



Confederation of Indian Industry



Automation in Manufacturing: Improving Quality and Productivity while Sustaining Competitiveness



In association with

Knowledge Partner

ACMA
Automotive Component
Manufacturers Association of India

SIAM
Society of Indian
Automobile Manufacturers



 **AVALON**
Consulting

FOREWORD



Manufacturing sector is the backbone of any economy. It fuels growth, productivity, employment and strengthens agriculture and service sectors.

Over the past decades, astronomical growth in worldwide distribution systems equipped with IT solutions coupled with opening of trade barriers have led to stupendous growth of global manufacturing networks. If India has to benefit from this global situation with its additional advantage of low-cost yet efficient workforce, it's the time to gear up to reach world class industry practices.

Currently, the manufacturing sector is merely warming up to the idea of technology however the adoption is slow in comparison to its counterparts in developed economies. Due to information gap of global technologies and best practices, India is grappling with its manufacturing competitiveness in spite of its unquestionable potential to be a world-class player in this sector.

Automation in India is much lower as compared to some countries like Japan and Germany. In order to enhance technological capabilities the green, clean and lean manufacturing is the order of the day for the Indian Industry. Here comes the relevance of AutoMach 2013. Towards developing a judicious view and policy as per the specific requirement of India, this conference on the sidelines of this exposition would discuss a set of new concerns related to automation touching upon light weighting, increased use of electronics, more advanced safety equipment and norms, increased deployment of EVs, which are going to be pressing issue for the industry while retaining India's frugal advantage. Hence such an agora of stakeholders is the need of the hour.

This report outlines the need of automation in Indian manufacturing sector while addressing preliminary issues of automation, its implementation and implications. From national to state level, this report encapsulates sub-sectorial manufacturing output while comparing with global fact sheet. This report intends to give the basic context of automation for India along with trade output figures to examine the benefits and challenges and to formulate strategies and policies.

CII has always been closely associated with the Government to work towards commanding initiatives in the manufacturing sector & has supported the reform process thereby improving competitiveness.

We would like to thank the Steering Committee members for their valuable and timely inputs. Our deepest thanks to Automotive Component Manufacturers Association (ACMA); Society of Indian Automobile Manufacturers (SIAM) and Automation Industry Association (AIA) for partnering in this initiative.

We hope that you will find the report enriching and meaningful. Looking forward to a fruitful association.

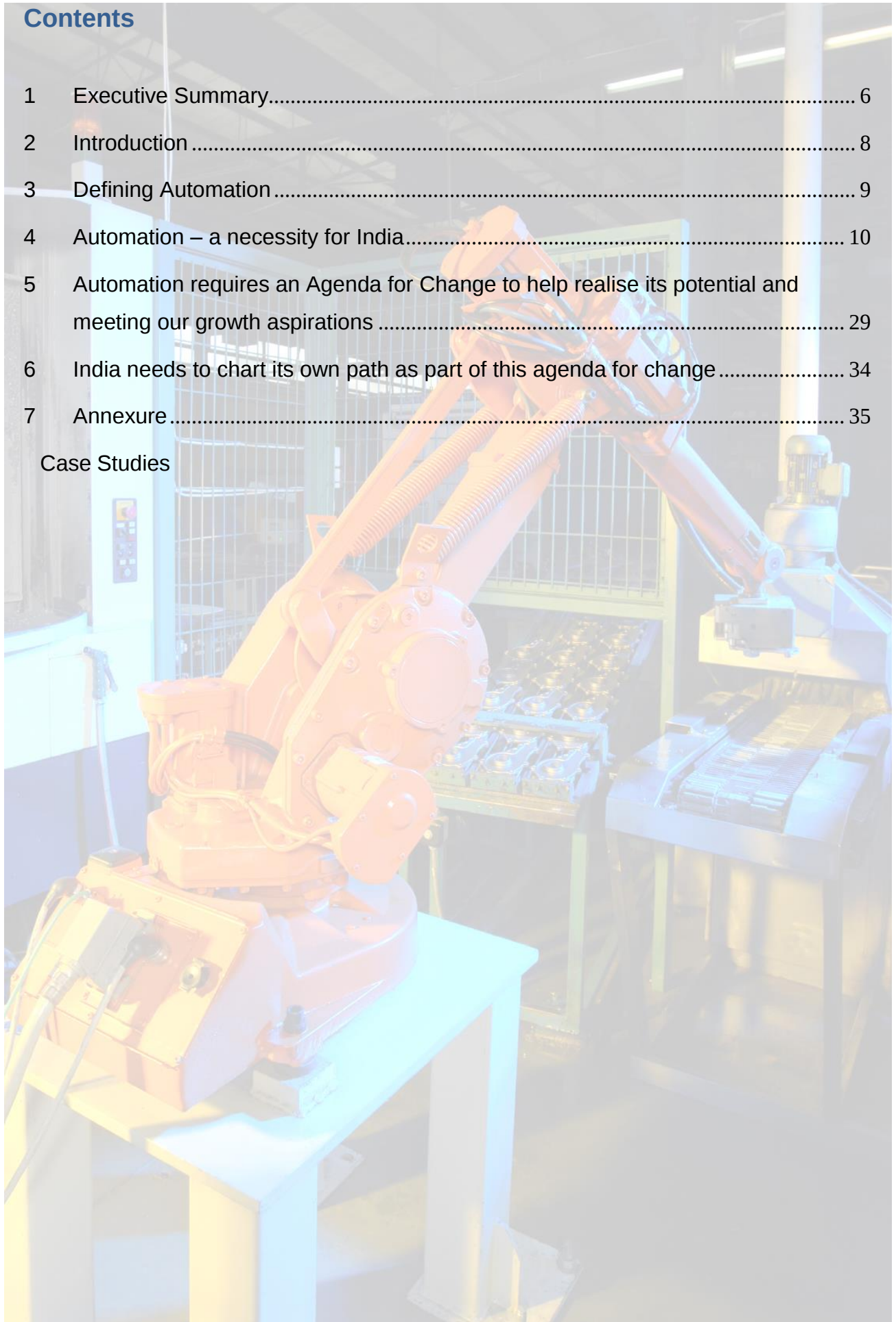
A handwritten signature in black ink, appearing to read 'Deep Kapuria'.

