEs, to private sector including foreign enterprises.

Trade and exchange rate policy reforms: This set of reforms focused on liberalization of imports through substantial reduction in tariff and non-tariff barriers[5]; initial devaluation of rupee and subsequent substantial convertibility of rupee on current account and partial convertibility on capital account respectively and implementation of export promotion measures.[6]Besides, as a major commitment made to liberalise its trade regime under WTO, India agreed to bind tariff rates to lower levels than those prevailing at the time of signing of the Agreement (viz. GATT-1994) for a large number of commodities. As a result of trade reform measures, India has dismantled import licensing system, removed almost all quantitative restrictions on import of most of the commodities and reduced the import tariff in the neighborhoods of the WTO bound rates.

Measures of import liberalization impacting imports in the various segments of IMI has been as follows: First of all, the entire industry has been freed gradually from import licensing requirement and almost all the items have been included in the list of capital goods allowed for imports under open general license mainly to meet the requirements of modernization of the industry and export promotion. Secondly, the capital goods sector including machinery industry was subjected to the drastic tariff reductions in the initial period of reforms. As a result, customs duty on capital goods was lowered from a peak of 90 per cent in 1991-92 to a peak of 35 per cent in 1993-94 and further to 25 per cent in 1994-95. The rate of custom duty remained at 25% during 1994-95 to 1996-97 but fluctuated thereafter in the range of 10% - 25% since 1997-98. Thirdly, with a view to encouraging exports, a large part of administered licensing of imports has been replaced by import entitlements schemes (e.g. Special Import License scheme and Export Promotion Capital Goods (EPCG) scheme for duty-free imports of capital goods) linked to export earnings. Fourthly, a scheme for imports of second hand machinery was introduced. Further the initial age limit requirement for import of capital goods not being more than seven years old was also relaxed. (CII 2007; Mathur and Sachdeva 2005).

Substantial liberalisation of policies relating to FDI and import of technology: This set of reforms initially granted automatic approval to the proposals of FDI and import of disembodied technology under foreign technological collaboration agreements and allowed majority equity participation by a foreign entity;[7] removal of trade related investment measures (TRIMs) that favoured domestic firms over foreign firms); removal of restrictions on the use of foreign brand name or trademarks for goods sold in the domestic market; replacement of FERA by Foreign Exchange Management Act, 2002 (FEMA) that among other things removed discrimination against operations of foreign companies in India. Later GoI allowed FDI with up to 100 per cent foreign equity participation in a manufacturing company under automatic route in all activities except in a few like cigars and cigarettes manufacture and defense equipment considered by foreign investment promotion board for prior approval of the government (GoI 2008a,b).

Strengthening of intellectual property regime (IPR): To fulfill its commitments towards WTO under trade related intellectual properties (TRIPs) agreement of GATT-94, GoI implemented a much stronger intellectual property regime, which *inter alia* provides patent protection to innovative products as well as to its processes and increased the duration of protection.[8]

[4] MRTP companies were required to obtain prior permission from the government before they could expand their existing capacities; establish a new undertaking; merge, amalgamate or take over another undertaking.

[5] The GoI made exchange rate nearly market oriented, freed substantial portion of tariff lines for import, sharply reduced peak and average nominal import tariffs and effective rate of protection (Pant and Pattanayak 2005). For example, the weighted average of basic customs duty declined from128% in 1991/92 to less than 16% in 2007/08.

[6] To encourage exports, a large part of administered licensing of imports was replaced by import entitlements schemes (such EXIM scrips, Special Import License, EPCG schemes for imports of capital goods at nominal or zero rate of customs duty against export obligation, interest subvention schemes, etc.

[7] The principal changes in the FDI and technology import policies initially included automatic approval of FDI up to 51% of equity participation by a foreign entity in a group of 34 high priority (or technology intensive) industries, automatic approval of technological collaboration meant for import of disembodied technology, a case by case consideration of applications for foreign equity ownership upto 75% and even 100% in most of the infrastructure sector, streamlining of procedures for FDI and technological collaboration (Kumar 2000).

[8] Some provisions of earlier Indian Patent Act of 1970 (IPA) protected processes of production invented by a firm but not to the products generated thereby for 7 years in food, pharmaceutical and agro-chemicals industries as against product patent for much longer periods prevalent in industrialized countries.

