

CII 14TH MANUFACTURING SUMMIT 2015

FUTURE OF INDIAN MANUFACTURING: BRIDGING THE GAP

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PREFACE

INDIAN MANUFACTURING HAS BEEN experiencing good times for most of the last year. Index of Industrial Production (IIP) growth is at its highest in several quarters. And, the growth is broad-based, with 14 sub-sectors showing positive growth in the last quarter. The drivers of this phase of growth are robust too, with consumer spending up (about 7.5 percent growth over last year) and commodity prices at an all-time low, ensuring some profitability in downstream manufacturing.

Could more have been done?—Of course. The Make-In-India program has not taken off to as good a start as expected. Change is slow. There are more announcements than action. The private sector is partly to blame as well, for not fully seizing the opportunity. The ease of doing business has not improved dramatically and most states (especially the ones with low costs) significantly lag on easing business environment.

While growth and reforms continue, there are sweeping changes happening in the technology front and the location front. Advanced manufacturing is a big theme in manufacturing companies across the globe with more and more investments being made in robotics, automation, and big data capabilities. India is seen as a laggard but sooner than later, this trend will manifest in India as well. China's slow but steady decline as a manufacturing location is being compensated by India holding steady and many new manufacturing nations vying for investment—from East Africa to Vietnam to even the UK (relatively very competitive for a Western European country).

The report aims to distil key trends and insights from each of the above themes and draw out the implications for Indian manufacturing leadership. The future for Indian manufacturing continues to be bright and we look forward to seeing the sector going from strength to strength in years to come. Happy Reading.

STATE OF THE INDUSTRY: MUTED OPTIMISM

"In this hour, I do not believe that any darkness will endure."

— J.R.R. Tolkien

Manufacturing Growth On the Rise

The Indian manufacturing sector is finally growing! After a roller coaster ride that saw growth in Index of Industrial Production (IIP) move from a high of 8.2 percent in 2010-11 to a low of -0.1 percent in 2013-14, the sector seems to be returning to a more favorable zone this year (Exhibit 1.1). What's more, the index has continually been positive for the last nine months—another feat it could not accomplish for four years. How broad is this growth, how long will it sustain? And will it be strong enough for us to get to the original goals stated in the Make-In-India program?

Broad-based Growth

A deeper look at the growth of the sectors indicates that the growth is broad-based. Many sectors have started growing faster in Q1 than their historical average, while some have slowed down. A few key themes emerge from an analysis of the de-averaged growth patterns:

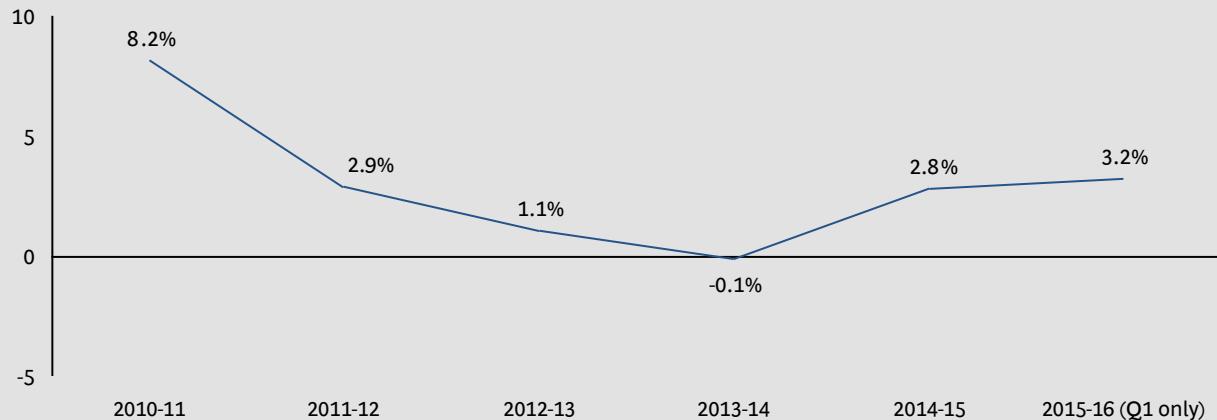
- All manufacturing sectors except food products and tobacco have had positive growth in Q1 of this year (Exhibit 1.2).

- Many have had higher growth this year than last year (motor vehicles, chemicals, paper, machinery, apparel and furniture), while few have had lower growth than before (metals, textiles, rubber and plastic, electrical machinery).
- While the growth has been positive, the quality of the growth is suspect in a few industries. For example in metals, where the IIP indicates a positive growth over two years, prices are at an all-time low and the stock market performance is very poor, raising the question of the nature of the growth and the sector's outlook going forward.
- What is most heartening is that certain sectors which have been closely associated with general economic well-being are seeing consistent revival—for example, Commercial vehicles

Interestingly, the above growth in manufacturing is being driven by fundamental consumer demand. Consumer spending grew at an all time high of Rs. 15.9 trillion in the Q4 FY2014-15 from a record low of Rs. 4.5 trillion in Q3FY2003-04. Falling input costs have helped maintain attractive prices that has also helped keep up the demand momentum. This growth in consumer spending has also helped offset the sluggish exports situation. Investment demand is also based on in-

EXHIBIT 1.1 | Revival in Growth of Industrial Production

Growth in overall IIP (%)



Sources: Ministry of Statistics and Programme Implementation; BCG analysis.

Note: IIP growth rate for an FY is defined as the growth in average IIP of all months in that FY. Growth rate in FY16 Q1 is calculated against FY15 Q1 average IIP and FY16 Q1 average IIP.

EXHIBIT 1.2 | Most Manufacturing Sectors Have Grown in Q1 FY15-16

Sector	Weight	IIP growth in 2014-15	IIP growth in Q1 2015-16
Basic metals	113	13%	9%
Chemicals	101	0%	4%
Coke, refined petroleum products and nuclear fuel	67	1%	6%
Electrical machinery	20	21%	1%
Fabricated metal products	31	-1%	0%
Food products and beverages	73	5%	-4%
Furniture manufacturing	30	7%	30%
Leather products	6	10%	4%
Machinery and equipment	38	4%	5%
Medical, precision and optical instruments, watches and clocks	6	-2%	-7%
Motor vehicles	41	3%	7%
Office machinery	3	-38%	-13%
Other non-metallic mineral products	43	3%	-3%
Other transport equipment	18	6%	2%
Paper and paper products	10	3%	4%
Publishing, printing and reproduction of recorded media	11	-4%	-5%
Radio, TV and communication equipment and apparatus	10	-54%	-23%
Rubber and plastics products	20	5%	2%
Textiles	62	3%	1%
Tobacco products	16	1%	-8%
Wearing apparel	28	5%	17%
Wood and wood products except furniture	11	4%	12%
Overall manufacturing	755	2%	4%
Overall mining	142	2%	1%
Overall electricity	103	8%	2%
Total	1,000	3%	3%

Sources: Ministry of Statistics and Programme Implementation; BCG analysis.

Note: IIP growth rate for an FY is defined as the growth in average IIP of all months in that FY. Growth rate in FY16 Q1 is calculated against FY15 Q1 average IIP and FY16 Q1 average IIP.

creasing corporate profits, and not triggered by large government spending. Thus the manufacturing growth is solid and broad-based.

Long Way From Make-In-India 2022 Targets

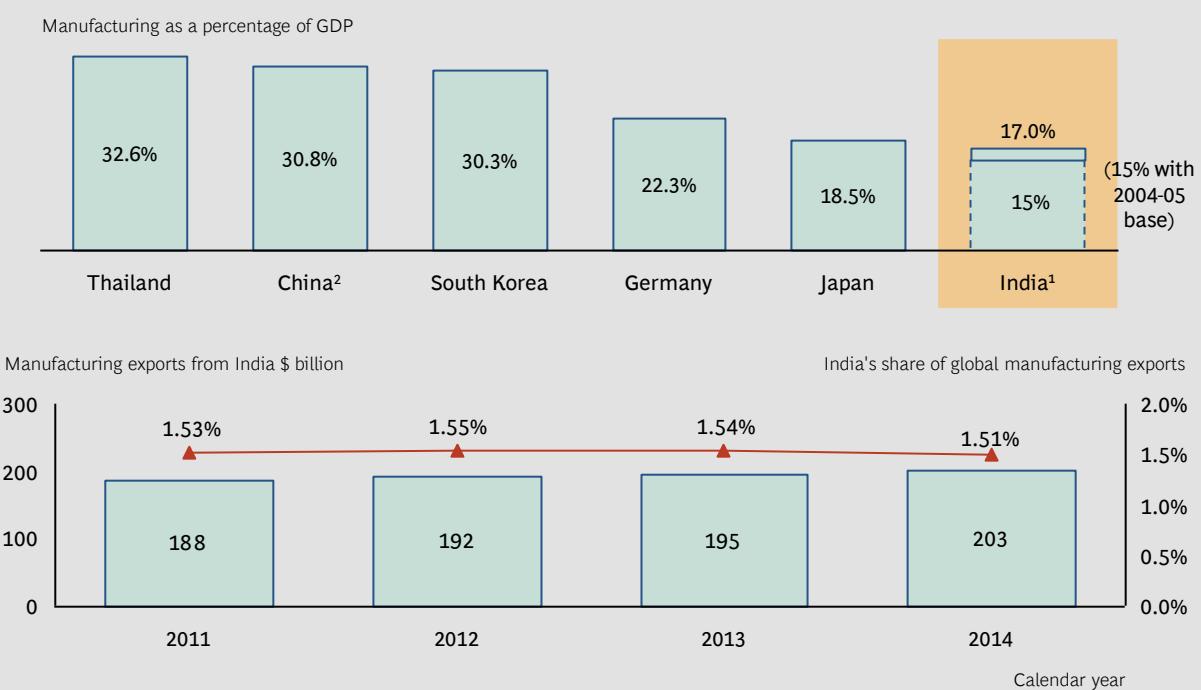
Although the performance of the manufacturing sector has improved in the past few months, this progress is not enough to achieve the targets set by the Make-In-India program that are based on the National Manufacturing Policy (NMP) of 2012. The policy had envisaged manufacturing to contribute around 25 percent to the overall GDP. As per the most recent statistics, manufacturing growth has not been able to keep up with the GDP growth. While India's share in the global GDP increased from 2.2 percent in 2009 to 2.5 percent in 2013, her share in global manufacturing decreased from 2.2 percent to 2.0 percent during the same period. Most of the other major global economies have seen the trend in the two metrics move in the same direction. In contrast to the Make-in-India target, manufacturing still accounts for only 17

percent of India's GDP, and has remained stagnant at this level for the last five years. Strong manufacturing economies have more than 20 percent of their GDP coming from this sector. Examples are Thailand (33 percent), China (31 percent), South Korea (30.3 percent) and Germany (22.3 percent). The story is similar with India's manufacturing exports. While manufacturing exports increased from \$188 billion in 2011 to \$203 billion in 2014, India's share in global manufacturing exports still remains at 1.5 percent (Exhibit 1.3). As expected, this shortfall is reflected in job creation in the manufacturing sector. Make-In-India aspires to create 100 million new jobs in manufacturing by 2022. In reality, only 4 million jobs are estimated to have been created in the sector since 2010. Extrapolating this growth of 1.5 percent, we will fall short of the Make-In-India target by 92 million jobs by 2022 (Exhibit 1.4).

Increasing Foreign Investments

While growth parameters have been positive, it is important to note that several foundational elements are also falling in place.

EXHIBIT 1.3 | Manufacturing Remains at 17% of GDP Against 20%+ For Strong Manufacturing Economies. Share of Global Manufacturing Exports Remains at 1.5%



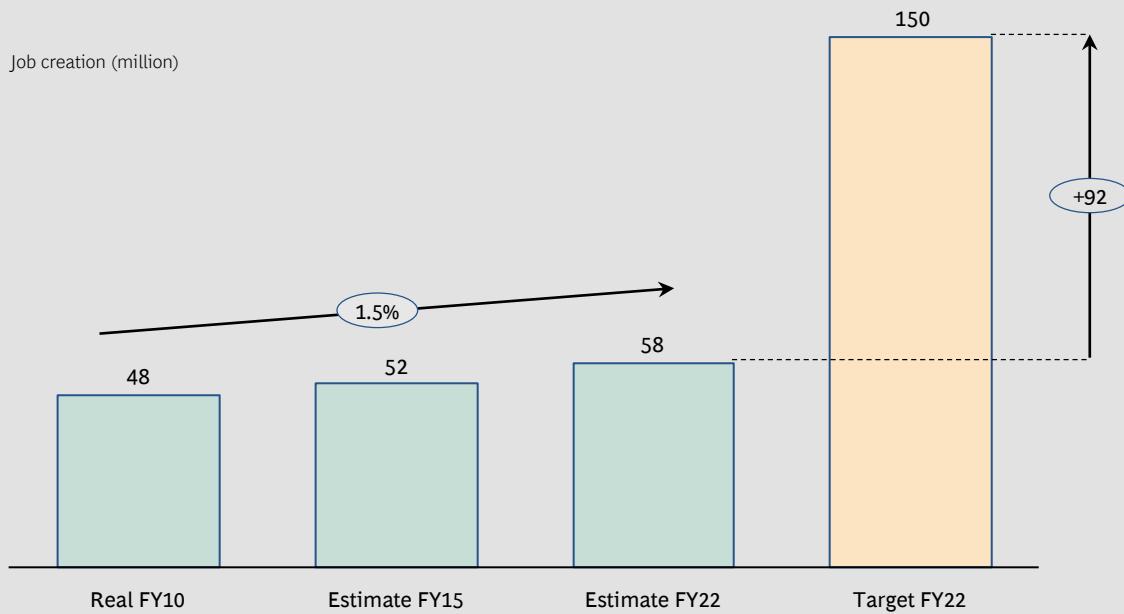
Sources: World Bank, Central Statistics Office (CSO), BCG analysis.

¹World Bank data used. 18% if CSO data is used with base 2010-11 and 15% if CSO data with base 2004-05 is used.

²Calendar year 2014 data used for all countries except China. 2013 has been used for China.

EXHIBIT 1.4 | Growth in Manufacturing Jobs Only 1.5%

The NMP target was 6%, to create 100 million jobs (92 million fewer jobs will be created)



Falling short of NMP target of 25% of GDP and 100 million additional jobs

Sources: Ministry of Statistics and Programme Implementation; Oxford economics; BCG analysis.

'Make-In-India' pitch has been received well by foreign investors, and is marked by several high profile large ticket investment announcements. The first six months of 2015 have seen more FDI inflows than the whole of 2012 (Exhibit 1.5). A significant portion of this FDI is headed towards the manufacturing sector, which attracted over one third of FDI. Interestingly, the investments are spread across a large number of sectors including electronics and aerospace, apart from the more traditional ones such as automobiles and components; this reflects the broad based traction generated by the program. It is also noteworthy that the source of the FDI is quite diverse; it includes not just the traditional western nations and global powers, but also Asian economic powerhouses including China, Taiwan and Singapore. The announcements include those from marquee names such as Foxconn, Honda, Airbus, Mercedes Benz, ThyssenKrupp, Hyundai Heavy Industries and several others (Exhibit 1.6).

Improving Fundamentals and a Determined Government

Infrastructure is one of the key enablers of

manufacturing. Several key reforms have been implemented in the energy, coal and mining sectors. Fiscal 2014-15 saw the highest ever capacity addition in power generation, significantly reducing the energy shortfall prevalent for a long time (Exhibit 1.7). The huge push to the transportation sector has been marked by investments into roads, railways and shipping (Exhibits 1.8, 1.9). Some of the key areas of focus are to build 30km of highway roads per day, implement dedicated freight corridors with fast trains, construct new shipping ports, and develop inland and coastal waterways.