Deep Kapuria
Chairman, AutoMach 2013 &
Chairman, Hi-Tech Group of Companies

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1 Executive Summary

Automation in a broader context is not about Robotics but about productivity enhancement and creating better paying jobs.

1.1 India cannot achieve its GDP growth targets without industry growing significantly and increasing its share of GDP

Industry has been a key contributor to our 'golden period' of 8% GDP growth in the last decade. Exports from India have undergone a sea change in the last decade – industry has been a key driver of this revolution in Indian exports.

India (and the world) has set itself a target of 8% GDP growth in the coming decades in order to emerge as a key player influencing the global economy.

India cannot achieve these growth targets without industry growing significantly and increasing its share of GDP

1.2 Automation is a critical pre-requisite for industrial growth and productivity increase

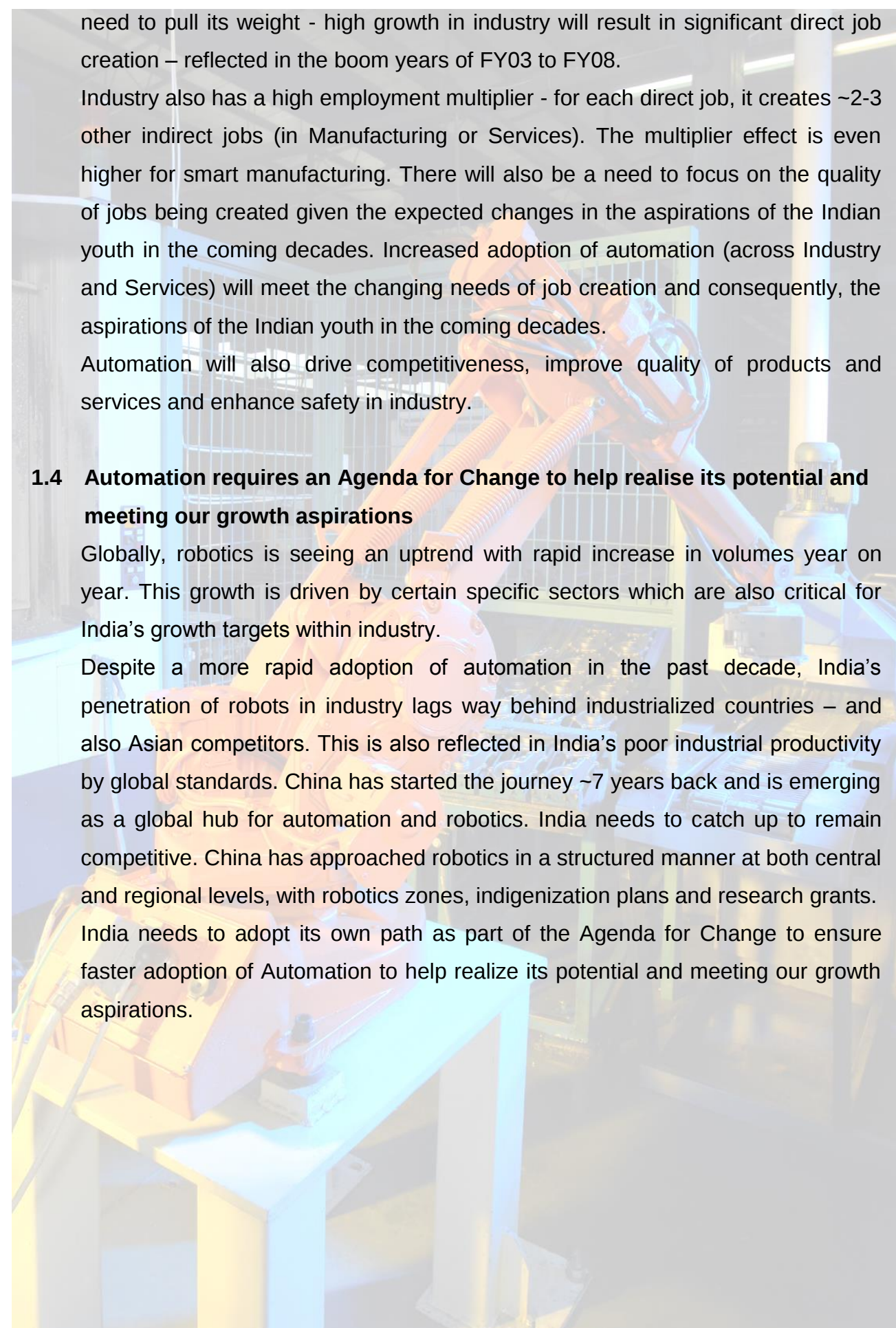
Industry growth in the past decade has been driven by several sub-sectors like mining, automobiles, basic metals, fuel derivatives etc. Consequently, some of these sectors have also increased their share within industry.

These sectors have also seen rapid growth in exports with global markets even accounting for a significant share of the Indian production in some sectors. Many of these high growth sectors have seen a significant adoption of automation in the last decade. This is reflected in the employment and productivity growth seen in the constituents of these high growth sectors.