Implications Of Economic Reforms For The Indian Manufacturing And IMI

These policy reforms have substantially increased competition in the manufacturing sector including IMI. A study by Pant and Pattanayak (2005) indicates that the economic reforms implemented since 1991 has the following implications for the Indian manufacturing sectors. First, it has made exchange rate nearly market oriented, freed substantial portion of tariff lines for import, reduced peak and average nominal import tariffs and effective rate of protection sharply. Secondly, it has eased the barriers to entry for new firms (both domestic as well as foreign), leading to the entry of a comparatively larger number of new firms during 1989-1995 but the smaller number of the new firms during 1996-2003. Third, it has reduced the share of PSEs and increased the share of FDI companies (defined as those with more than 10 per cent foreign equity) in aggregate sales of companies.

The reform measures also resulted in the considerable amount of corporate freedom and the national treatment to foreign companies present in the Indian manufacturing sector. For examples, the firms can take independent decisions on: undertaking industrial activity of their choice; fixing up of prices of their products and services; enlarging the size of their operation and widening the product base with a view to achieve economies of scale or scope; maintaining specific level of foreign equity holding; sourcing of inputs, technology and finance from India or abroad; repatriation of dividends and profits abroad or reinvestment of earnings within the firm; overall restructuring of their operation in profitable lines of business, etc. Along with economic freedom, there has been substantial growth in industrial output, FDI and exports across various industry groups in the aftermath of reforms.

As far as IMI is concerned, the most important aspects of economic reforms affecting this industry has been the liberal imports of capital goods and second-hand machineries, open door policy towards FDI and import of disembodied technology and promotion of exports. Some scholars (e.g. Desai 2001 and Nagaraj 2003a) have pointed out that the import liberalization effected through the sharp reductions in import duty and liberal import of second hand machinery led to the substantial increase in imports of machinery after 1991 and thereby adversely affected the domestic machinery manufacturing capacity. Notably, the domestic manufacturing capacities in textile machinery and machine tools were severely affected on account of imports far exceeding the domestic production in a number of segments like weaving, processing, knitting, etc. This has probably happened as the industry could not develop in the earlier periods adequate technological capability required to face competition from imports and lack of fresh investment due to reduced role of public sector in the industry.The analysis of data presented in Table-5 shows that the share of imports of IMI in its market size has risen consistently and sharply from about 22 per cent in 2002/03 to 40 per cent in 2014/15. Following this trend, the share of machinery in India's total import also rose from 6.2 per cent to 8.0 per cent during the same period. Thus the analysis of data also supports the view that the imports have substituted the domestic production.The share of machinery exports in its market size rose from5 per cent in 2002/03 to 11 per cent in 2014/15. However, the share of machinery exports in the basket ofIndia's totalexports rose from 4.0 percent in 2002/03 and to 5.3 per cent in 2014/15.

Table-5: Domestic Production, Imports and Market Size, FY2002/03 to 2014/15

Year	FY03	FY15
Share of import as % of market size	22	40
Share of export as % of market size	5	11
Percentage share of importsin total Indian imports	6.2	8.0
Percentage share of exports of IMI in total Indian exports	4.0	5.3

Source: Compiled and computed from the data given in: i)Industry, Market Size and Shares, and Commodity Composition of India's Imports and Exports, Foreign Trade and Balance of Payments, Centre for Monitoring Indian Economy Ltd.

Given the absence of indigenous technological capability in this sector, foreign technological collaborations (FTCs) and FDI have been the most important source of access to foreign technology in the Indian manufacturing sector. With an almost open door policy on import of disembodied technology and FDI in the post 1991 period, Indian manufacturing sector witnessed increased recourse to foreign technological collaborations as well as FDI. As compared to FDI, however, FTC has been more important source for obtaining foreign technology into the IMI (Keshari 2011, Chapter-3).The reasons for exports from IMI not matching the imports in the same industry could the following: i) high domestic demand of machinery due to high growth in GDP experienced during this period, ii) Indian producers of machinery and exporters could not built up international competitiveness despite economic reforms and liberalization of FDI, foreign technology and trade.