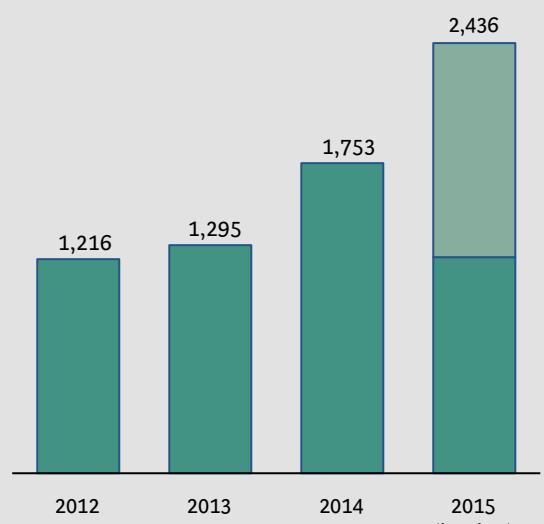
Gains in industrial relations from the past few years continue to hold. There have been fewer industrial disputes, leading to the decade's lowest man-days lost last year (Exhibit 1.10).

The current government's explicit commitment to improve the ease of doing business is evident from the reforms in many areas:

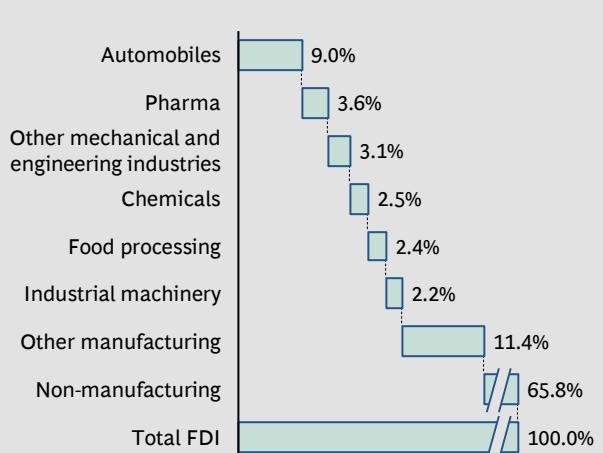
- Online e-business portals launched to cut the time required to establish a new business.

EXHIBIT 1.5 | FDI Inflow Has Been Continuously Increasing...

FDI in Rs. billion



**Top manufacturing sectors attracting FDI
(January 2014 to June 2015)**



Total FDI for January 2014 to June 2015: 2,971 billion

■ Estimate for the rest of the year ■ Actuals

Sources: Department of Industrial Policy and Promotion; BCG analysis.

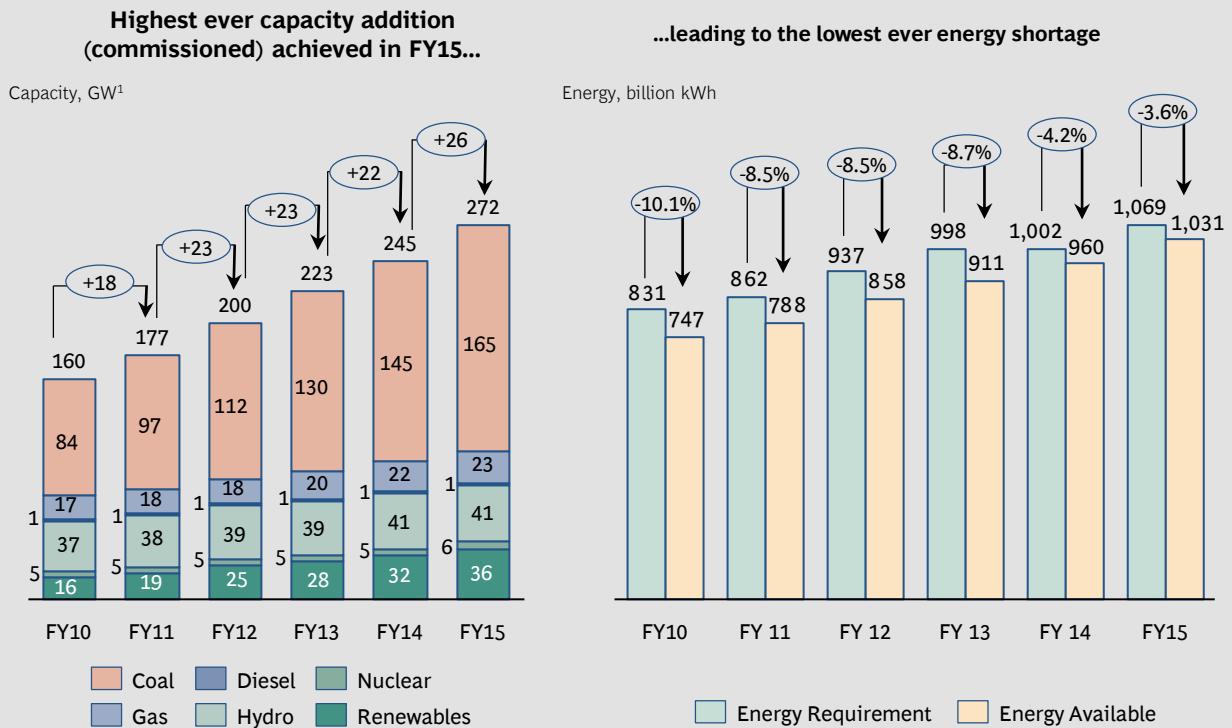
EXHIBIT 1.6 | There Have Been Many Block Buster Announcements of Investments Into India

Not exhaustive

Electronics	<ul style="list-style-type: none"> Foxconn: \$2-5 billion investment over five years Lenovo: 6m smartphones in FY16, 12-14m in FY17 Xiaomi: Started manufacturing smartphones this year in Visakhapatnam
Automobiles	<ul style="list-style-type: none"> Suzuki: Rs. 8,500 crore investment to set up a new facility in Gujarat Mercedes Benz and BMW: Investments to increase localisation level to 60% and 50% respectively Volvo: Investment of Rs. 500-700 crore for expansion of units making busses, trucks, etc. Honda: Rs. 4000 crore investment planned for a new plant in Gujarat (third plant in India) General Motors: \$1 billion investment for plant expansion (unit to be an export hub) Ford: Rs. 4000-5000 crore investment to set-up an R&D centre in Chennai Isuzu: Rs. 3000 crore investment to set-up a new plant for SUVs and pick-ups
Defence	<ul style="list-style-type: none"> Russian Helicopters (RH): ~\$700m investment planned for 200 helicopters Boeing: JV with TASL to manufacture defence systems and UAVs
Other sectors	<ul style="list-style-type: none"> Aviation <ul style="list-style-type: none"> Airbus: \$2 billion cumulative outsourcing by 2020 Aerospace <ul style="list-style-type: none"> ThyssenKrupp: Materials plant in Bengaluru for aerospace and defense sectors Metallurgical <ul style="list-style-type: none"> POSCO: JV with Uttam Steel to set-up steel plant (3 million tons / year) Ship-building <ul style="list-style-type: none"> Hyundai Heavy Industries: Project with Hindustan Shipyard for Indian Navy

Source: Press articles.

EXHIBIT 1.7 | Grid Capacity Addition at an All Time High in FY2015



Sources: Central Electricity Authority, Ministry of Power.

¹Capacity in GW on 31st March of the year.

EXHIBIT 1.8 | Infrastructure: Roadways and Railways

Expansion in roadways and investments to make railways the preferred logistics channel

Roadways	<p>Investments</p> <ul style="list-style-type: none"> Target to build 30km/day in 2016. Six highway projects totaling 712 km with an investment of \$2 billion already approved, final batch of nine projects for this FY covering 895 km at \$2.82 billion investment being finalized Proposal to set up road development fund with an amount of Rs. 1 trillion (US\$15.83 billion), in collaboration with Japanese investors <p>Structural changes</p> <ul style="list-style-type: none"> Projects over 4,084 km are being restructured from PPP to EPC (engineering, procurement and construction) mode to get them going
Railways	<p>Investments and MoUs</p> <ul style="list-style-type: none"> MoU signed with Chinese Government and Czech Railways to improve technical cooperation Hundred per cent FDI invited in railway infrastructure – inflows of US\$ 634.27 million from Apr 2000 to Feb 2015 <p>Dedicated freight corridors</p> <ul style="list-style-type: none"> Implementation of Eastern Dedicated Freight Corridor (EDFC) and Western Dedicated Freight Corridor (WDFC) with freight train speeds of maximum 100 kmph <p>Investments and capacity expansion</p> <ul style="list-style-type: none"> Gross budgetary support of \$6.33 billion for the Railway's annual Plan New rail coach manufacturing unit at Kolar to produce 500 coaches/annum

Sources: Government publications; Press articles.

EXHIBIT 1.9 | Infrastructure: Waterways

New ports and investments planned, private participation in ports being increased, red-tape cut

Shipping and Waterways

New ports and increasing private participation

- Sagarmala Project (Blue Revolution): New ports planned. E.g.: Transhipment ports in Colachel and Vizhinjam and bulk ports in Sagar, Dugarajapatnam, etc.
- Push towards land-lord port model (owned by Government, operated privately)
- Private terminals planned in existing ports. E.g.: Ennore port

Investment push

- 100% FDI allowed under the automatic route for port development projects
- Shipping Ministry accorded investment approval rights for PPP projects
- Maritime Agenda 2010–2020 target capacity of over 3,130 MMT through participation from the private sector. Non-major ports to generate over 50% capacity

Operational efficiency

- Focused project to increase operational efficiency of 12 major ports
- Effort to create a common platform for different stake-holders. E.g.: Forums where CHAs, CFSs can voice their concerns
- Streamlining customs and security clearance. E.g.: e-documentation for Form 13

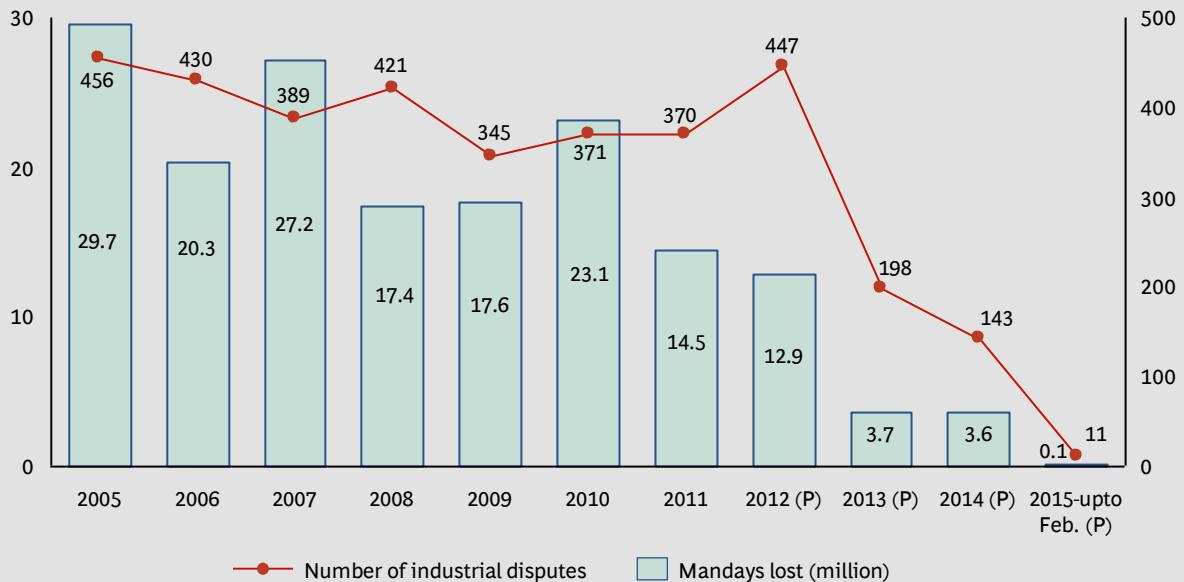
Inland Waterways

- Government developing inland waterway and coastal shipping sector as an alternative to road and rail
- MoU between the Inland Waterways Authority and Dedicated Freight Corridor Corporation for rail connectivity to waterway hubs

Sources: Government publications; Press articles.

EXHIBIT 1.10 | Industrial Relations Continue to be on an Improving Trajectory

Industrial relations have improved over the last decade

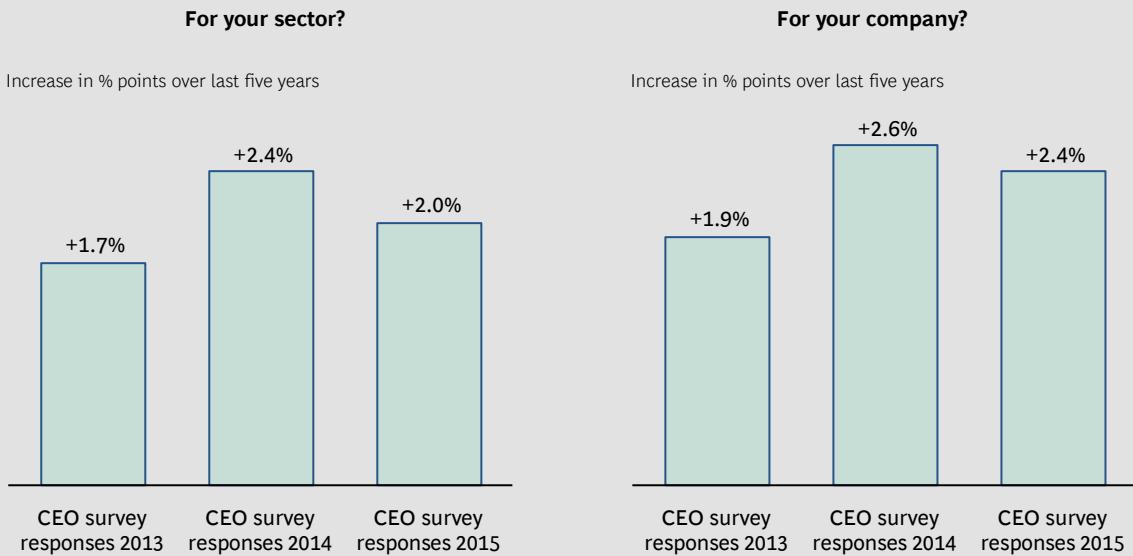


Source: Ministry of Labour and Employment.

Note: (P) Data for 2012 to 2015 is provisional; Industrial disputes include all strikes and lockouts.

EXHIBIT 1.11 | Higher Growth Expected Over Next Five Years Than The Previous Five Years, However Less Optimistic Than Last Year

Do you see stronger growth over the next five years compared to the last five years?



Sources: CII-BCG Manufacturing Leadership Survey 2013; CII-BCG Manufacturing Leadership Survey 2014; CII-BCG Manufacturing Leadership Survey 2015.

- Rules for environmental approvals eased and new online systems set up to speed up project approvals.
- Reforms in labor laws relating to welfare, transparency, terms and conditions and layoffs and closure.

Cautious Optimism in the Air

When 'Make-In-India' was launched last year, the industry showed great optimism about the growth prospects of the sector. CEOs are still positive about future growth prospects, albeit less than last year, as revealed by the BCG-CII Manufacturing Leadership Survey 2015 (Exhibit 1.11). Industry leaders see their growth in the next five years at 2.4 percent higher than in the last five years. This is down from 2.6 percent last year.

Why has this optimism come down from the last year? We will explore this in the next chapters.

MAKE-IN-INDIA: SCORECARD ONE YEAR ON

"We have come far, but we still have a long way to go"

— Anonymous

REVIVAL OF THE MANUFACTURING sector has been one of the cornerstones of the new government's electoral promises and efforts so far. The centerpiece of these efforts is the Make-In-India program which was launched in September 2014 to facilitate investment, foster innovation, enhance skill development, protect IP and build manufacturing infrastructure.

In addition, the government has initiated bold moves to address key concerns on multiple fronts including the much anticipated goods and services tax, initiatives in the power sector reforms land acquisition and labor law. While some of these have been able to make a difference on the ground, the others are stuck on the legislative or implementation runway and are yet to take off. This chapter takes stock of the government's efforts and progress on the key fronts that can unlock the development of the manufacturing sector.

Make-In-India Framework

The Make-In-India initiative is aimed at bringing a paradigm shift to the manufacturing sector. With intent to attract both foreign and domestic investment in manufacturing, the initiative was launched last year in all Indian states and several overseas embassies.