At a macro level, the increased adoption of automation is reflected in the changing Incremental Capital Output Ratio (ICOR) indicating that productivity enhancements has also been a key contributor to India's GDP growth in the past decade

1.3 Automation will create the kind of jobs required by an aspirational India

Given the demographics of India, finding gainful employment through appropriate job creation will be a key challenge for the youth in the coming decades. Several segments within the Services sector have played and will continue to play a significant role in job creation in the coming years. However, Industry will also



need to pull its weight - high growth in industry will result in significant direct job creation – reflected in the boom years of FY03 to FY08.

Industry also has a high employment multiplier - for each direct job, it creates ~2-3 other indirect jobs (in Manufacturing or Services). The multiplier effect is even higher for smart manufacturing. There will also be a need to focus on the quality of jobs being created given the expected changes in the aspirations of the Indian youth in the coming decades. Increased adoption of automation (across Industry and Services) will meet the changing needs of job creation and consequently, the aspirations of the Indian youth in the coming decades.

Automation will also drive competitiveness, improve quality of products and services and enhance safety in industry.

1.4 Automation requires an Agenda for Change to help realise its potential and meeting our growth aspirations

Globally, robotics is seeing an uptrend with rapid increase in volumes year on year. This growth is driven by certain specific sectors which are also critical for India's growth targets within industry.