Table-6: Growth Rates for Machinery, Industrial Sector and GDP, 1996/97-2016/17

Industry	1996/97-2002/03 Annual average	2003/04-2007/08 Annual average	2008/09 to 2016/17 Annual average
Indian Machinery Industry (IMI)	na	na	2.7
Electrical Machinery Industry (EMI)	na	na	
IMI+EMI	5.7	14.2	na
Industrial sector	5.3	8.4	3.4
GDP Growth	5.7	8.8	7.1

Sources: Economic Survey, various issues

Table-6 presents the annual average growth rates based on data on Index of Industrial Production (IIP) for different sub-periods between 1996/97 to 2016/17 for the IMI, the entire industrial sector and GDP.[9] The combined growth rate of IMI and electrical machinery averaged about 5.7 per cent during the 5 years period of 1996/97 to 2002/03. This rate of growth was in line with the average growth rate of manufacturing sector (5.3 per cent) and GDP (5.7 per cent). There has been a turnaround in the economy during 2003/04 to 2007/08.As a result, Indian machinery and equipment industry including IMI achieved a quite high rate of growth, averaging over to 14 per cent during 2003/04-2007/08 (Table-6). This rate of growth was also much higher than that of industrial sector or GDP. However, such a high rate of growth nosedived on an average to 2.7 per cent in subsequent period during 2008/09- 2016/17.[10] This rate of growth is in line with growth in industrial sector. However, it is less than half compared to growth in GDP.

Very high rate of growth during 2003/04 to 2007/08 was sustained mainly due to high domestic and international demand and supply of credit at low rates of interest. Demand side boom was propelled by growth in IT and IT enabled services, private housing, road construction, communications and cellular phone services and consumer durables and high growth in merchandise exports due to the buoyancy in the world economy. On the supply side, the high growth was supported by higher growth in credit due to low rate of interest, unprecedented rise in mean gross domestic savings including corporate savings[11] from 24 per cent of GDP during 1997/98 to 2002/03 to 33 per cent during 2003/04 to 2006/07 and gross domestic capital formation including investment by private corporate sector[12] (Kumar 2008, Nagaraj 2008 and Mohan 2008).

V. Issues, Concerns And Status Of IMI

Despite pursuing outward oriented growth strategy for over 25 years, there has been inadequate domestic as well as foreign investment in IMI. IMI has attracted only a few new enterprises. As a result, IMI has not grown sufficiently even to cater domestic demand for machinery and equipment. Government of India, academicians, industry associations and consultancy firms tried to find out the nature and reasons of unsatisfactory status of IMI as described in the last section. This section articulates the major issues and concerns behind the present unsatisfactory status of IMI.

Limited Technological Capabilities

Indian machinery manufacturing firms have good ability to productionise given design and drawings for the product but do not have sufficient expertise in preparing designs and drawings. Productionising capability may develop in a firm through 'learning-by-doing' or informal efforts to assimilate and adapt technology during the process of production and interaction with customers. It may also come from minor R&D efforts. Indian engineering firms undertake a low level of R&D (around 0.5 percent of sales) and devote a major portion of their R&D for adapting imported technology to local needs and shop-floor based problem-solving related to the running, maintaining and repairing of plants.[13](CII 2007).

The acquisition of design capability is crucial for innovation and developing durable competitive advantage. This requires a deep knowledge of materials and an understanding of the specificity of user industry's requirements. The designing capabilities are divided between basic design and detail design

[9] With the revision in IIP series with base 1993/94 data on IIP for IMI is not separately available. Therefore, we use data on IIP growth of the combined group of IMI and electrical machinery industry as a proxy for the growth rate of IMIfor the two periods 1996/97-2002/03 and 2003/04-2007/08. Growth rates calculated during 1996/97 to 2007/08 are with respect to base year 1993/94.

[10]The annual growth rate calculated for this period has 2004/05 as bases year. Thus the annual average growth rate during 2008/09 to 2016/17 is not strictly comparable with the average growth rates in the previous periods

[11] In the last six year, corporate savings also rose sharply due to dramatic rise in corporate profit.

[12] Growth in investment by private corporate sector rose sharply from 5.5 percent of GDP in 2001/02 to 12.4 per cent in the year 2006/07 (Kumar 2008).

[13]The global benchmarking of the R&D intensity is in the range of 3 to 5 per cent.

capability. While basic design capability enables a firm to launch completely new products (innovation), the detail design capability equips a firm to adapt a particular application, raw materials, components, etc. without modifying the general feature of the product. In-house R &D activities of a firm leading to basic design capability for development of a new product is crucial for acquiring international competitiveness. Although GoI provides fiscal incentive in the form of depreciation benefits leading to tax benefits to enterprises undertaking R&D, it has not been effective in inducing firms to undertake significant amount of design activities.