The Make-In-India initiative has four key themes:

- **Procedural simplification** aims to improve the ease of doing business through deregulation, reducing licensing requirements, simplifying and rationalizing rules and leveraging information technology.
- **Infrastructure** build-out through development of large scale industrial corridors. Work on five smart cities is currently underway in the Delhi Mumbai Industrial Corridor (DMIC). Feasibility of other industrial corridors is also being studied; these include the Bangalore Mumbai Economic Corridor, East Coast Economic Corridor and Amritsar Kolkata Industrial Corridor.
- **New sector** growth by aggressively attracting investments in specific industries. For example, 100 percent FDI is now invited in railways and medical devices. FDI is allowed up to forty nine percent in defense manufacturing and 55 percent of the items have been removed from licensing requirements.
- **Ushering in a new mindset** to transform the Government from a regulator to a facilitator. An investor facilitation cell has been set up to assist investors with subjects like policies, incentive schemes and opportunities. The government has also taken steps to reduce regulatory

filings. For instance, companies now need to file a single self certified compliance report for 16 central labor laws.

The government has made significant efforts to take the Make-In-India campaign to global leaders and industry captains through a combination of events, roadshows, bilateral discussions and overseas visits. The Prime Minister has leveraged his overseas visits for bilateral dialogues and multi-lateral forums to push the developmental and investment agenda. His visit to the US generated investment commitments worth \$40 billion; deals worth \$22 billion were signed during his China visit (Exhibit 2.1).

Several leading global companies across multiple sectors have made big ticket announcements to set up production facilities in sectors ranging from automotive, aerospace, defense and high-tech electronics, to food processing and healthcare. In recent months, electronics manufacturing giants have been making the headlines. Apart from Foxconn, companies like Lenovo, Xiaomi and Motorola plan to set up smartphone manufacturing plants, with a combined investment of more than \$5 billion.

However, the momentum is yet to build up among domestic investors. The import of capital goods is yet to see an uptick and was in fact a little lower in FY15 than in FY14. In fact, the executives feel that translating the vision of the government into the right policies will be one of the biggest challenges over the next five years (Exhibit 2.2).

Ease of Doing Business

Though the government has been pushing active reforms and procedural simplifications to make it easier to do business, the industry is yet to see a clear change on the ground. Thirty nine percent of the top management surveyed felt there has been no improvement in the ease of doing business over the last year, while 20 percent felt it has improved somewhat. Specifically, more executives saw an improvement in project clearance and approvals, while land acquisition and labour laws continued to be seen as 'difficult' in terms of ease of doing business (Exhibit 2.3).

GST—Still Some Way to Go

Several past regimes have initiated and discussed a move towards GST which will replace

EXHIBIT 2.1 | Prime Minister Visited Several Key Countries Pitching 'Make-In-India'

Month, year	Country	Highlights of the visit
August, 2014	Japan	<ul style="list-style-type: none"> Japan pledged \$35 billion FDI over the next five years to boost infrastructure, including bullet trains
September, 2014	United States	<ul style="list-style-type: none"> \$40+ billion investments committed by US firms over next two to three years GE, Boeing and others have already announced projects
April, 2015	France	<ul style="list-style-type: none"> Deal to fast-track Jaitapur Nuclear Plant Airbus to enhance outsourcing in India from \$400 million to \$2 billion over next five years Twenty pacts in nuclear energy, urban development, railways, space, etc.
April, 2015	Germany	<ul style="list-style-type: none"> Inauguration of the Hannover Messe Industrial Trade Fair PSUs like BHEL, HMT, etc. signed pacts with German, Swiss, Bulgarian and Russian companies for manufacturing in high-tech areas
May, 2015	China	<ul style="list-style-type: none"> Deals worth \$22 billion were signed, including 21 deals in sectors like industrial parks, ports and financing Chinese electronics companies announced big ticket investments in India
May, 2015	South Korea	<ul style="list-style-type: none"> Seven agreements signed, including Double Tax Avoidance Agreement \$10 billion funding for infrastructure development
August, 2015	UAE	<ul style="list-style-type: none"> Agreement to boost trade by 60% over the next five years Joint statement for investment of INR 4.5 lakh crore rupees in India

Source: Press articles.

EXHIBIT 2.2 | Translation of Vision Into Policies Remains One of the Top Challenges Over the Next Five Years

What do you foresee as the biggest challenge for manufacturing growth in India over the next five years? (Top three)

Concern	2015	
	Rank	Survey responses (in %) ¹
Inability of bureaucracy to implement policies appropriately	1	25 ↑+9%
Infrastructural constraints	2	19 ↑+2%
Lack of translation of vision of the Centre into the right policies	3	15 ↑+3%
High cost of capital	4	8 ↓-4%
Demand slowdown	5	7 □0%
Low/no innovation	6	7 ↓-3%
Unstable polity	7	6 □0%
Currency fluctuations	8	4 ↓-3%
Rising labor costs	9	4 ↓-4%
Manufacturing overcapacity	11	2 ↓-3%
Others	10	3 ↑+1%

Source: CII-BCG Manufacturing Leadership Survey 2014, CII-BCG Manufacturing Leadership Survey 2015.

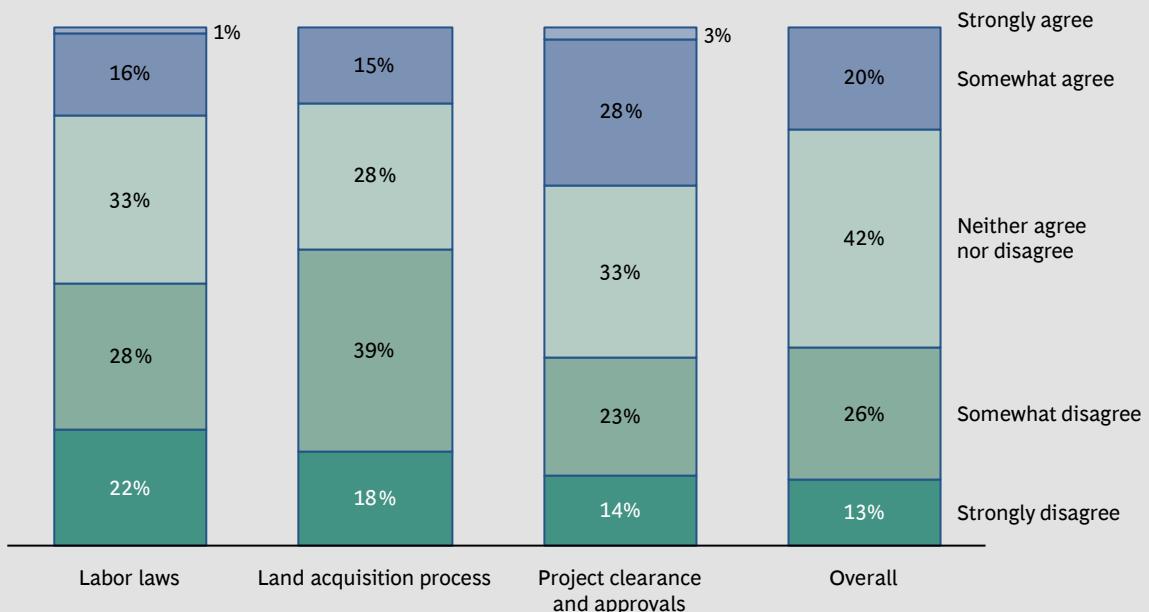
¹Percentage of responses identifying the concern to be one among the top three concerns.

xx change over survey results in 2014

EXHIBIT 2.3 | Only 20 Percent Feel that Ease of Doing Business has Improved

Has 'Ease of doing business' improved in your industry, state?

Survey Responses (in %)



Source: CII-BCG Manufacturing Leadership Survey 2015.

most indirect taxes with one single tax. GST is expected to transform India into a single unified market, reduce the cost of manufactured goods and boost exports by 10-14 percent. It is expected to boost India's GDP growth by about 2 percent and is considered to be the most significant tax reform since Independence.

The new government has shown strong intent to implement GST and has set a deadline of April 1, 2016. Significant work on GST has been completed. The Bill has been passed in the Lower House (Lok Sabha). The Upper House (Rajya Sabha) panel has endorsed majority provisions (Exhibit 2.4) and the bill has been tabled in Rajya Sabha (Exhibit 2.5).

However, the Bill faces disagreement from the Principal Opposition Party on select clauses; and from several states on concerns of revenue loss. Legislative logjam and implementation efforts needed could force the government to miss the deadline. States will need to repeal and replace their existing VAT legislations; this is expected to involve quite a few complications. Trade and industry will

also need to invest in systems to align with the GST regime. All stakeholders including government officials need to be educated on the new regime.

Land Acquisition Bill—Onus on State Governments

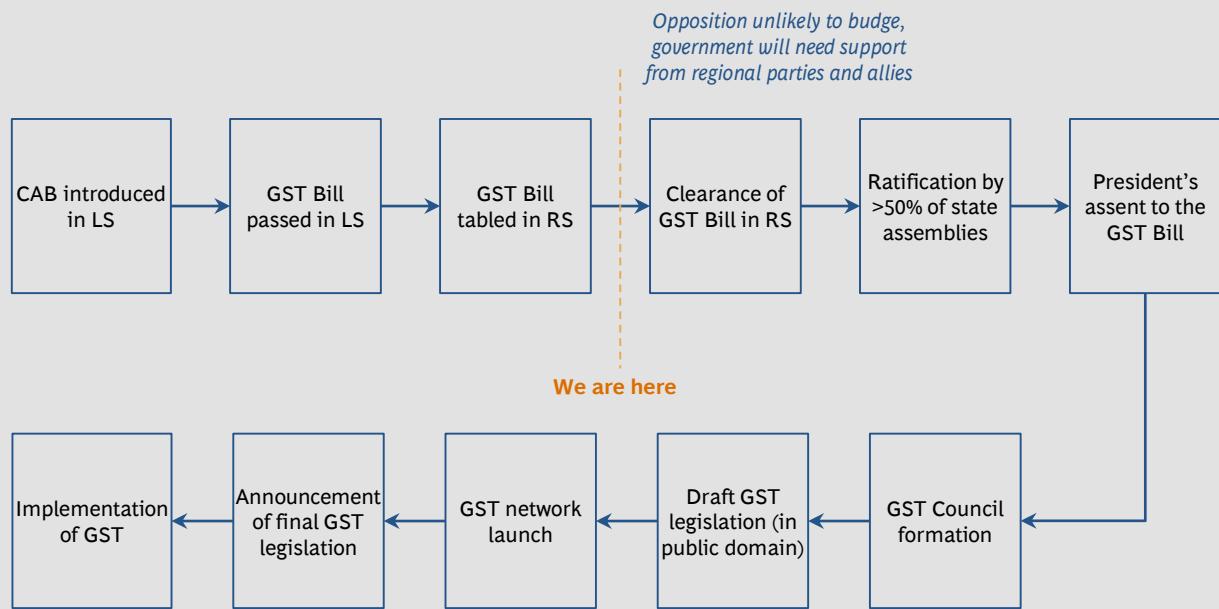
Despite urbanization, a significant portion of India's population still lives in villages and is directly or indirectly dependant on agriculture for its livelihood. Acquisition of land for industrialization and infrastructure development has been a hotly debated issue in Indian socio-politics for a variety of genuine reasons. Farmers have opposed conversion of fertile farmlands for other uses; environmentalists have opposed deforestation and coastal zone development; and sociologists are keen to ensure protection of tribal habitats. On several occasions, these legitimate oppositions have acquired political overtones. Partly given this context, and the myriad of resulting clearances, on average, it takes 14 months, and at times more, to acquire land for a factory.

EXHIBIT 2.4 | Government Has Laid Out Key Provisions of the New GST Bill, However a Few Are Still Contentious

Provisions with broad alignment		Contentious provisions
Intra-state	Center (CGST) and states (SGST) entitled to impose GST concurrently within a state	Compensation to states Compensation to states for revenue losses may be provided up to a period of five years (<i>Deemed inadequate</i>)
Inter-state	Integrated Goods and Services Tax (IGST) will be levied by the Center and further shared between the Center and the states	Entry, purchase tax The Bill seeks to delete the imposition of entry tax and purchase tax across India (<i>faces opposition from states</i>)
Incremental revenues	Sale of newspapers and ads therein (hitherto tax free)	Additional tax Additional tax (up to 1%) on inter-state supply of goods: This will be assigned to states for two years (<i>Opposition against levying this tax</i>)
Restrictions on tax imposition	Restricts states from imposing taxes on goods and services	Right GST rate The mooted GST rate is a revenue neutral rate of 26-27% (<i>Opposition wants it to be capped at 18%</i>)
Exempt goods	<ul style="list-style-type: none"> • Alcohol (for human consumption) • Petroleum products (under discussion) 	

Sources: Finance Ministry publications, Lok Sabha publications, Press articles.

EXHIBIT 2.5 | Though Government Has Made Some Progress in Rolling Out GST, Deadline of April 1, 2016 Unlikely to Be Achieved



Source: BCG analysis.

The Prime Minister, in his earlier capacity as Chief Minister of the western Indian state of Gujarat, had successfully boosted industrialization by proactively addressing this issue of land acquisition along with other simplification measures. The new central government introduced the Land Acquisition Bill last year, but met with a lot of opposition from various parties on several clauses, most prominently on the issue of setting fair compensation (Exhibit 2.6).

Despite several amendments to iron out the differences, contentions still persisted. The Ordinance was allowed to lapse. The central government is now asking the state governments to enact their respective legislations in this regard.

Labor Laws—Several Small Steps Forward

Indian labor laws are the most rigid among the BRICS countries. Many date back as far as 1926. Reform efforts focus on rationalizing the legal requirements as well as simplifying the compliance procedures.

Online portals have been launched, that clearly lay out the regulatory requirements. A new web-based labor inspection system will do away with the current arbitrary selection of factories, thus curbing harassment of factory officials by government inspectors. Another portal helps employers submit a single compliance report for 16 labor laws.

Amendments have been made that relax the regulations around apprenticeship. Draft amendments propose changes to layoff approval requirements and delegation of power to states to formulate and revise minimum wages. Another draft amendment proposes an increase in the overtime hours allowed to a worker and also lays down additional clauses to enhance worker safety (Exhibit 2.7).

However, the government has faced opposition from trade unions, besides the opposition parties. Though several meetings have been held to allay the fears, it will be a long haul for the government to work with the state and local governments and other stakeholders.

EXHIBIT 2.6 | Key Provisions of the New Land Bill Laid Out. Several Provisions Quite Contentious

Provisions with broad alignment		Contentious provisions	
Five special categories	<ul style="list-style-type: none"> • Defense • Rural infrastructure • Affordable housing • Industrial corridors • Infrastructure projects including PPP where central government owns the land 	Private hospitals and schools	Exclude private hospitals and educational institutions from restrictions
Private 'entities'	Extends applicability of the law to private 'entities': Any entity other than a government entity including <ul style="list-style-type: none"> • Proprietorship • Partnership • Non profit organization and others 	Consent clause exemption	Five special categories exempt from consent requirements (from 80% landowners in private and 70% in PPP projects)
Inclusion of thirteen Acts	For a uniform central policy on resettlement, thirteen Acts such as National Highways, Railways have now been included	Offense by government officials	Protection of government officials from being prosecuted
Retrospective application	<ul style="list-style-type: none"> • Retrospective application in case of incomplete transactions made more than five years ago • Clause to discount the period during which proceedings of acquisition were held up (for example, due to court order) to calculate time period 	Social impact assessment	Exemption of assessment of social and agricultural impact for five specific categories
		Return of unutilized land	Period increased from five years to the higher of five years or period specified at the time of setting up the project
		Compensation	Four times the market price for rural land and two times for urban land

Sources: Department of Land Resources publications; Lok Sabha publications; Press articles.