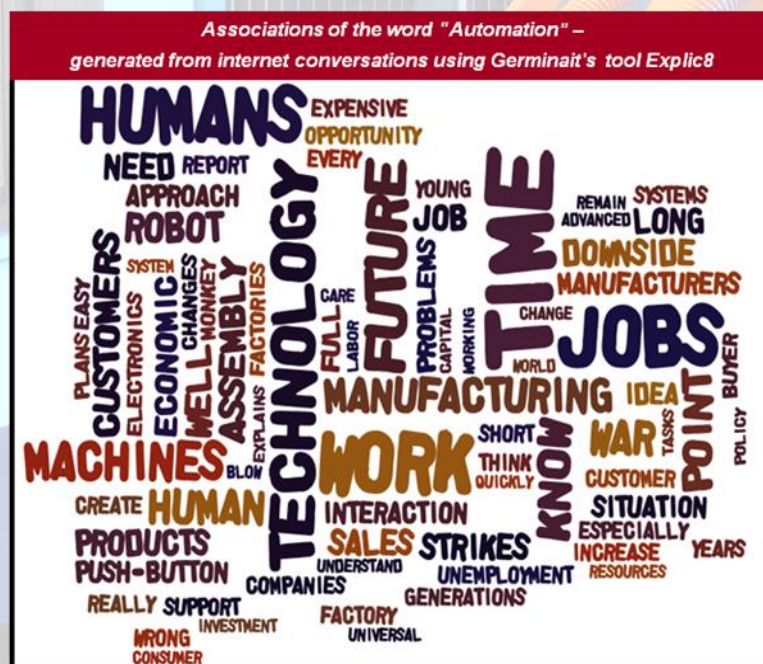
Despite a more rapid adoption of automation in the past decade, India's penetration of robots in industry lags way behind industrialized countries – and also Asian competitors. This is also reflected in India's poor industrial productivity by global standards. China has started the journey ~7 years back and is emerging as a global hub for automation and robotics. India needs to catch up to remain competitive. China has approached robotics in a structured manner at both central and regional levels, with robotics zones, indigenization plans and research grants. India needs to adopt its own path as part of the Agenda for Change to ensure faster adoption of Automation to help realize its potential and meeting our growth aspirations.

2 Introduction

In this paper we shall explore the following:

- Why is automation essential for a country like India
- Why the apprehensions about automation leading to job losses are misleading, and in fact, automation is essential for job creation
- Which sectors are likely to see the maximum benefit from automation, and where automation would be essential
- What kind of policy discourse should be initiated to foster a flourishing automation, robotics and machine tool industry in India

Figure 1 : Associations of the word “Automation” – generated from internet conversations using Germinait’s tool Explic8



Automation leads to jobless growth

In a country like India, we cannot afford to have capital replace labour, as happens in case of automation

Automation benefits on paper often do not translate into practice

Automation increases capital investment

The idea that machines can replace humans is wrong

3 Defining Automation

Automation is defined by the Automation Federation as follows:

Automation is “the creation and application of technology to monitor and control the production and delivery of products and services.”

Industrial robot is defined as follows by ISO 8373:

An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications.

Robotics thus can be considered to be a sub-segment of automation.

In this paper we look at automation beyond simple robotics and in a broader context about productivity enhancement and creating better paying jobs.

Figure 2 : Automation is “the creation and application of technology to monitor and control the production and delivery of products and services”

Automation is “the creation and application of technology to monitor and control the production and delivery of products and services”