Among the countries of the world, India scores very high in terms of availability and quality of scientists and engineers, yet the share of human resources devoted to design and engineering activities in Indian capital goods enterprises is 20 to 50 per cent lower as compared to the enterprises in the industrialized countries (UNIDO 2005). Besides, IMI could not attract best managerial and technical talent available within the country. In terms of attracting talent, it lagged behind IT, pharmaceuticals, automobiles, finance, etc.Product innovationsarefew in IMI.

Most of the Indian machinery firms import technology, but very few of them improve upon it. Moreover, technological competitiveness of the Indian firms in IMI is highly skewed. While a few firms are close to the international frontiers in terms of product design, engineering capability and process technology, technological capabilities of most players are extremely limited. Many firms are capable of achieving high levels of precision, yet they are unable to produce high quality products due to lack of supporting process technologies such as precision measuring, material engineering and process control. Most Indian manufacturers define quality of machinery largely by performance parameters and dimensional accuracy. They lack in terms of aesthetics or finish of the goods, which adversely impacts the competitiveness of the Indian machinery in a discriminating and sophisticated international market. The defect rates of final products are also quite high as compared to Japan and the USA, and about 20 per cent of firms use obsolete machinery and equipment. (EXIM Bank 2014; CII 2007).

Management and Operational Inefficiencies

Operational efficiencies of Indian firms in IMI are comparatively low. Very few Indian domestic firms use techno-managerial processes like just-in-time (JIT), total quality management (TQM), total production management (TPM), etc. for making their business processes like procurement, distribution, marketing and servicing more efficient. Except in a few product groups (e.g. earthmoving) quality consciousness is low in most of the product groups of IMI. There most of the domestic companies spend inadequate resources on training their employees for achieving world-class bench marking in productivity and quality. As a result, labour productivity measured by sales per employee is much lower in comparison to international benchmark. The limited presence of Indian machinery firms in the value chain leads to diminished cost and differentiation advantage.(EXIM Bank 2014; CII 2007).

Liberal Import of Finished goods

Due to sharp reductions in import tariffs on capital goods, notably with the launch of various schemes for import of capital goods at nil duty, and liberal policy for import of second hand machinery, the domestic manufacturers have been put to disadvantage vis á vis foreign suppliers. The low customs duty of around 5 per cent on import of second hand machinery, which is at par with import of new equipment, has led to unhealthy price competition, import of junk machinery and machinery creating environmental hazards. Import of finished products has gained at the expense of domestic production, leading to a rising share of imports in the aggregate market size of IMI. Many product segments of IMI such as machine tools, textiles, printings and metallurgical machinery and pumps of all types have been severely affected by huge imports from China and other countries. (EXIM Bank 2014; CII 2007).

Poor quality of domestically produced raw material and components

Compared to international standards, the quality of raw materials components produced in India is not up to the mark mainly in terms of the dimensional tolerances and metallurgical properties. Therefore, large and reputed machinery-manufacturing firms prefer to import raw material from international market for maintaining the quality of the final products to the international standards.Moreover as certain types of raw material used in the industry are not produced domestically, they have to be necessarily imported. Due to dismantling of price controls and sharp reduction in import duties, the prices of raw material, except for a few types, have been more or less in line with international prices. In recent years, international prices of raw material have risen faster than the price of final products but rise in prices could not be passed on to customers. At the same time, the rising price of raw material has induced only a few larger domestic producers to resort to value engineering techniques for efficient usage of raw material and cost reduction. Hence, the profit margins of most of the Indian machinery producers have been thinning despite good demand for their products.

Lack of Level Playing Field

Indian manufacturers of machinery and equipment lack level playing field vis á vis their foreign counterparts due to poor quality of infrastructure (e.g. poor road conditions and connectivity with sea-ports and airports, inefficient distribution channels, poor logistics, etc.), unreliable power supply and higher cost per unit of power and fuel, higher working capital requirements, higher rate of interest and higher and multiple incidence of indirect taxation. Poor infrastructure affects competitive delivery schedules and increases operating costs. The delivery time of locally made machinery in many cases is 1.5 to 2 times longer than that in industrialized nations. Companies tend to lose orders due to longer delivery schedules. To obviate the problem of unreliable power supply, many machinery-manufacturing firms have set up their own captive power plants but that has added to the costs. Overall the infrastructure inadequacies are estimated to translate into 5 per cent cost disadvantage for the Indian machinery manufacturers against the overseas manufacturers.(EXIM Bank 2014; CII 2007).