EXHIBIT 2.7 | Summary of Progress on Labor Reforms

	Quick fixes	<ul style="list-style-type: none"> • Web based labor inspection system: Selection of factories for inspection by the system based on data as compared to arbitrary selection by inspectors • Shram Suvidha Portal: Self certified single compliance for 16 central labour laws
	Amendment to Apprenticeship Act	<ul style="list-style-type: none"> • Dropped the provision of imprisonment of employers for violation of Act provisions • Employers can formulate their own policies for recruiting and absorbing apprentices • Restriction on number of inspections of one establishment
	Amendment to Factories Act	<ul style="list-style-type: none"> • Removed restriction on employment of women & disabled near certain machines • Liability to ensure safety placed on the manufacturer • Increased overtime hours allowances and entitlement for paid leave
	Labor Code on Industrial Relations Bill, 2015	<ul style="list-style-type: none"> • Proposes to combine Industrial Disputes Act, 1947, the Trade Unions Act, 1926, and the Industrial Employment (Standing Orders) Act, 1946 • Government permission needed for retrenchment only in firms with more than 300 employees • Clauses to keep strikes and lock outs under control • Minimum number of employees needed for registering a union increased
	Labor Code on Wages Bill, 2015	<ul style="list-style-type: none"> • Minimum Wages Act, the Payment of Wages Act, 1936, the Payment of Bonus Act, 1965, and the Equal Remuneration Act, 1976 rationalized • Delegation of complete power to the states to formulate the wages • Fewer compulsory work days to enjoy benefits

 Implemented

Sources: Ministry of Labor publications; Lok Sabha publications; Press articles.

Power Sector Reforms

Coal based generation is the predominant source of power for India. The sector has been plagued by issues like fuel availability, investment in transmission infrastructure and the poor financial health of several utilities. A struggling power industry puts pressure on the productivity of the manufacturing sector.

Coal mining, power and renewables have now been brought under a single ministry. Significant reforms have been carried out to ensure fuel availability. Coal blocks have been allocated and / or re-allocated with greater transparency. The assurance of coal linkages has revived power generation units that were inactive due to lack of fuel.

The government has announced its target of providing 24x7 power across the country by 2019; accordingly, significant capacity addition has been planned through ultra mega power plants. The government has also increased the budgetary allocation for renewables by 65 percent and has set an ambitious

target of achieving 400 percent growth by 2022 (Exhibit 2.8).

To promote the growth of the domestic equipment industry, local manufacturers have been given priority as rupees 1 lakh crore of capital equipment orders are placed by NTPC, Coal India, Power Grid Corporation and other agencies. Manufacturers in the renewable energy space also stand to benefit with significant increase in target capacity.

With all of the above efforts, the industry seems to be divided in its assessment of the government's effectiveness. As shown in exhibit 2.9, only 42 percent of respondents believe that the government's efforts in improving the sector have been effective.

Specifically, respondents believe that the top four areas that the government needs to address are labor law reform, infrastructure development, faster clearances and approvals for projects, and land acquisition reform.

With many efforts already made, the next year is likely to be pivotal in witnessing their impact to strengthen the sector.

EXHIBIT 2.8 | Summary of Initiatives of the Government in the Power Sector

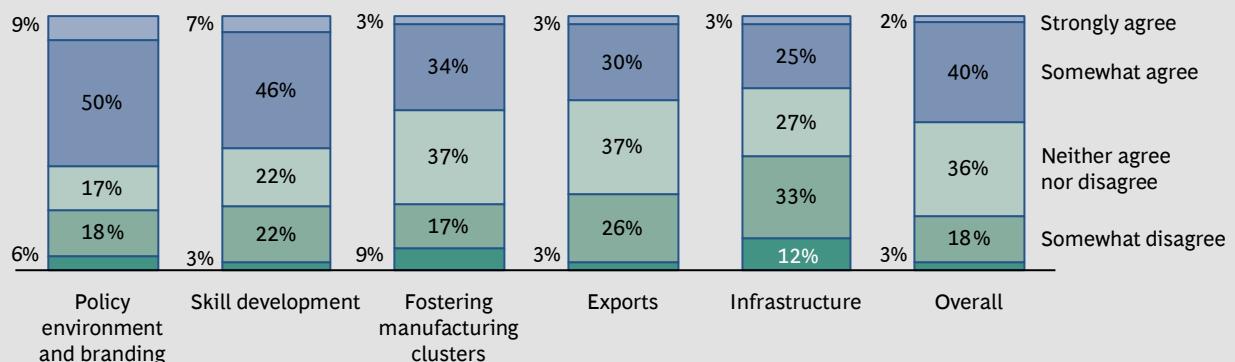
Availability of fuel	<ul style="list-style-type: none">Integrating the responsibility of coal mining, power and renewables under a single ministryCoal block allocation / re-allocation done via a more transparent methodAutomatic clearances for coal-linkage for all new power plants
Push to renewable energy	<ul style="list-style-type: none">Stepped up budget allocation for renewable energy by 65.8%Target of 175 GW from the current levels of 36 GW set for 2022Focus on renewables—25 solar parks of about 100 MW each and a Rs. 38,000 crore green energy corridor planned
National Smart Grid Mission	<ul style="list-style-type: none">Approved Rs. 980 crore outlay for National Smart Grid Mission to make the Indian power infrastructure cost effective, responsive and reliable
Electricity Act	<ul style="list-style-type: none">Consumers will have a choice to buy from companies of their choiceStronger penalty provisions, making them more enforceablePromote competition, efficiency in operations and improved quality of electricity supply
24X7 power access vision	<ul style="list-style-type: none">Envisages provision of 24X7 power across country by 2019Five ultra mega power plants totalling 20,000 MWReduction in peak load shortages through revival of stranded gas-based power plantsRs. 1.09 lakh crore investment in sub-transmission and distributionRs. 1 lakh crore of new transmission projects to be bid for in the current year

Source: Press articles.

EXHIBIT 2.9 | Forty percent Respondents Feel Government's Manufacturing Drive Has Been Effective

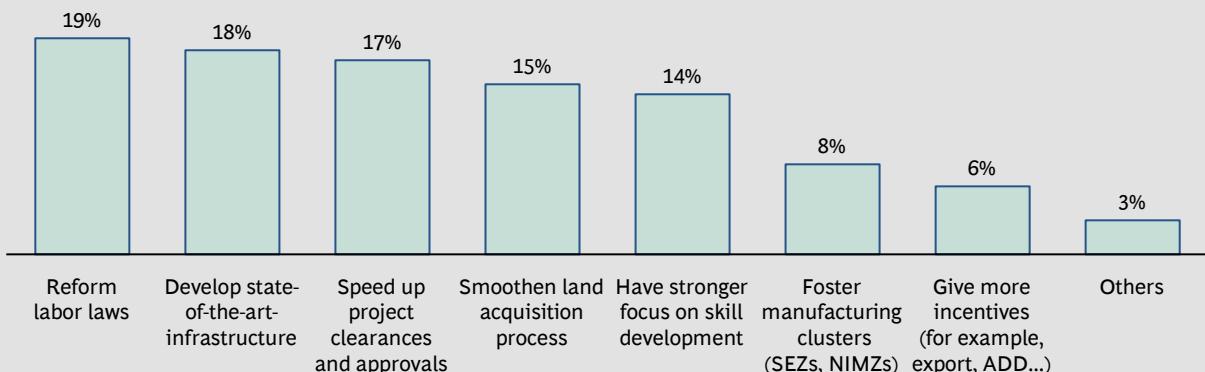
Government's drive to improve manufacturing sector has been effective

Survey responses (in %)



What more should the government do to drive growth in the manufacturing sector?

Survey responses (in %)



Source: CII-BCG Manufacturing Leadership Survey 2015.

GLOBAL SHIFTS: ADVANTAGE MANUFACTURING, ADVANTAGE INDIA

“Teachers open the doors, but you must enter by yourself”

— Chinese Proverb

FROM A GLOBAL PERSPECTIVE, three key trends stand out that are impacting the evolution of manufacturing across the world. These three trends together have a positive-to-neutral impact on Indian manufacturing:

- Deflation in factor costs
- Decline of China
- New manufacturing locations

Factor Cost Deflation

The price of nearly every major commodity used in manufacturing has dropped over the last two years. Steel, copper, zinc and crude oil (which impacts many downstream raw materials like plastics) have all reduced in price, with steel having touched an all-time low. This ‘cool down’ has been driven largely by a demand slowdown in China and other developed markets. Exhibit 3.1 shows the movement of key commodity prices over the last two years.

At the same time, end product prices have not really dropped, especially in countries like India where consumer demand is strong. Put the two of these together, and what you get

are unprecedented low input costs with reasonably stable prices. The result is additional margin expansion. The extra money is used for re-investing the surplus back with the customers (as reduced prices); or in driving innovation projects that strengthen the industry’s core; or to give the investors higher dividends. Either way, margins in the industry have never been this good.

China Decline

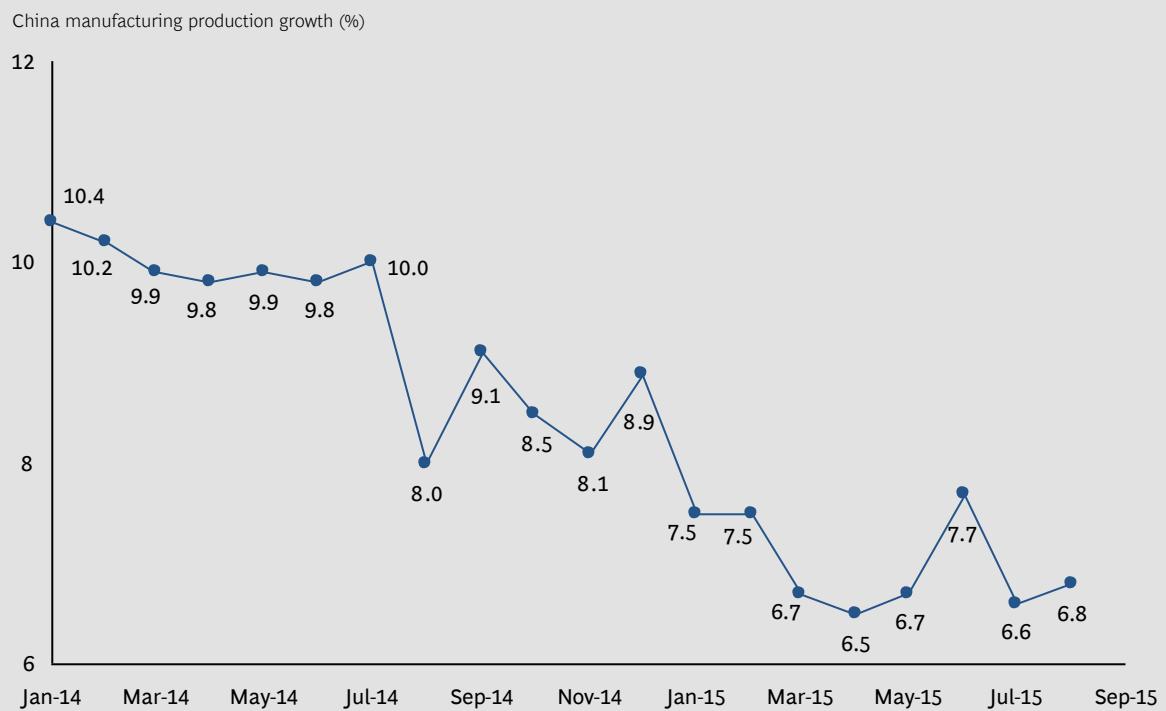
Over the last two decades, evolution of the global manufacturing landscape has normally implied a shift of production from the West to China. This was largely driven by the factor cost advantages and concerted efforts by the Chinese government to orchestrate infrastructure and inputs for large scale production. The results have been dramatic. China, which used to contribute a mere 3 percent of the global manufacturing output in 1990, now accounts for over a quarter of global production. More impressive, what started as supply of labor intensive, lower technology products has now evolved beyond production into design and development of sophisticated engineered products. Though China continues to dominate the world in manufacturing, its proposition is no longer as compelling to companies, including Chinese companies, that are looking to expand their footprint beyond China (Exhibit 3.2).

EXHIBIT 3.1 | Prices Of Many Commodities Have Fallen Significantly Over The Past Two Years



Sources: U.S. Energy Information Administration, LME, Steelfirst.

EXHIBIT 3.2 | Manufacturing Production Has Been Slowing Down In China



Source: National Bureau of Statistics, China.

There are four major reasons for this weakening of value proposition:

- Inflation in Chinese wages
- Strengthening yuan
- Cheaper energy in the West
- Declining costs of technology

INFLATION IN CHINESE WAGES

In the year 2000, China's fully loaded factory wages were a mere 3 percent of those in the U.S. However, the picture has changed significantly. In 2015 China's wages are around 17 percent of those in the U.S. This is essentially because while U.S. wage inflation has been in the 2-4 percent range over the last 15 years, Chinese wages have inflated by 15 percent. Avid China supporters continue to pitch for the lower wage cost Chinese interior, but the jury is still out on the pace of movement of manufacturing activity inward.

STRENGTHENING YUAN

Over the last ten years, the Chinese yuan

has systematically strengthened against the U.S. dollar; this is inevitable due to the innate growth of the Chinese economy and the dollar flows into China. Though this strengthening is tightly controlled and the recent devaluation has raised questions on the direction of movement of the yuan against the dollar for a short while, the fact is that (as shown in Exhibit 3.3), the Chinese currency is now significantly stronger compared to that of many other emerging markets and exporting countries. This situation makes it much more expensive to buy Chinese made material as compared to buying the same from other countries.

LOWER ENERGY COSTS IN THE WEST

Prices of natural gas fell by 25-35 percent in North America over the last decade, thanks to increased supply from shale. At the same time industrial electricity costs in China have gone up by about 65 percent, and natural gas costs by over 130 percent. Energy and labor, besides raw material, are the two major drivers of costs for any manufacturing company. Chinese companies now face a disadvantage in both of these

EXHIBIT 3.3 | Changes In Exchange Rates Of Key Manufacturing Economies Have Been Significant And Disparate



Source: Bloomberg.

Note: All exchange rates are with respect to USD. The exchange rates represented here are taken as in the last week of August for each of the years mentioned. Exchange rates are indexed to the respective 2005 values.

areas compared to the U.S. Exhibit 3.4 shows survey results indicating the same.

DECLINING COSTS OF TECHNOLOGY

While the wage rate advantage of low cost manufacturing countries like China is fast eroding, the cost of automation is declining sharply. An average spot welding machine, for instance, is about 25 percent cheaper now than in 2005. The cost of industrial robots has fallen over the past decade; the drop is expected to continue by more than 20 percent over the next decade. As a result, the adoption of technology by countries is increasing and further blunting the cost advantage of China and other low cost manufacturing locations.

Newer Manufacturing Destinations

The third key shift that is taking place in the global manufacturing landscape is the slow but steady emergence of alternative manufacturing locations. Depending on the product category and target markets, new and interesting choices are emerging.

Three specific upcoming manufacturing locations make for interesting reading.