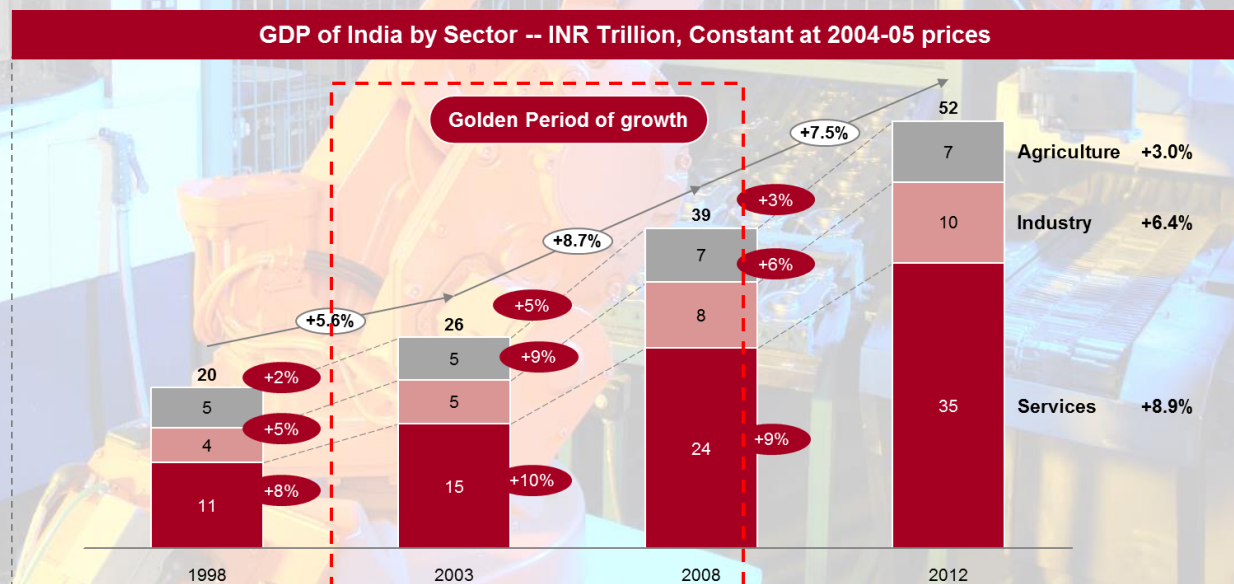
4 Automation – a necessity for India

4.1 The case for Industry

India cannot achieve its GDP growth targets without industry growing significantly and increasing its share of GDP

Industry has been a key contributor to our 'golden period' of 8% GDP growth in the last decade. In fact, if we compare the high growth years of 2003-2008 with the more moderate growth years of 1998-2003 and 2008-12, we see that while services maintained a growth of 8-10%, the difference in growth stemmed from Agriculture and Industry. Given that Industry is ~25% larger than agriculture in terms of GDP, it stands to reason that Industrial growth can be the motor that drives the Indian GDP in the coming years.

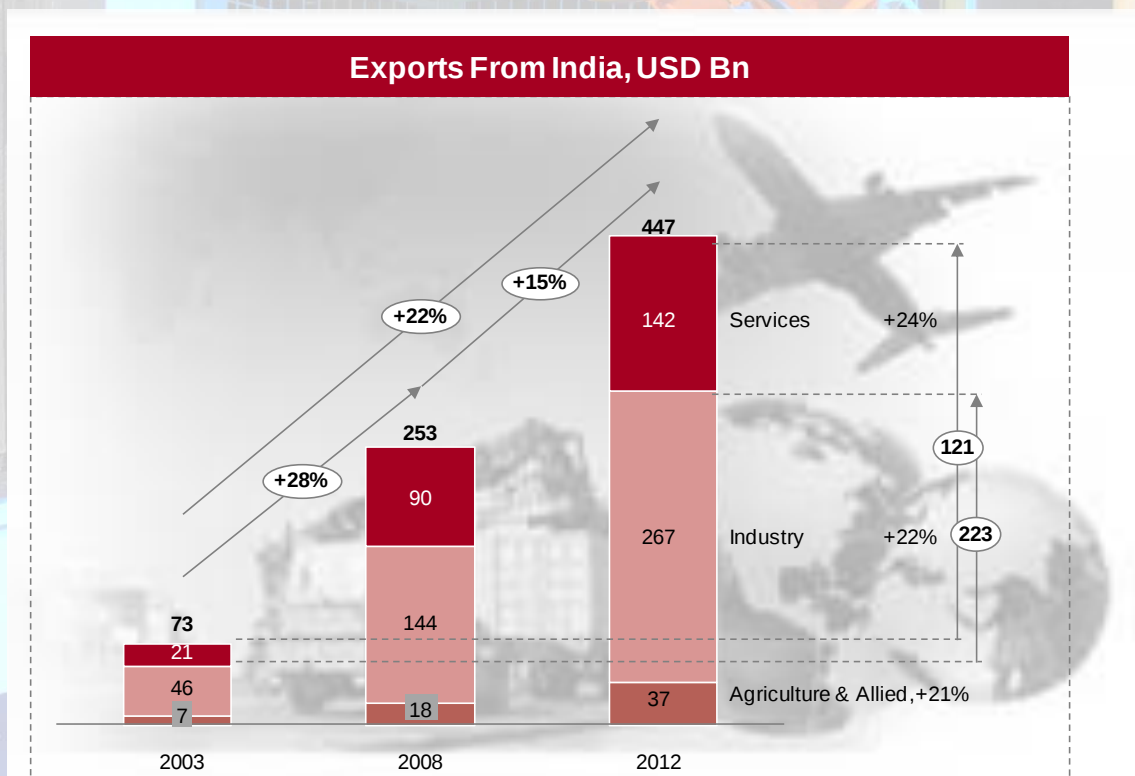
Figure 3 : GDP of India by Sector -- INR Trillion, Constant at 2004-05 prices