Domestic producers of machinery are also required to maintain high level of inventory due to transport bottlenecks, delays in custom clearance and supply commitments. As a result, working capital requirement of Indian manufacturers of IMI is as high as 40-45 per cent against global benchmark of 15 per cent of net sales. Besides, high interest rate regime in India results in a substantial 7 to 8 per cent interest rate differential relative to the reference foreign countries. Interest rate differential together with higher capital requirement causes about 4 per cent capital cost disadvantage. The overall cost disadvantage to domestic machinery producing firms vis-à-vis foreign manufacturers/contractors roughly works out to 15 to 24 per cent on account of higher incidence of indirect taxes, custom duty, financing costs and inadequate infrastructure. (EXIM Bank 2014; CII 2007).

Lack of Global Marketing and Customer Orientation

Machinery firms worldwide are increasingly becoming global in their mindset and operations. Yet, Indian firms, in general, lack export thrust in their marketing strategies and focus largely on the domestic market; exports gain importance only in case of fall in domestic demand. The reasons for inward orientation of Indian machinery manufacturing firms are the following: First, domestic market has low degree of buyer sophistication, which allows the firms to get away with less than desirable quality and necessity for innovation. Secondly, the export transaction costs in India are among the highest in the world. High transaction costs not only increase the price of the final export product, but also result in inordinate delays in export fulfillment. Thirdly, Indian banks, including Export–Import Bank of India, are unable to offer competitive rates and terms to their IMI clients.(EXIM Bank 2014).Fourthly, Indian firms makelittle effort on branding of their products. Investments in marketing, increased customer orientation and branding could act as entry barriers for foreign firms into the Indian market. Finally, trends in international market suggest that foreign firms are increasingly adopting solution-based approach to selling while Indian domestic firms continue to adopt a product-oriented approach towards their customers. (EXIM Bank 2014).

VI. Make In India And Other Programme And Policies Of Goi: Implications For IMI

The present government under the leadership of Prime Minister Shri Narendra Modi launched 'Make in India' programme on 25th September 2014 which aims at making India a global hub for manufacturing, research & innovation and integral part of the global supply chain. The Government has identified ten 'Champions sectors' including IMI that have potential to become global champion, drive double digit growth in manufacturing and generate significant employment opportunities. Due to the Government's strong push for Make in India big investment opportunities have arisen in various important areas of economy. They include investment in environment solution; logistic infrastructure; indigenization of manufacturing aerospace and defense sector; improvement of urban infrastructure and creation of smart cities; electricity generation, transmission and distribution; basic material like coal and cement; creation of food infrastructure; roads, bridges, highways, metros and railways and waterways; production of electronic goods and telecommunication equipment, etc.

Besides, GoI has substantially improved the ease of doing business in India and has been vigorously promoting FDI through the Make in India and other enabling policies and programmes. In May, 2016, GoI adopted a comprehensive National Intellectual Property Rights (IPR) policy which is expected to improve Indian intellectual property ecosystem and create an innovation movement in the country. Subsequent to the approval of this policy and creation of Cell for Intellectual Property Rights Promotion and Management **(**CIPAM), there has been a substantial improvement in the IPR and Patent handling matters. As per the World Bank Group's latest *Doing Business 2018: Reforming to Create Jobs* report India's ranking improved substantially from the top 130 to 100 in the World Bank's Ease of Doing Business global rankings mainly due to the business reforms undertaken over the last few years.[14] The present Government has opened up Indian

[14] http://www.worldbank.org/en/news/press-release/2017/10/31.

manufacturing sector for 100 per cent foreign equity participation on an automatic basis except in two industries as per the latest Consolidated FDI Policy effective from August 28, 2017. Only manufacturing of cigars, cheroots, cigarillos and cigarettes using tobacco or tobacco substitutes remains banned for inward FDI. Besides, a defense machinery and equipment manufacturing firm can have foreign equity participation up to 49 per cent through automatic route but beyond 49 per cent only via Government route (GoI, 2017). Besides removing entry level hurdles of FDI for receiving higher inflows of FDI, GoI has taken several enabling policy measures and strategic initiatives for creating level playing field between FDI firms (FFs) vis a vis domestic firms (DFs). The stated objectives of FDI policies and strategic initiatives have been to supplement domestic capital, technology and skill formations in the Indian firms and thereby to improve their productivity and exportability for attaining accelerated and sustained GDP growth.