UNITED KINGDOM

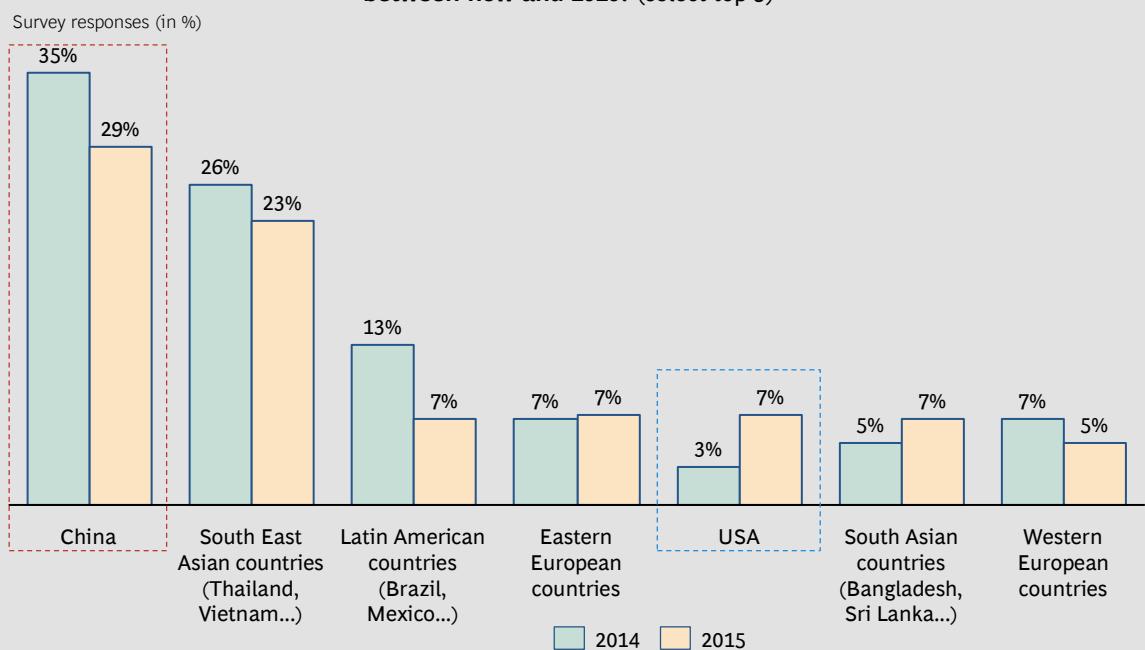
UK is now the most cost efficient manufacturer compared to its immediate neighbors in Western Europe (Exhibit 3.5). Sustained increase in productivity (3 percent improvement per year over three decades) makes it the second lowest wage cost country in Western Europe next to Spain. UK's corporate rates are expected to fall to 20 percent in 2015 from 28 percent in 2010, making it the most tax-attractive nation for manufacturing companies. While power costs are still high, the combined effect of productivity-adjusted wages and low tax rates makes UK the most competitive manufacturer in Western Europe.

VIETNAM

Vietnam has been a good location for manufacturing for the last ten years. The country has come up as a suitable alternative to China; several of its current factories are being set up by Chinese investors keen to offer an alternative lower

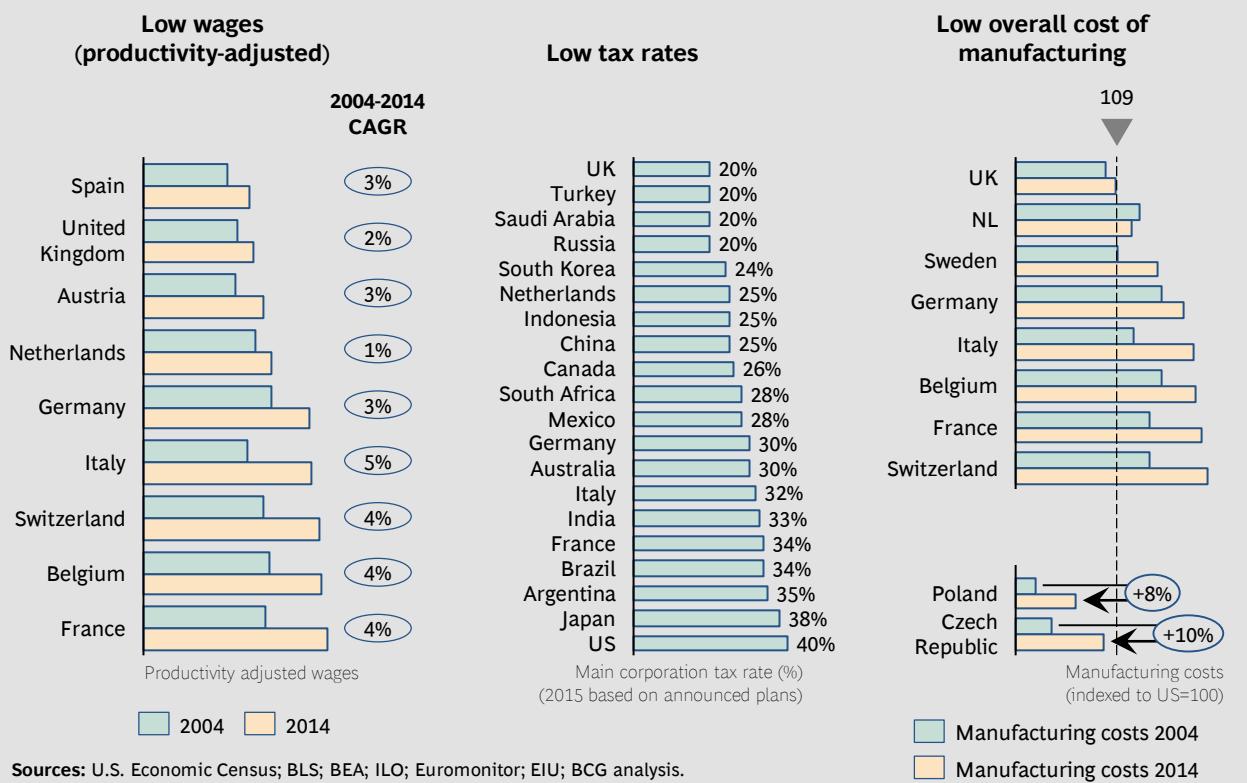
EXHIBIT 3.4 | China Seen As Less of A Competitor In Export Markets Than Before

Which countries will be our biggest competitors in the export markets, between now and 2020? (select top 3)



Sources: CII-BCG Manufacturing Leadership Survey 2014, CII-BCG Manufacturing Leadership Survey 2015.

EXHIBIT 3.5 | UK Is Now Western Europe's 'Low-Cost' Manufacturer



Sources: U.S. Economic Census; BLS; BEA; ILO; Euromonitor; EIU; BCG analysis.

cost choice to their end customers. Today, with a wage rate of \$150 / month and electricity rate of \$0.04 / kWh, Vietnam compares very favorably with many of the major manufacturing countries. Vietnam's manufacturing sector has displayed robust growth over the last 15 years (as shown in Exhibit 3.6), and today it ranks as a preferred manufacturing location for several commodities, especially apparel.

EASTERN AFRICA

Eastern African countries, especially Ethiopia, have been touted as the next frontier for low cost manufacturing, especially in labor intensive industries. Low labor rates (\$60 / month); an improving infrastructure (Mekelle, the second largest city in Ethiopia, now boasts of wide clean roads and a vibrant manufacturing cluster); and attractive government incentives (tax holiday, 100 percent import duty subsidy on capital equipment) have all contributed to this perception. However, these new destinations also have their challenges. For example, the widely acclaimed deal that Karuturi had signed with the Ethiopian

Government for farming over 300,000 hectares of land has fallen through amidst a lot of speculation and finger-pointing. These new destinations still have some way to go before they can establish themselves as a credible alternative to the existing manufacturing locations.

Imperatives for India

In this context, the 'Make-In-India' program becomes very timely and relevant. Given its growing domestic market and relatively high manufacturing cost competitiveness, India can become the logical location choice of any manufacturing company.

However, it needs to act quickly to make the most of the opportunity, or risk taking away of investments by the many competing countries around the world.

Recognition of the major issues that have held back India's manufacturing growth and kept investors at bay is clearly the first step. Ensuring the availability of key factor inputs such as labor and energy, creating an

EXHIBIT 3.6 | Vietnam's Manufacturing Sector Has Displayed Robust Growth Over The Last Fifteen Years



Source: World Bank.

¹Manufacturing value added.

enabling policy and regulatory regime and simplifying procedures and taxes are important considerations.

In addition, as described in this chapter, the role of technology is adding a critical dimension to the manufacturing competitiveness equation. We must recognize the key trends, identify specific opportunities and move quickly to ensure that we leverage technology to our advantage. We will discuss them in the next chapter.

THE FACTORY OF TOMORROW: IS INDIA READY?

“Changing the paradigm is the price of surviving success.”

— Luc Brabandere

Next Stage of The Industrial Revolution

The global manufacturing industry is at the cusp of major technological transformation. Some refer to this development as the fourth stage of Industrial Revolution, or Industry 4.0. We believe five key technologies will drive this trend. Interplay between these technologies will determine how the future of manufacturing will play out.

The five key technologies that will most influence manufacturing and improve productivity in the next few years (Exhibit 4.1):

- Additive manufacturing / 3D printing
- Autonomous Robots
- Agile Product Development
- Digital manufacturing
- Industrial internet

Additive Manufacturing

Also known as 3D printing, additive manufacturing can be used to produce objects

from digital designs by a process of depositing thin layers of material in succession. Additive manufacturing has three types of applications—prototyping and tooling, mass customization, and cutting edge manufacturing.

The technology is already being used to make prototypes in industries such as aerospace, automobile parts, and basic consumer goods. In the future, additive manufacturing methods will be widely used to produce small batches of customized products in a short time span.

GE is one major company that is successfully using additive-manufacturing to build fuel nozzles for new turbofan engines. The process uses direct metal laser melting, and a computer-guided laser builds the nozzle from layers of cobalt-chromium powder. The new nozzle is 25 percent lighter than the machined version of the component. It is also five times more durable and has improved corrosion resistance. The nozzle is 3D-printed in one piece while it would earlier be assembled from 20 different parts. The company plans to spend \$32 million dollars to build a new research-and-education center focused on additive technologies.

Several Indian SMEs have successfully leveraged additive manufacturing in tooling for samples or prototypes. The conventional

EXHIBIT 4.1 | Five Key Technologies That Will Influence Manufacturing In The Next Few Years

Manufacturing Process Technology	Manufacturing Information Technology
Additive Manufacturing (3D Printing) 	Robotics and Automation 
Process for creating 3D objects from digital models	Combined system of machines, control systems and Information Technology to optimize productivity
Agile Product Development 	Digital Manufacturing 
Computer modeling of products before they are fabricated; Integrated approach for simulating	Full virtualization and automation of production
	Industrial Internet and Flexible Automation 
	Integration of hardware with networked sensors

Source: BCG analysis.

method for making toolings involves machining using a high precision CNC and finishing operations—an expensive and time consuming approach. By using 3D printing along with finishing operations, the SMEs are quickly able to create a mock-up tool that can be used to make samples. Besides time and cost savings, SMEs are able to provide samples to customers quicker.

Additive manufacturing offers multiple advantages including improved flexibility, quick production from design and a lower environmental impact. It makes it possible to create previously impossible designs (for example, seamless hollow spheres). In fact, they can be produced on a one-off basis without any additional capital expenditure. The process is also less raw material intensive and generates very little scrap material compared to traditional processes. High-performance and decentralized additive manufacturing also have the potential to reduce transportation distances and inventory in stock.

Autonomous Robots

Robotics for industrial applications has advanced significantly from spot-welding arms that have become popular among auto assembly shops over the past decades. The new age robotic systems are equipped with high-

end sensors, standardized interfaces and control units. Robotic actuators are linked to the machines, workstations and handling equipment via information technology networks. Combined with advanced computing, robots are becoming more autonomous, flexible, and cooperative. For example, Kuka, a European manufacturer of robotic equipment, offers autonomous robots that automatically adjust their actions based on changes in their surroundings and the actions of nearby machines / humans. These lightweight robots conduct assembly tasks that require high precision, sensitivity and strength (for example, assembling gearboxes).

Toyota uses a spare tire-loading robot to mount tires in assembly lines. The robot operates under cooperative person-machine control. This enables shop floor workers to safely follow assembly tasks while the robot mounts spare tires in the car next to him. The worker can stop the robot by simply entering its space or using his hand to stop its activity.

Here in India, a ‘goods-to-person’ system is used at a leading automotive player’s warehouse, where automated systems pick up parts and bring them to the workers. The precision of automated systems, along with better retrievability of the inventory and strong software support, has helped create a signifi-

cant difference in order processing of slow-moving parts.

The cost of these robots is decreasing; it is estimated that the total cost of using industrial robots will decrease by an estimated 20 percent by 2025 while the performance has been increasing at 5 percent per annum over the last decade. The future robots will also have a greater range of capabilities in manufacturing. Until now, robots have been employed in tasks of low complexity and rigid movements but advanced robots will tackle complex tasks that require deeper logic and variable movements. Falling costs and increasing sophistication will drive use in many new industries and applications (Exhibit 4.2).

Improved flexibility enables robots to be deployed across a wider range of functions,

thereby resulting in lower capital expenditure for companies.

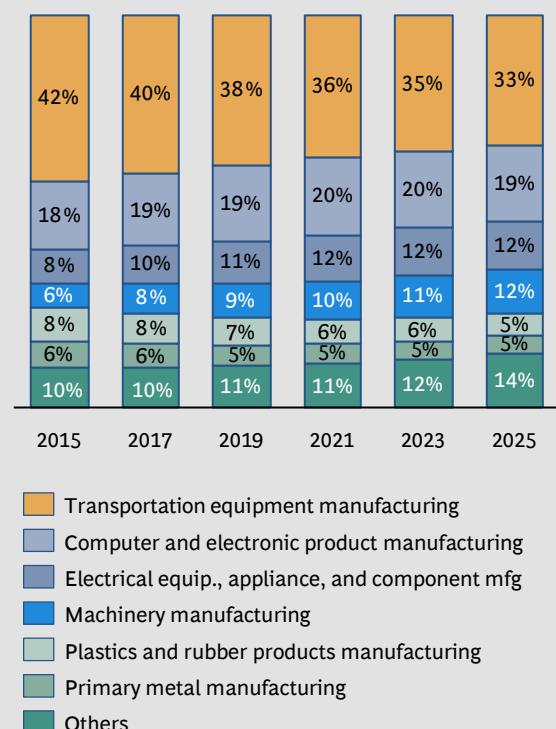
Agile Product Development

Advancement in product development enables computer models to be created and the product's properties to be simulated before it is fabricated. Thus, engineers and designers can develop products better, faster and less expensively. For example, Ford Motor Company is using Integrated Computational Materials Engineering (ICME) to reduce the time and cost of developing aluminum castings for engines. The conventional method is to design an engine block on a computer, build a physical prototype, test it, tweak the design, rebuild the prototype, and retest it—again and again—until the product is ready to be manufactured. Using an ICME process, digital

EXHIBIT 4.2 | Falling Prices of Robotics Systems and New Technological Possibilities Will Lead to The Adoption of Robotics in New Industries



Global stock of operational robots by industry² Falling Prices of Robotics Systems and Evolution of Capability is Driving Adoption Across Industries



Sources: IFR "World Robotics-Industrial Robots 2013", expert interviews; International Federation of Robotics, BCG analysis.

¹Example costs are for a spot welder (largest current application) in the US automotive industry, numbers in nominal dollars.

²Includes current stock of robots and changes by shipment volume that adds to the operational stock of robots. Historically, ~60% shipments add to operational stock while ~40% of shipments are replacement purchases. Analysis assumes that this fraction will remain constant in the next decade.

models of castings can be tested virtually, and a prototype can be built only after engineers are convinced that they have created the best design. (Illustrated in Exhibit 4.3) Ford invested \$15 million over five years in this experiment, which involved 15 of its own engineers and 10 university researchers. The company has been able to save over \$120 million (a 700 percent ROI) and development times have been cut by 15-25 percent.

Further advantages include better control over the design process, which leads to higher innovation capability and quality.