Source: RBI, Avalon Consulting Research and Analysis

Exports from India have undergone a sea change in the last decade – industry has been a key driver of this revolution in Indian exports. In the period of 2003-12, Industry has witnessed an export growth rate of ~22% cumulative annual growth rate (CAGR). In terms of absolute value, the industry exports (~USD 223 Bn) has contributed close to 60% of the total increase in exports in value terms.

Figure 4 : Exports from India, USD Bn

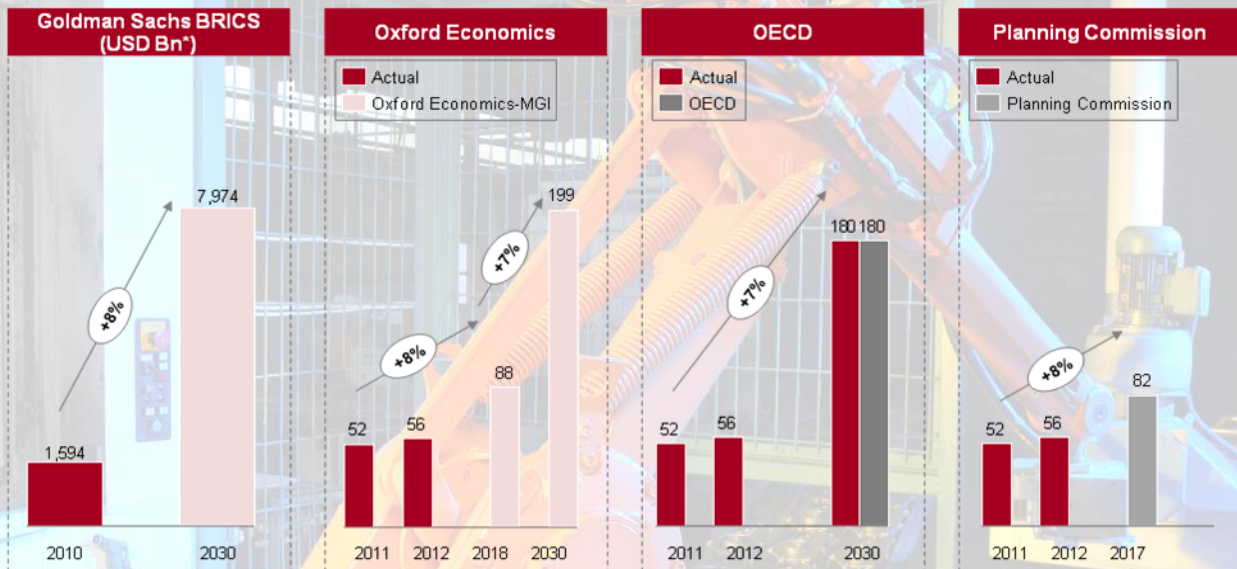


Note: Average exchange rate taken in FY 2012: 1 USD = 48.3 INR

Source: RBI, DGFT, Avalon Consulting Research and Analysis

Various international agencies like Goldman Sachs, Oxford Economics / McKinsey Global Institute, OECD and the planning commission itself has set a growth target of ~8% over the coming decade. This growth is essential for India to both reap advantage of its demographic dividend, and emerge as a key player in influencing the global economy.