Due to proactive approach of GoI for attracting FDI into the economy, India has become one of the most attractive destinations of FDI and amount of FDI equity inflows has sharply increased from USD 2.5 billion in FY 2000/01 to USD 40 billion in FY 2016-17.[15]Whether FDI could improve the capabilities of DFs operating in IMI and other connected industries? In this context, both the theoretical and empirical research points out that FDI offer great potential for developing IMI. The mainstream theories of FDI[16] have opined that: a) FDI constitutes a package of several critical resources[17],notably firm-specific assets (FSAs), of competitiveness; b) FDI firms (FFs), being a major vehicle of FDI, possess firm-specific advantages over DFs. Secondly, the DFs based in the same industry as that of FFs and connected industries may also get benefitted from the spillovers of many of the resources and capabilities of the latter. These positive externalities/spillovers may in turn improve the productivity and exportability of DFs. Several recent studies have empirically established that of FFs based on these firm-specific advantages enjoy higher level of productivity/efficiency and exportability.[18]The improvement inDFs' productivity and exportability depend on the channels of FDI spillovers, namely technological and information externalities and competition effect, as per the findings of the recent micro-econometric empirical studies.[19]Besides, there should be a significant presence of FDI firms in the industry which is possible only IMI attracts a significant amount of FDI equity. However, IMI has been able to receive only slightly over 4 per cent of cumulative FDI equity inflow of USD 332.1 billion during April 2000 to March 2017.[20]Thus, the GoI and firms in corporate sector need to make extra efforts to attract FDI in IMI.

Government of India has also formulated a National Capital Goods Policy in 2016 with ambitious intent to boost capital goods production from approximately Rs. 230000 crore in 2014/15 to Rs. 750000crore in 2025 while raising direct employment from current level of 84 lakh to 3 crore(GoI 2016). For this purpose, it has suggested implementation of various strategies and schemes including the following (GoI 2016):

- Heavy Industry Export & Market Development Assistance Scheme for developing a comprehensive branding plan for the CG sector with the support of India Brand Equity Foundation and other similar organizations
- Increasing the budgetary allocation to the present 'Scheme on Enhancement of Competitiveness of Capital Goods' which includes setting up of Centers of Excellence, Common Engineering Facility Centers, IntegratedIndustrial Infrastructure Park and Technology Acquisition Fund Programme.
- Increasing the coverage of the present 'Scheme on Enhancement of Competitiveness of Capital Goods' by including technology, skills & capacity building, user promotional activities, green engineering and energy, advanced manufacturing and cluster development
- To launch a Technology Development Fund under PPP model to fund technology acquisition, transfer of technology, purchase of intellectual property rights, designs & drawings as well as for commercialization of such technologies for capital goods.
- To create a 'Start-up Center for Capital Goods Sector' to be shared by Department of Heavy Industry and industry/industry association in 80:20 ratio to provide an array of technical, business and financial support and services to promising start-ups in both the manufacturing and services sector.

[15]Calculated from data contained in *Fact Sheet on Foreign Direct Investment* from April 2000 to March 2017.http://dipp.nic.in/publications/fdi-statistics

[16] Main stream theories considered are transaction cost/internalization (TCI) theory as explained in Hennart (2007) and eclectic approach of FDI as discussed in Dunning (2000).

[17] FDI's contribution to an Indian firm's resources and capabilities may include:equity capital, performance oriented organizational culture and expertise; tax, accounting and financial management skills; international marketing expertise and market access; transmission of intellectual property rights, unique skill sets and technological prowess, trade secrets, brand equity and global reputation.

[18] Refer to Bellak's (2004) survey and Keshari (2016).

[19] Refer to Keshari (2012A) for studies on productivity/efficiency and Keshari (2012B) for studies on exportability and spillovers.

[20]Calculated from data contained in *Fact Sheet on Foreign Direct Investment* from April 2000 to March 2017.http://dipp.nic.in/publications/fdi-statistics

- Mandatory Standardization by defining minimum acceptable standards for the industry and adoption of International Organization for Standardization and up gradation of development, testing and certification infrastructure such as Central Power Research Institute (CPRI). It also envisages setting up 10 more CMTI like institutes to meet the requirements of all sub-sectors of capital goods.
- To develop a comprehensive skill development plan/scheme with Capital Goods Skill Council and to upgrade existing training centers and set up 5 regional State-of-the-Art Greenfield Centers of Excellence for skill development of CG sector.