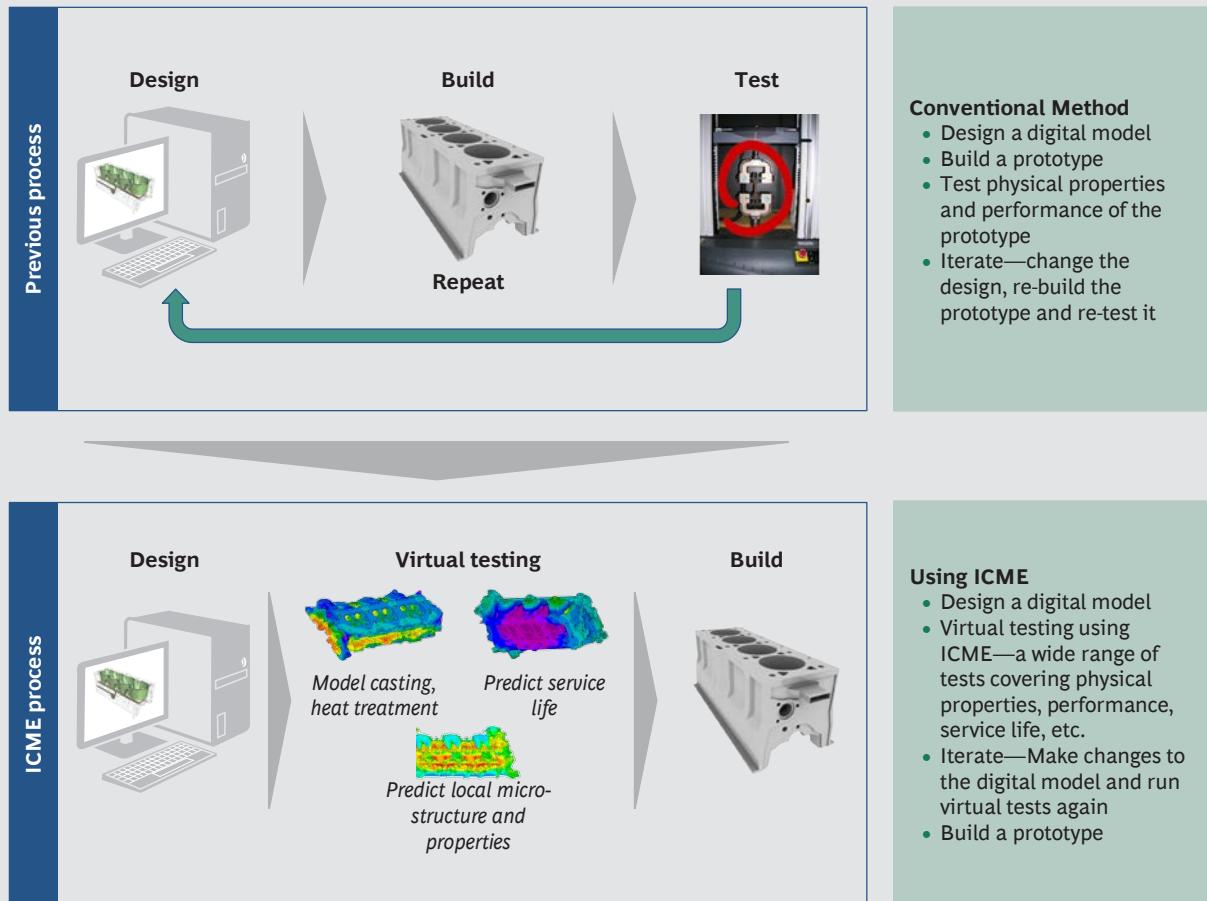
Digital Manufacturing

Digital manufacturing is a virtualization technology that can be used to generate complete digital factories that simulate the

entire production process. Among other things, digital simulation can help engineers save time and money by optimizing the layout of a factory, identifying and automatically correcting flaws in each step of the production process, and modeling product quality and output. Entire assembly lines can be replicated in different locations at a relatively low cost. For example, an Indian FMCG major uses virtual 3D walk-throughs of their factories to identify layout issues and aid MEP infrastructure planning. An international auto player simulated a virtual factory and eliminated more than 50 percent of the prototyping process by laying out the assembly line and ensuring that robots perform without collision and in minimal cycle time. Consequently, it was able to launch a new car 20 percent earlier than its previous models. The advantages of digital manufac-

EXHIBIT 4.3 | Agile Product Development

Illustration



Source: LeStar. R: Integrated Computational Materials Engineering. Summary Presentation, The National Academics, June 2010.

turing include better control over the quality of output, faster prototyping time, and reduction in cost due to the early identification and automatic correction of flaws in each step of the production process.

Industrial Internet and Flexible Automation

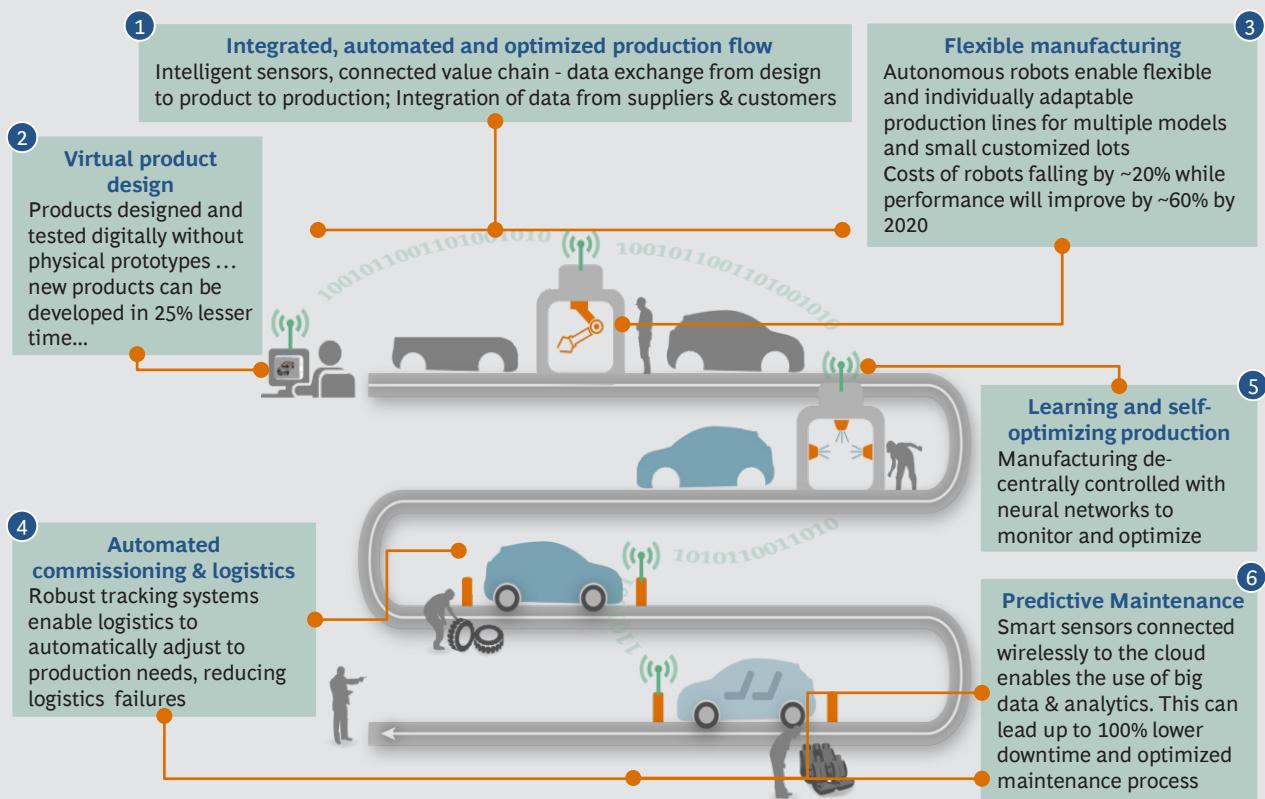
Machines have been increasingly integrated with computer numeric control for over two decades. Recent advances in manufacturing interlink the machines and material handling equipment between workstations. The result is a multi-step flexible manufacturing system that is rather autonomous and could be computer-controlled through centralized command centers. This method uses a combination of cameras, precision lasers, RFID tags and micro-controlled actuators, including many with embedded software and connected using standard technologies. For example, a European auto major started RFID tagging all of its car bodies to track progress and steer bodies throughout the manufacturing process.

One auto manufacturer in India uses a remote server controlled assembly system that guides workers to select the correct parts depending on the car model. This technology enables them to use a single assembly line for engines of different models of cars while eliminating human-error. The system also keeps track of inventory in real-time.

Impact Across Supply Chain

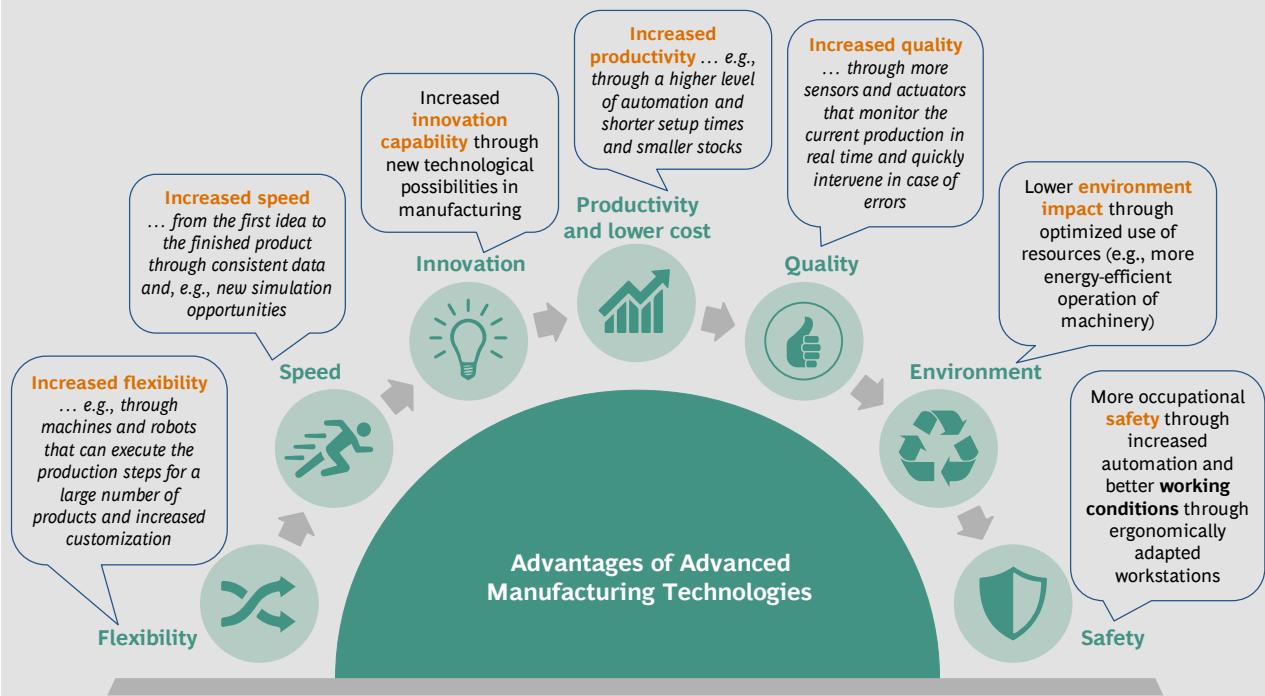
The onset of these technologies is having a significant impact on the economics of design and manufacturing (Exhibit 4.4 and 4.5). Virtual design, prototyping and simulated testing has made the process more agile and cost efficient. This in turn, is allowing closer collaboration with the suppliers, and reducing the time to market significantly. Use of robots and interconnected manufacturing systems are helping optimize manufacturing planning, operations and even materials management. Feedback driven process control is leading to lower energy consumption, a more accurate raw material

EXHIBIT 4.4 | These Technologies Will Create A New Way Of Manufacturing



Source: BCG analysis.

EXHIBIT 4.5 | Advantages of Advanced Manufacturing Technologies



Source: BCG analysis.

mix, reduced production costs and improved quality. The use of sensors and data analytics is helping optimize maintenance procedures and costs. The reducing cost and widespread availability of RFID chips and mobile tracking devices is helping optimize logistics and supply chain like never before. Data integration between sales and production is already improving production planning, creating lower inventory levels, and keeping inefficiencies at bay.

Impact and Implications for India

Advanced manufacturing technologies are vital to gain global competitiveness in cost, speed, innovation and quality. In BCG's annual manufacturing survey in the US, 72 percent of the manufacturing executives said that they would be investing in advanced manufacturing technologies in the next five years. The German industry estimates to invest a total of €40 billion in these technologies every year, for the next five years.

This year's BCG CII India survey of the manufacturing sector's top leadership reveals

that the role of technological advancements is changing significantly (Exhibit 4.6). In the last five years, the focus has been on meeting the table stakes—improved product quality, increased productivity and improved product delivery. In the next five years, the industry expects to increase the use of technological advancements to gain sustainable competitive advantage—increased innovative capability, shorter product development life cycle, etc.

Fortunately for the Indian manufacturing industry, most of these capabilities already exist in India due to the offshore engineering services industry that works with the global manufacturers. Indian manufacturers have the unique opportunity to blend the availability of these advanced manufacturing technologies with low cost labor to create extraordinary competitive advantage. The industry must stop looking at automation as just manual labor being replaced by technology. Rather, the judicious use of technologies can help focus its incidence on areas that helps push quality, design simplicity, speed and safety.

EXHIBIT 4.6 | Technology Will be Increasingly Used to Drive Competitive Advantage

What elements of manufacturing factory and supply chain have seen the **most change due to technological advancements—over the last 5 years (FY 11-15)?**

% of respondents	Element
72%	• Improvement in product quality
68%	• Productivity improvement
46%	• Improvement in product delivery
43%	• Shortening of product development life cycle
39%	• Real time manufacturing and stock management based on demand
34%	• Innovation in general (across the value chain)
30%	• Procurement

What elements of manufacturing factory and supply chain will see the **most change due to technological advancements—over the next 5 years (FY 16-20)?**

% of respondents	Element
75%  41%	• Innovation in general (across the value chain)
58%  -10%	• Productivity improvement
57%  -15%	• Improvement in product quality
55%  12%	• Shortening of product development life cycle
52%  13%	• Real time manufacturing and stock management based on demand
46%  0%	• Improvement in product delivery
23%  -8%	• Procurement

Source: CII-BCG Manufacturing Leadership Survey 2015; BCG analysis.

MAKE-IN-INDIA: STATE'S RESPONSIBILITIES

"No one can whistle a symphony.

It takes a whole orchestra to play it."

— Halford Edward Luccock

THE SUCCESSFUL DEVELOPMENT OF manufacturing base requires governments to create appropriate ecosystems, offer incentives and ensure ease of doing business. In a federal state like India, both the Central and State governments need to play their part in supporting the industry on the above mentioned factors. Even under a common federal framework, the different states in India have had widely varying levels of success in terms of manufacturing GDP growth and the ability to attract investments.

While the central government has the primary responsibility on the overall policy framework, taxation and country level branding, the states have an equally important role in ensuring the effective translation of the government's intent on the ground. The constitution gives the states the authority to legislate on a number of subjects including labor laws and land acquisition laws, education and skill development. Further, the state governments can be proactive in offering incentives, procedural de-bottlenecking and other execution support to attract investments in manufacturing industries. Political will backed by some of these levers has proven effective in chang-

ing the developmental trajectory and the creation of new manufacturing hubs.

Significant Variation Among the States

The Indian states are at various levels of maturity when it comes to manufacturing. While manufacturing contributes 26 percent to Gujarat's GDP, the figure is only 10 percent for West Bengal. More importantly, the growth rates of manufacturing output in the last five years have been significantly different as well. Tamil Nadu and Uttarakhand grew at double digit rates, whereas Punjab and Haryana grew at only 6 percent and 3 percent respectively (Exhibit 5.1). The same is true for FDI as well; while a few states have been really successful in attracting FDI, most states need to step up (Exhibit 5.2).