Figure 5 : India GDP Projection, Rs. Trillion, 2004-05 prices

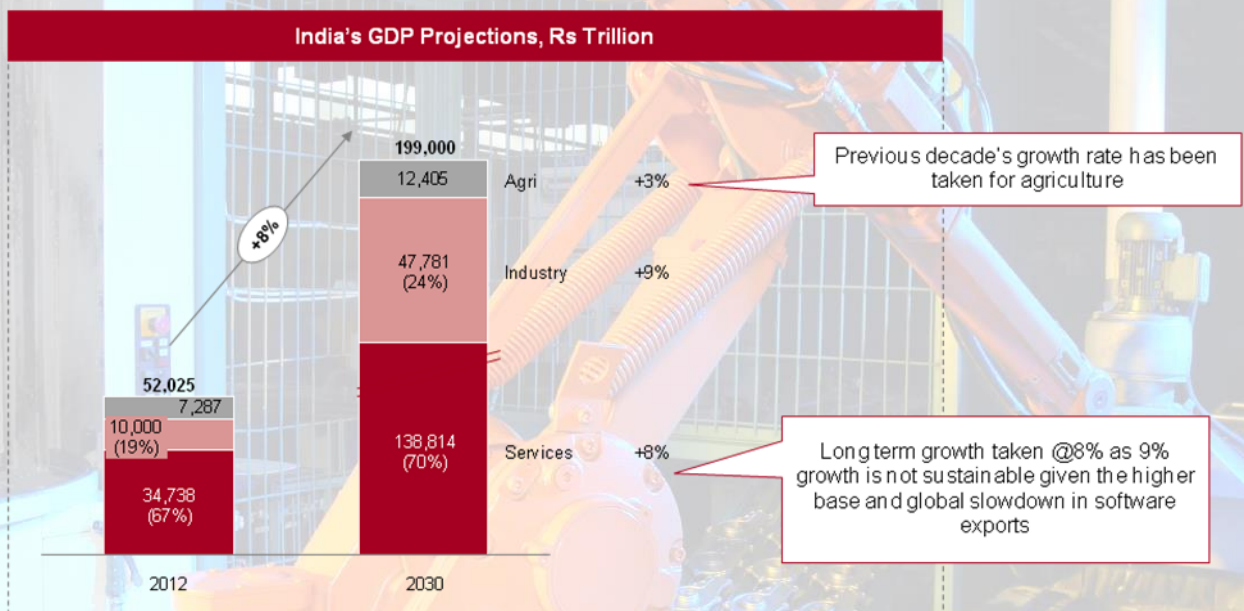


Note: *GS 2010

Source: MGI, Oxford Economics, Avalon Consulting Research and Analysis

India cannot achieve these growth targets without industry growing significantly and increasing its share of GDP. If we assume agriculture is going to grow @~3% and services is going to grow @~8%, then, to maintain the 8% growth, industry needs to grow @~9%. This, we believe, should be the growth target of GDP going forward.

Figure 6 : India's GDP Projections, Rs Trillion



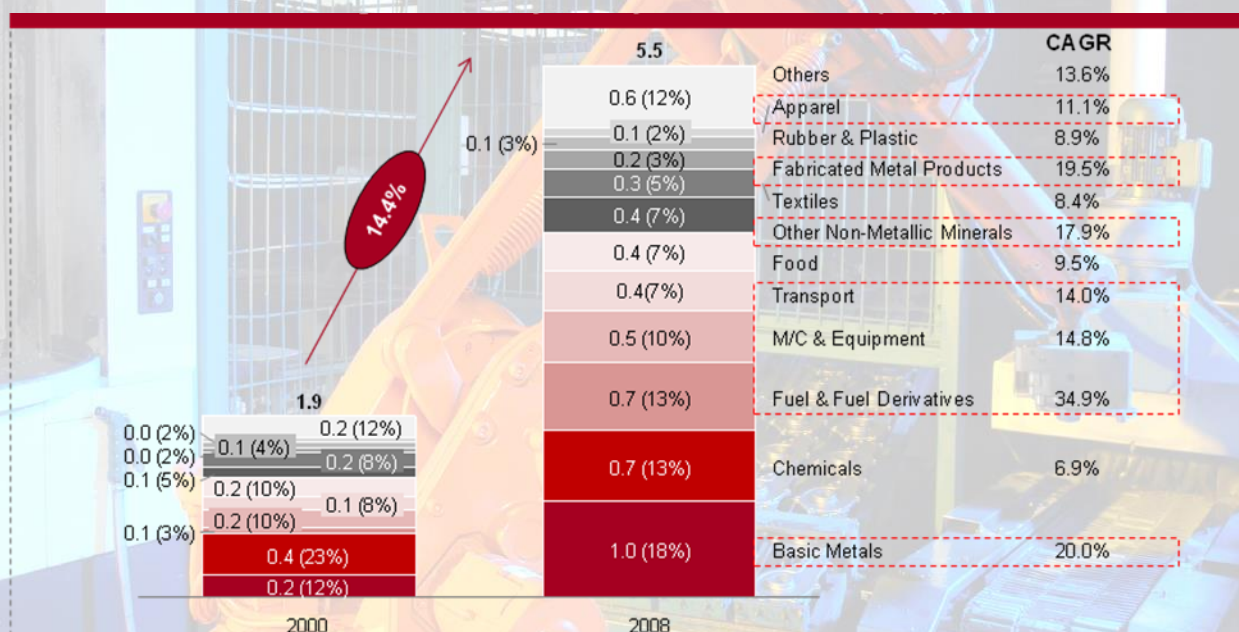
Source: Avalon Consulting Research and Analysis