As IMI is a part of capital goods sector, it is likely to benefit from the implementation of the above schemes of GoI and thereby its present status would improve in due course of time.

VII. Conclusions

Competitiveness of IMI is determined by a combination of policy, industry and firm-specific factors. Increasing opportunities and competition associated with economic reforms and globalization have brought to the fore shortcomings of IMI and the firms operating therein.The industry is beset with many external and internal problems. The external problems include huge imports, including that of the second-hand machinery and equipment, displacing and posing threats to the existing Indian manufacturers; unavailability of quality raw material and components domestically; lack of level playing field due to the inverted duty structure, infrastructure bottlenecks and high cost of finance, all impairing international competitiveness of Indian machinery producers. The internal firm or industry specific problem involves inadequate technological capabilities, notably in the areas of design and drawings and process technology; management and operational inefficiencies, lack of global marketing and customer orientation, etc.

Present Government is taking important steps for creating level-playing field for the Indian manufacturers of machineries and equipment under the "Make in India" other programmes. Besides, GoI is implementing programmes for boosting capital goods sector with huge investments and skill formation, high public investment in developing transport infrastructure, implementation of GST, digitalization of every sector of the economy, impressive inflow of FDI in recent years, banking reforms, emphasis on stepping growth for agriculture and small and medium enterprises, etc. As a result, great opportunities are arising for the growth of IMI. To capture a decent share in domestic and global market, IMI firms need to leverage on their strengths and work hard to make use of the emerging opportunities.

Appendix

Product Group	Market Leaders
Textile machinery	LMW, Sulzer India, Veejay Lakshmi Engg. S K F India
Machine tools	Kennametal India, A C E Designers, Sandvik Asia, H M T Machine Tools
Tractors	Mahindra & Mahindra, Tractors & Farm Equipment, Escorts, International Tractors
Earth moving machinery	B E M L, JCB India, Telco Construction Equipment, L & T-Komatsu, Caterpillar India
Material handling equipment	Mcnally Bharat Engg. Co, Elecon Engineering Co, TRF, Godrej &Boycee Mfg. Co.
Printing machinery	Manugraph India, Stovec Industries, Shilp Gravures, Positive Packaging
Chemical machinery	L&T, Godrej, Ingersoll-Rand , BHEL, Heavy Plate and Vessels, Tema India
Metallurgical machinery	L &T, Tata Steel, Disa India, Mukand
Cranes	Action Construction, Equipment, T I L, Mukand, Hercules Hoists
Environment control equipment	Paharpur Cooling Towers, Thermax, Ion Exchange, B O C India
Lifts & Escalators	Otis Elevator , U T Johnson Lifts, Kone Elevator,
Drilling equipment	Sandvik Asia, Atlas Copco (India), Addison, Revathi Equipment
Construction machinery	Escorts Construction Equipment, Gujarat Apollo Industries, Ashoka Buildcon, Sayaji Iron & Engg.
Sugar machinery	Thyssenkrupp Industries India Pvt, Fives Cail K C P, Texmaco
Agricultural machinery	V S T Tillers Tractors, Tractors & Farm Equipment, Kerala Agro Machinery Corporation, Aspee Agro Equipment.
Cement machinery	L &T, API, FL Smith, Walchandnagar .
Boilers	BHEL, Thermax, Cethar Vessels, Walchandnagar Industries
Engines of all types	Cummins India, Kirloskar Oil engines, Greaves Cotton, Simpson & Co.
Bearings	S K F India, National Engineering Industries, F A G Bearings India, N R B Bearings
Pumps of all kinds	Kirloskar Brothers, BHEL, K S B Pumps, Sulzer Pumps India
Steam and hydro turbines	BHEL, Triveni Engineering & Inds, Belliss India, Kirloskar Hydrair Pvt.
Compressors, all types	Elgi Equipments, Emerson Climate Technologies (India), Atlas Copco (India), Ingersoll-Rand (India)
Valves	Audco India, Larsen & Toubro, BHEL, K S B Pumps
Gears	Elecon Engineering, Premium Energy Transmission, Fairfield Atlas, Eicher Motors

Source: CMIE, Industry, Market Size, and Shares

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