The state governments that have been proactive in attracting investors by using the above levers and marketing themselves have done very well. Uttarakhand has leveraged fiscal incentives to put Pantnagar on the industrial map within a short time. Rajasthan has made key changes to its labor laws to relax regulations around layoffs and winding up of units. Gujarat's approach to land acquisition and fair compensation is seen as an example. The Andhra Pradesh government's efforts to market Hyderabad as a better alternative to Bangalore and to attract some of

EXHIBIT 5.1 | Manufacturing Growth Has Varied Significantly Across States in the Past Five Years

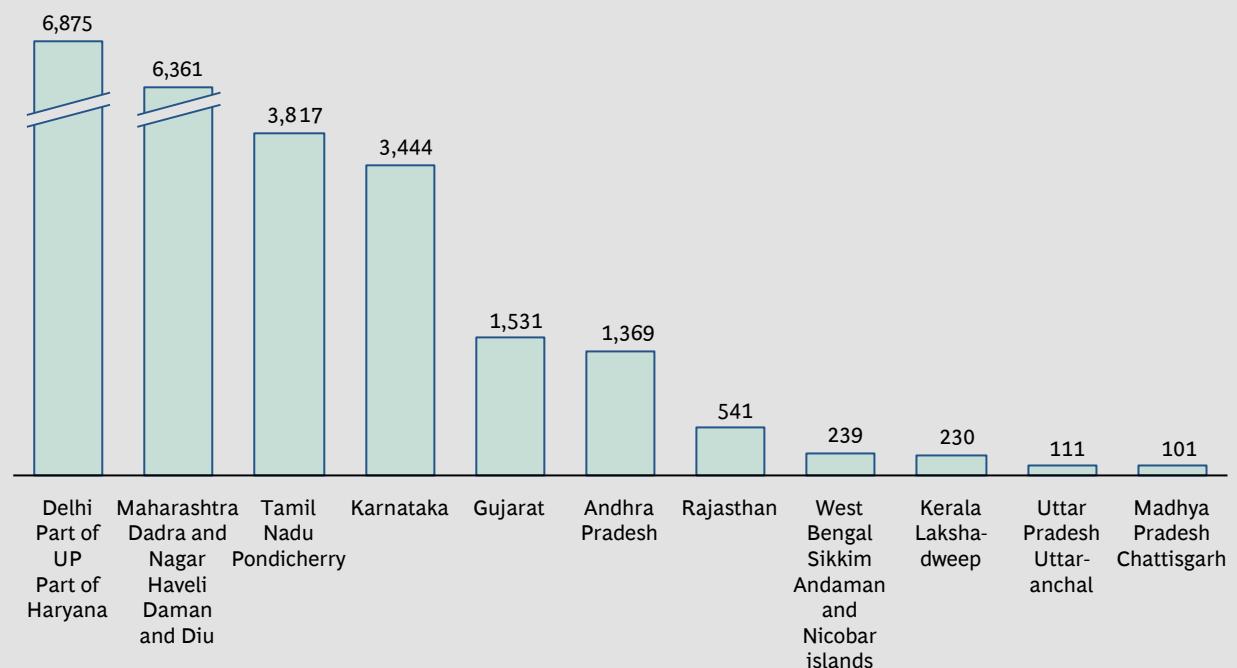
Manufacturing GSDP growth FY10-FY14 (in %, CAGR)



Sources: Indiastat; Planning commission.

EXHIBIT 5.2 | FDI Attracted Mainly by Select States, Other States Need to Step Up

FDI in FY15 (US\$ in million)



Source: RBI.

the world's largest IT companies have been well known. In recent years, states including Bengal, Jharkhand, and most recently Tamil Nadu, have conducted high profile investor meets to successfully drum up investor excitement towards their respective states. The Maharashtra government has taken a delegation to Japan with similar objectives.

Drivers for Manufacturing Growth

Manufacturing enterprises consider three sets of enablers while deciding on investments and choosing their footprint locations (Exhibit 5.3).

These factors affect the cost and complexity of setting up manufacturing facilities. They also drive the economics and ease of running the business in steady state. Successful industrialization efforts—both in India as well as other countries—have recognized this and are laying out well packaged offers to potential investors.

Even though the industry typically considers these factors while making investment decisions, political will and leadership have repeatedly proven to make a huge difference. As captured in the examples throughout this

chapter, a determined local / state leadership and a proactive and focused outreach has changed the manufacturing attractiveness of several locations in a relatively short time.

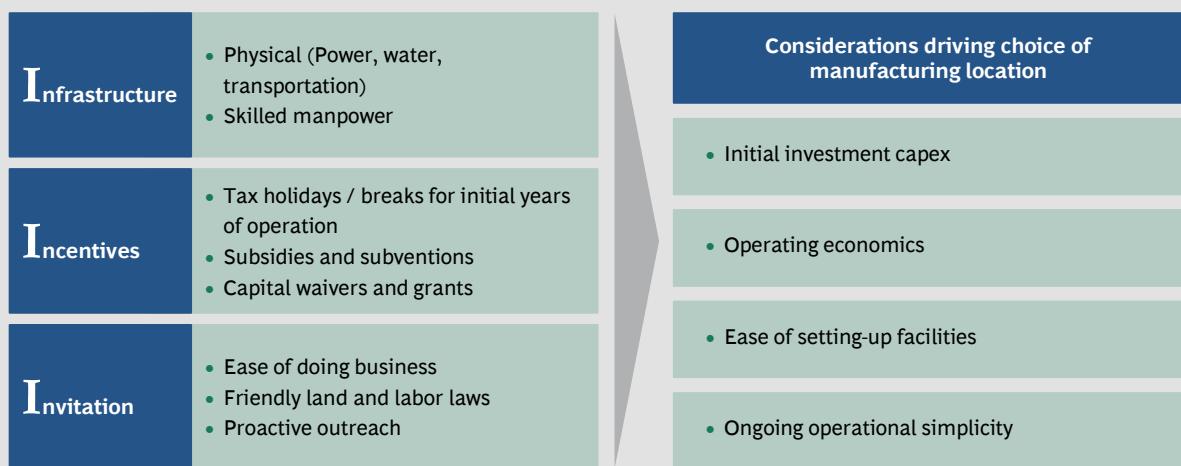
Incentives

Fiscal incentives are a powerful lever that can impact the initial investment and ongoing operating economics, thereby driving the ROI. Some sops like capital subsidies / waivers, and duty exemptions drive down the investment requirements. Holidays/ breaks on VAT, local cess, property taxes and R&D investments help reduce the ongoing operating costs.

As they craft the incentive packages, States can be selective about encouraging particular industries / stakeholder groups. Maharashtra offers lowest VAT rate on electronic products used for data communication. Gujarat gives a 7 percent interest subsidy to MSMEs with an additional 1 percent assistance to young entrepreneurs, women and differently abled. 2 percent interest subsidy is also given to units with investment more than Rs. 100 crores. Punjab offers reduced VAT and CST, exemption from electricity duty, stamp duty and property tax, waiver of Mandi fee, infrastructure development cess for the manufacturing sector.

EXHIBIT 5.3 | Manufacturing Enterprises Consider Three Sets of Enablers While Deciding on Investments and Locations

Three I's drive investment decisions of manufacturing enterprises



Source: BCG analysis.

Infrastructure

Companies looking to invest in manufacturing look at industrial and urban infrastructure as well as labor / manpower availability as important parameters in their location selection process.

Physical infrastructure including reliable power availability, good quality of local road and transportation infrastructure is a pre-requisite for any manufacturing industry. Historically, states in West and South, such as Maharashtra and Tamil Nadu have been preferred destinations for auto and other manufacturing industries. Manufacturers have seen power surplus states like Chattisgarh and Uttrakhand favorably as well.

Another crucial factor for companies to decide on a location for their plant is the availability of skilled labor. China has successfully attracted specific industries to specific clusters / locations based on developing manpower skilled on specific crafts such as electronics assembly, small machines, apparel, toys and heavy manufacturing. India faces an unpleasant dichotomy—while we have a large number of graduates being churned out each year, their employability is quite low. States must actively

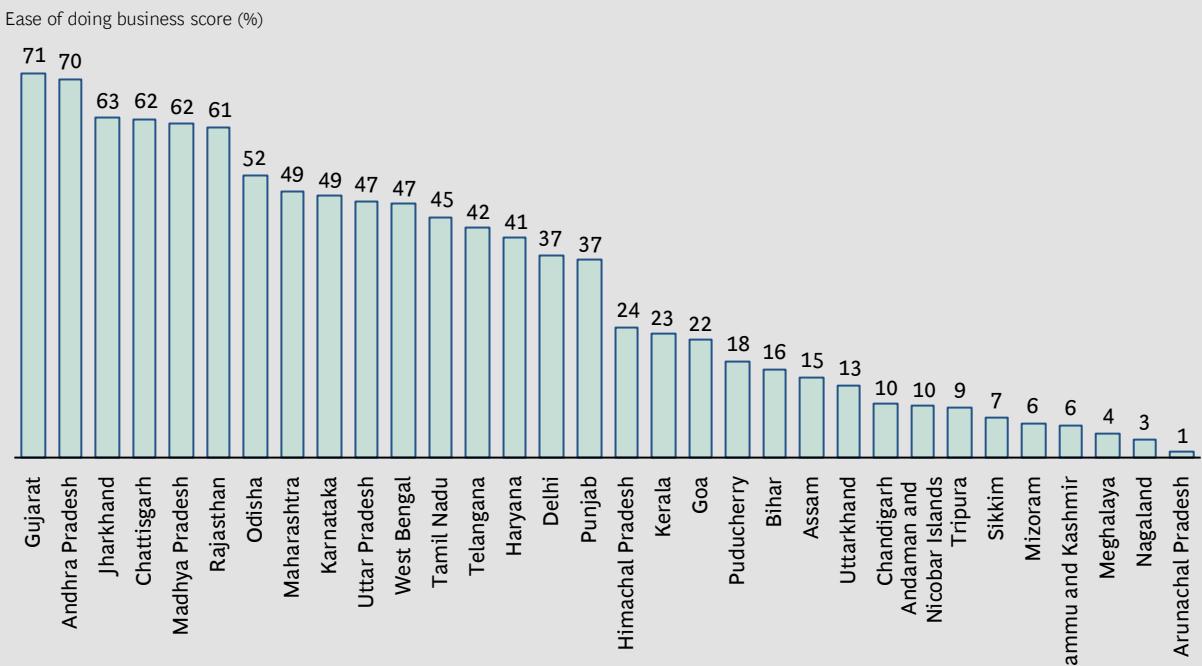
promote manpower development via training institutes and vocational programs, for specifics skills such as machining, fabrication, assembly and engineering. For instance, Kaushal Kendra in Kerala gives a finishing touch to the educated youth by training them in English and foreign languages, and other industry specific training to make them more employable.

Invitation

States must realize that they are in a globally competitive race to attract manufacturing investments—not just against peer states but also against locations outside India. Beyond incentives and infrastructure, manufacturing (like other industries) takes a hard look at overall ease of doing business. In simpler terms—the time, effort and money required to set-up a business, operate it successfully, and wind it down if things don't work out. This ease of doing business is the real invitation—in addition to proactive outreach.

Exhibit 5.4 shows a significant difference on the ease of doing business across states, as reported by the Central Government in a recent report. Gujarat, Andhra Pradesh and Jharkhand are the three best states to do

EXHIBIT 5.4 | Significant Difference in Ease of Doing Business Across States



Source: Released by Government of India along with World Bank (2015).

business with whereas Bihar, Jammu and Kashmir, and the north eastern states are ranked towards the bottom of the list.

India, as a whole, ranks poorly on the World Bank Ease of Doing Business Index. While India ranks relatively well on access to credit and protecting minority investors, it ranks poorly on all remaining dimensions (Exhibit 5.5). ‘Paying taxes’ and ‘Trading across borders’ fall under the realm of the Central government, but states can make a significant impact in the remaining six parameters.

Global companies and executives find the number of approvals, the procedures involved, lack of clarity on key information and sheer delays to be frustrating. Some states have tried to address these challenges using a combination of reduced procedural requirements, simplification of processes, technology solutions and structural overhauls through “single window” methods (Exhibit 5.6).

Labor and Land Law Reforms

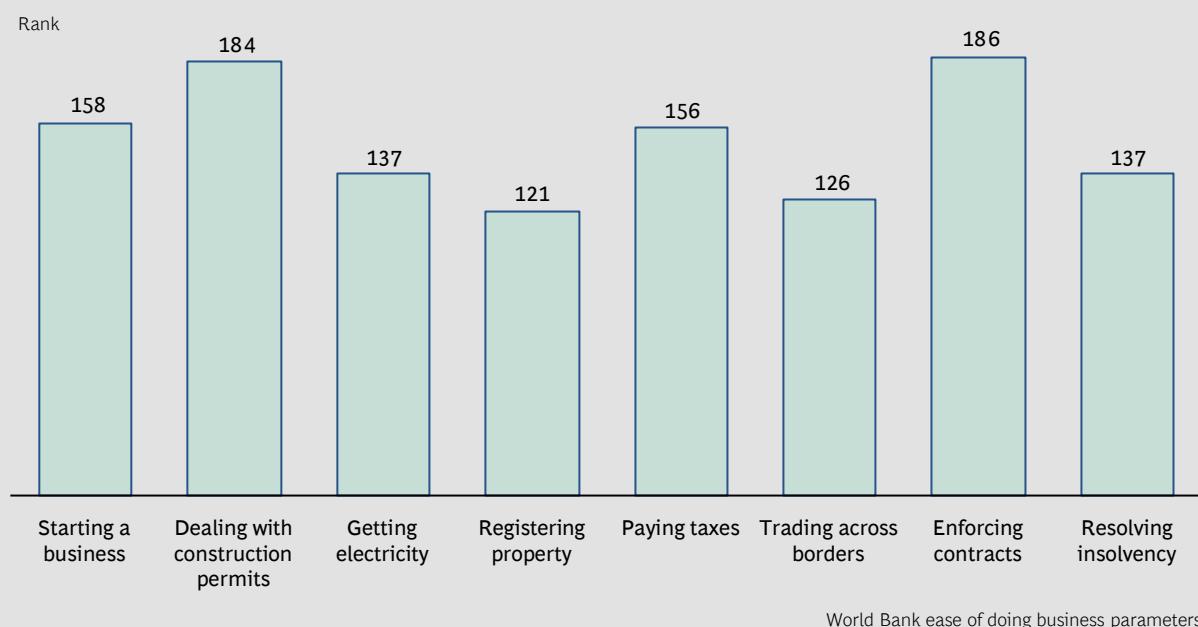
In addition to the procedural simplification, it is critical to reform the labor and land related laws to give a significant impetus to

the manufacturing sector. However, due to opposition from multiple quarters, progress in labor reforms has been slow, and the land ordinance has lapsed. These two subjects are on the Concurrent List and now the states must drive reforms.

With regard to labor laws, Rajasthan has made key changes to allow companies with up to 300 employees to retrench them or shut down the unit without government permission. It has also increased the minimum number of employees needed to register a labor union. Labor Management Solution launched by the state of Maharashtra creates a One-Stop Shop for integration and implementation of 46 labor laws. Several other states are also moving towards making labor laws more favorable, with easier compliance.

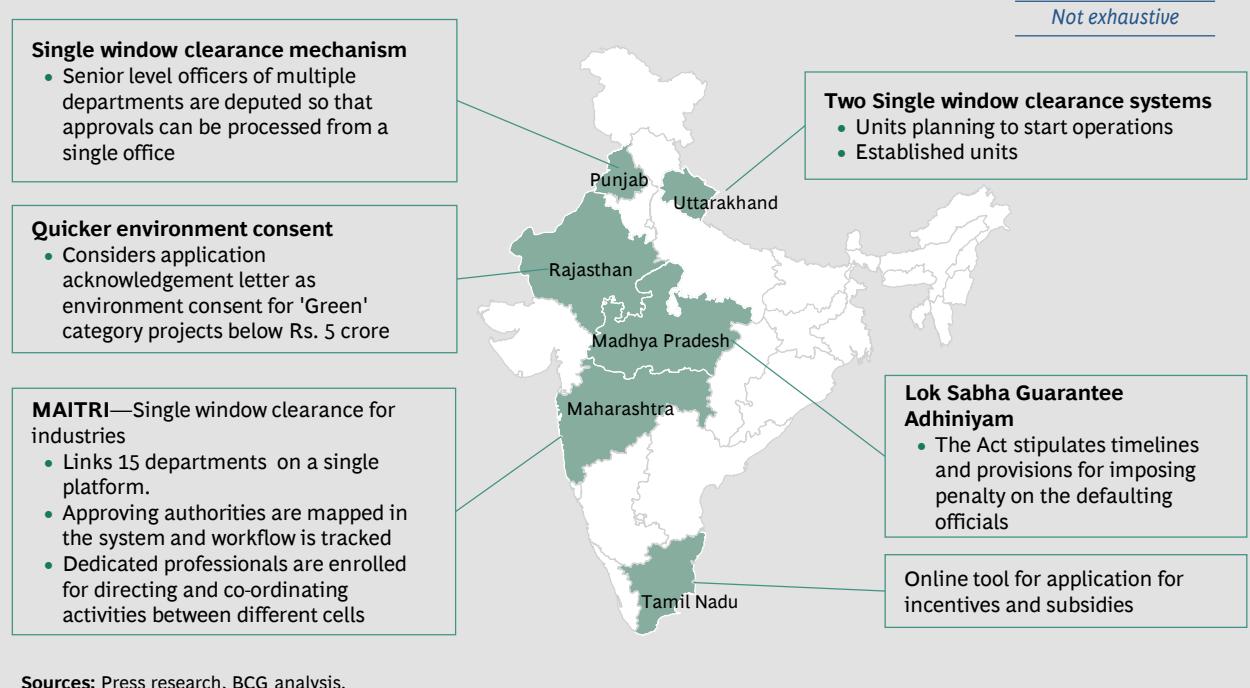
On land acquisition, several states have moved ahead to simplify the process and proactively resolve compensation issues. For example, Gujarat has a streamlined process that assures possession within 45 days of application. Compensation formula is well established, vacancy available online and allotment done using a GIS software. Punjab has a repository of pre-cleared land bank with

EXHIBIT 5.5 | India Ranks Poorly on Most Parameters of the World Bank Ease of Doing Business Rankings



Source: World Bank.

EXHIBIT 5.6 | Several Initiatives by States to Improve Ease of Doing Business



Sources: Press research, BCG analysis.

requisite power supply ready to be provided for setting up industries. The Land Pooling Scheme of Government of Haryana gives landowners the option to opt for developed land in exchange of land to be acquired. 'Aao Bihar' scheme of Government of Bihar has a provision for land owners willing to sell their land where they can register with the government which then connects them to investors as and when an investor requests for land.

Proactive Outreach

Hyderabad's rise as an IT hub and Ahmedabad's prominence as an automotive cluster rivaling Chennai, Pune and NCR are widely acknowledged because of proactive moves and outreach by the political leadership of the respective state governments.

More recently, the chief ministers of states such as Maharashtra, Andhra Pradesh and Haryana have made efforts to engage with investors around the globe. Global Investor Meets are being hosted to create an interest in potential investors—Vibrant Gujarat, MP Global Investors Summit, and Progressive Punjab have inspired Jharkhand, Bengal and Chattisgarh as well to host such events. Tamil

Nadu held its maiden summit this year and Maharashtra is planning to follow suit soon.

Comprehensive Effort by State Governments Have Proven Effective

The rise of Sanand as an automotive cluster and Pantnagar-Rudrapur as a thriving industrial zone clearly demonstrates the ability of state leadership to make a difference in a short order (Exhibit 5.7).

Sanand's journey started with Tata's small car plant which was transplanted from Bengal in 2008 owing to land acquisition issues at the latter site. In the next seven years, it has become home to marquee auto players such as Ford, Suzuki, Hero and is on the radar of several other automotive companies. Over the last few years, Ford has invested about a billion U.S. dollars for its plant in Sanand. Suzuki laid foundation for its plants last year and plans to invest about 8,000 crores to set up three plants. Honda has also announced plans of investing about 4,000 crores to set up a manufacturing plant. Hero and Honda motorcycles have also started work on their plants in the region and expect to start production by 2016.

EXHIBIT 5.7 | Comprehensive Effort by State Governments Have Proven Effective

Not exhaustive

Over the last decade, Sanand has emerged as a major auto hub

Companies	Year	Investment (Cr.)
Tata Motors (Nano)	2008	2,000
Ford	2011	6,000
Suzuki	2012	8,000
Hero Motocorp	2013	1,100
Honda	2014	4,000
HMSI	2014	1,100
Maxxis Group	2015	1,850

Rudrapur-Pantnagar has attracted key investments across sectors over the last decade

Sector	Companies
Auto	<ul style="list-style-type: none"> Tata Motors Bajaj Auto Ace Ashok Leyland
FMCG	<ul style="list-style-type: none"> Britannia Nestle Parle Biscuits Dabur
Electronics	<ul style="list-style-type: none"> HP HCL Delta Computers
Others	<ul style="list-style-type: none"> Voltas Kores India Escorts

Sources: Press research, BCG analysis.

Similarly, Pantnagar-Rudrapur is now home to world class manufacturing facilities in a variety of sectors. Ashok Leyland invested 1,500 crores for its largest production facility in Pantnagar. Tata Motors and Bajaj Auto have invested around 1,000 crores and 400 crores respectively. Other sectors such as FMCG, pharmaceuticals and electronics have attracted investments as well. Dabur has one of its largest manufacturing facilities in Rudrapur. Nestle, Britannia, Zandu pharma, HP and HCL have set up factories in the region too.

States can clearly complement the central government's efforts to make Make-in-India a success.

MAKE-IN-INDIA: INDUSTRY'S RESPONSIBILITIES

"You cannot escape the responsibility of tomorrow by evading it today."

— Abraham Lincoln

MAKING INDIAN MANUFACTURING A vibrant sector is not just the onus of the government, but that of the industry as well. We believe that industry captains can create vast improvements in the sector by focusing on four key areas:

- Think long-term (Plan for 5-10 years, not 2-3)
- Win on innovation, not cost
- 'Jugaad' free culture: Focus on systems and infrastructure
- Collaborate with supply chain partners, industry peers, and local institutions

Think Long Term (5-10 Years, Not 2-3)

Many entrepreneurs build their plans with a view to recouping investment and making healthy returns in the short run. A time horizon of 2-3 years as the bar for payback from a new investment is not uncommon. High levels of leverage, a money-making mindset, and volatile markets tend to further amplify this thinking. However, the short-term money making approach which is central to our way of working does not make for building a

good manufacturing sector. This approach focuses less on capability building, less on investments in research or people and typically only focuses on immediate cost reduction or sales increase ideas. New capex proposals which may be essential for long term survival and competitive advantage could sometimes be over-looked in favor of proposals that yield an immediate return. A classic trade-off is the building of distributed factories with a small labor base as against a scale-efficient large factory with a large labor base (the latter is seen as risky, but could pay off over the longer term if the management builds a strong cord with the workers—one that takes many years and one which may require many CSR activities as well).

Win on Innovation, Not Cost

India will lose the cost war soon. The slew of low-cost manufacturing bases that are on the horizon (East African countries for instance) and the aggressive trade deals that are struck with the middle-income countries (Trans-Pacific Partnership which offers duty-free access to the US market) will make pure-cost focused manufacturing redundant. India's inability to win the cost war even in sectors where it has strengths (for example, apparel-making) clearly shows that there is more to winning in a sector than mere conversion cost (quality of infrastructure, innovation in fabrics, reliability, etc. in this case).

All of these factors point towards a need to focus on innovation as a source of advantage and differentiation as against mere cost. An innovation culture, however, is typically not realized overnight but comes over years, and begins with the entrepreneur's relentless demand for innovation from his own employees. Focus on increasing revenues from newer products, continuous process improvement (which places the focus on process innovation), and a constant hunger to seek best practices from peers and customers are all cornerstones of this approach. The good-news is that (as shown in Exhibit 6.1), Indian companies are getting better and better at innovation.

Build a 'Jugaad' Free Culture

Frugal innovation or 'Jugaad' has defined the Indian entrepreneurial culture for many generations. A practice that was borne out of necessity (lack of capital) has now become fully embedded in the business approach of many of India's successful companies. The biggest risk in pursuing 'Jugaad' is that the approach is centered around quick fixes without fully addressing the root causes that may have caused

the issue in the first place. As Indian companies scale up to compete globally or even locally to cater to a higher standard of quality and reliability, it is very critical to build an organization that is known for sustained excellence and reliability than a company that can fix issues quickly. A move away from Jugaad would be exemplified in the key choices that the entrepreneur faces every day

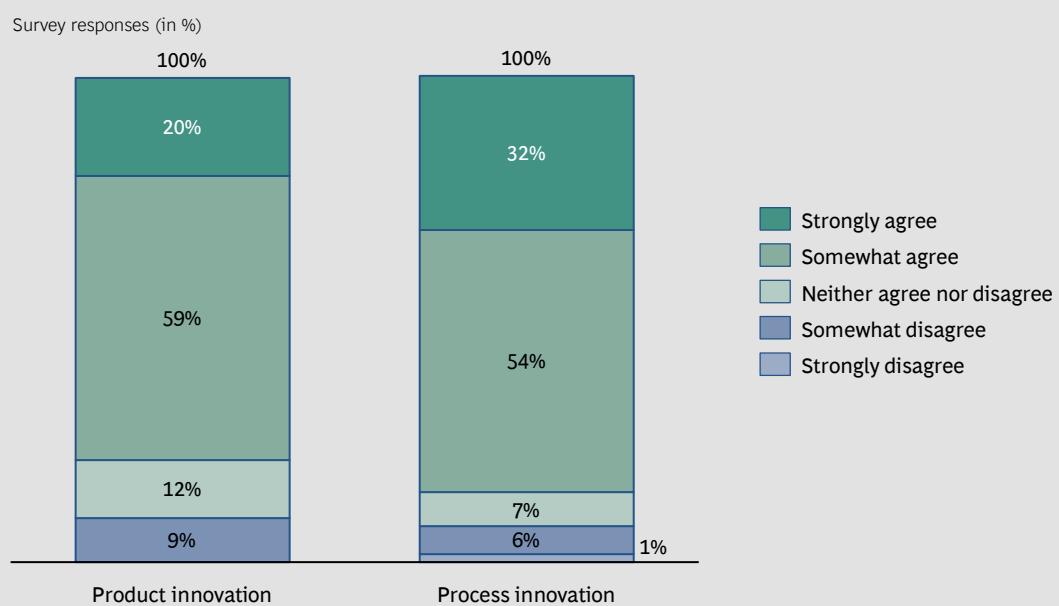
- Buying the more expensive, but higher quality, reliable equipment as against the lower cost equipment that reduces capex
- Focusing on key shop floor best practices—5S for instances though immediate financial results may not be visible
- Focusing on improvement projects, Kaizen as a way of life though the returns may not fully manifest themselves in short run

Collaborate With Suppliers and Peers

Indian companies are sub-scale and less integrated compared to global peers. In the appar-

EXHIBIT 6.1 | Indian Manufacturers are Getting Better at Both Product and Process Innovation

On an average, do you see Indian manufacturing companies getting better at innovation?



Source: CII-BCG Manufacturing Leadership Survey 2015; BCG analysis.

el industry for instance, yarn is spun by one company, fabric by another and apparel by a third—typically in different locations. While this distributed setup may make for flexibility and innovation, the cost and responsiveness disadvantage is not trivial. Supply chains are long, and inventories, trucking and material handling are carried out at multiple locations. One way of addressing this disaggregated business model is by openly collaborating with supply chain partners—suppliers for instance in lifting their capabilities to the next level. There are many ways that companies today are doing this, from deploying ‘crack’ teams to support suppliers in shop floor best practices, building ‘clusters’ of SME suppliers for manufacturing excellence programs, etc.

Another oft-forgotten lever is collaborating with industry peers. There are many areas that lend themselves to this sort of collaboration—sourcing and development of local talent for instance, supply chain optimization (optimizing for full truck load deliveries by combining shipments to the same location/customer), joint negotiation with a large-scale international supplier, or in joint engagement with the government. Indian manufacturers

can also leverage open source and open innovation platforms as they seek to march ahead. For instance, Vortex’s solar-powered ATMs use open-source platforms like Linux to increase reliability and keep costs down. Globally, companies have used open source models to collaborate with each other to share the risk and rewards of R&D. For example, collaboration between bio-tech and pharma firms in Japan brings in research capabilities from both the industries. Open innovation also helps with commercialization of inventions in case a company is unable to go to market due to strategic reasons or other issues.

A classic benchmark that Indian industry can compare themselves to is the German Mittelstand (middle-ground)—a term used to refer to German SMEs that have made a mark for themselves in the world through quality products and innovation. A hall-mark of the German Mittelstand is their continuous re-investment of surpluses in innovation and R&D. A characteristic example is that of Wittenstein (Exhibit 6.2). Wittenstein prides in its R&D prowess with 12 percent of its employees involved in R&D and over 10 percent of its revenue reinvested in R&D every year.

EXHIBIT 6.2 | A Successful Mittelstand Example: Wittenstein AG

Leading servo motor and electromechanical products company

History	Innovative product offering
<ul style="list-style-type: none"> • Founded in 1949, primarily produced sewing equipment for women’s gloves making • Started selling servo motors in 1979 • Started its international expansion in 1990 and is now present in 40 countries • Company was sold in 1996 	<ul style="list-style-type: none"> • Leader in high-precision electro-mechanism drives systems • Selling alpha servo drive components, electromechanical products, servo system solutions¹ developed in-house with ~10% of employees working in R&D
Key figures <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> USD 332 million revenue </div> <div style="text-align: center;"> 1,900 employees (12% in R&D) </div> <div style="text-align: center;"> ~10% of turnover reinvested in R&D every year </div> </div>	

Focus, innovation, process excellence

Source: Company's website, Press search

¹Used in robotics, conveyors, printing presses, medical technologies and aerospace

CONCLUDING THOUGHTS

INDIA IS IN A unique position right now. Many things are coming together for the Indian manufacturing industry as we speak. Make-In-India thrust by the government has created considerable momentum across various areas—especially in ease of doing business, labor reforms, etc. There seems to be a renewed vigour at the state level with many states upping the ante in terms of incentives as they compete for additional investment. Infrastructure push that has been on for years, has seen the power deficit situation improve steadily. Transport infrastructure should continue to improve given the massive investments that have been announced. At the same time, factor costs for manufacturing are at an all-time low, providing some increase in margins to manufacturers across the world, driving improved business health and business confidence.

A lot has been written about manufacturing, and on what needs to be additionally done for the sector to realize its potential. We believe that this is a time, not for further thought, but for action—joint, coordinated and sustained action. Action by center, state and entrepreneur. By the center in terms of sustained push on the Make-In-India promises, by the state in terms of ensuring speedy implementation of center's directives and creation of the right environment for increased investment, and by the entrepreneur in terms of investing in core capabilities and staying invested for the long run.

We truly believe that the next few years will see ever more accelerating momentum in the sector as many of the above pieces fall in place, and look forward to the journey ahead with a profound sense of hope.

FOR FURTHER READING

The Boston Consulting Group published other reports and articles on related topics that may be of interest to senior executives. Recent examples include:

Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries
A focus by The Boston Consulting Group, Apr 2015

The Proximity Paradox: Balancing Auto Suppliers' Manufacturing Networks
A report by The Boston Consulting Group, Mar 2015

Why Advanced Manufacturing Will Boost Productivity
An article by The Boston Consulting Group, Jan 2015

How to Boost Efficiency in Asset-Intensive Industries—Flex in Operations
A focus by The Boston Consulting Group, Feb 2014

The Rise of Robotics
An article by The Boston Consulting Group, Aug 2014

The Shifting Economics of Global Manufacturing—How Cost Competitiveness Is Changing Worldwide
A report by The Boston Consulting Group, Aug 2014

Make In India: Turning Vision Into Reality
A report by The Boston Consulting Group and CII, Oct 2014

The Most Innovative Companies 2014: Breaking Through Is Hard to Do
A report by The Boston Consulting Group, Oct 2014

The Evolution of Robotics
An interactive by The Boston Consulting Group, Nov 2014

People Productivity: Key to Indian Manufacturing Competitiveness
A report by The Boston Consulting Group and CII, Mar 2013

3D Printing Will Change the Game: Prepare for Impact
An article by The Boston Consulting Group, Sep 2013

NOTE TO THE READER

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