4.2 Automation as a pre-requisite

Automation is a critical pre-requisite for industrial growth and productivity increase

Industrial growth in the past decade has been driven by several sub-sectors like mining, automobiles, basic metals, fuel derivatives etc. Consequently, some of these sectors have also increased their share within industry.

Figure 7 : Trends in Organized Industry Gross Value Added (GVA), Rs. Tn



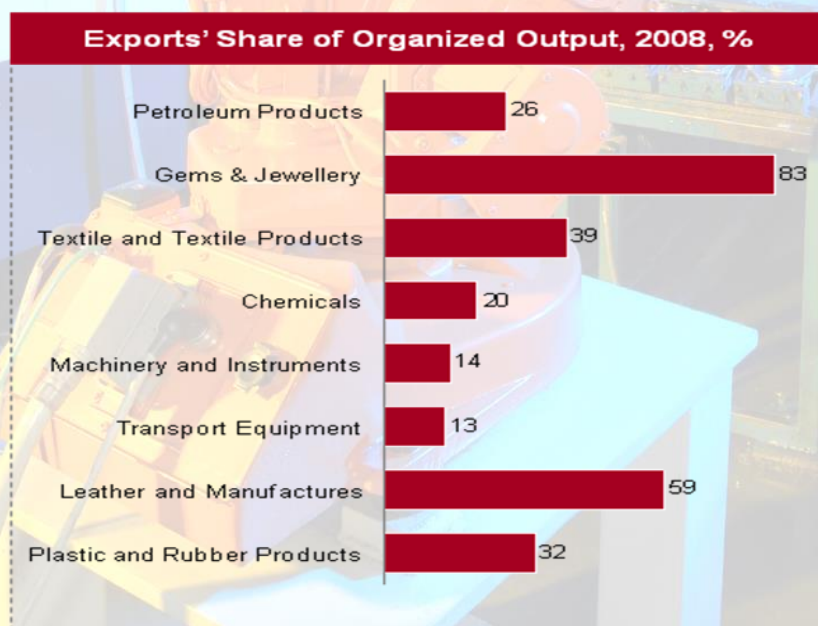
Source: ASI, DGFT, Avalon Consulting Research and Analysis

These sectors have also seen rapid growth in exports with global markets even accounting for a significant share of the Indian production in some sectors.

Table 1 : India's Exports in Financial Year Ending on 31 March, USD Billion

India's Exports in Financial Year Ending on 31 March, USD Billion			
	2000	2012	CAGR 2000-2012
Petroleum Products	0.04	55.60	83%
Transport Equipment	0.81	20.91	31%
Machinery and Instruments	1.18	14.36	23%
Gems and Jewellery	7.50	46.90	17%
Basic Chemicals, Pharmaceuticals & Cosmetics	3.09	24.44	19%
Manufacture of Metals	1.23	9.62	19%
Plastic and Linoleum Products	0.60	6.36	22%
Ores and Minerals	0.92	8.15	20%
Rubber, Glass, Paints, Enamels and Products	0.69	4.77	17%
Iron & Steel	0.83	6.45	19%
Leather and Manufactures	1.59	4.79	10%
Textile and Textile Products	9.82	28.00	9%

Figure 8 : Exports' Share of Organized Output, 2008, %



Source: DGFT, ASI (MOSPI), Avalon Consulting Research and Analysis

Many of these high growth sectors have seen a significant adoption of automation in the last decade. For example, in the biggest export driver petroleum products, new refineries and capacities have come up (e.g. Reliance) which are highly

automated and highly productive. Similarly, there has been significant implementation of automation and robotics in the automotive industry in the past decade, especially in welding and some parts of body assembly.

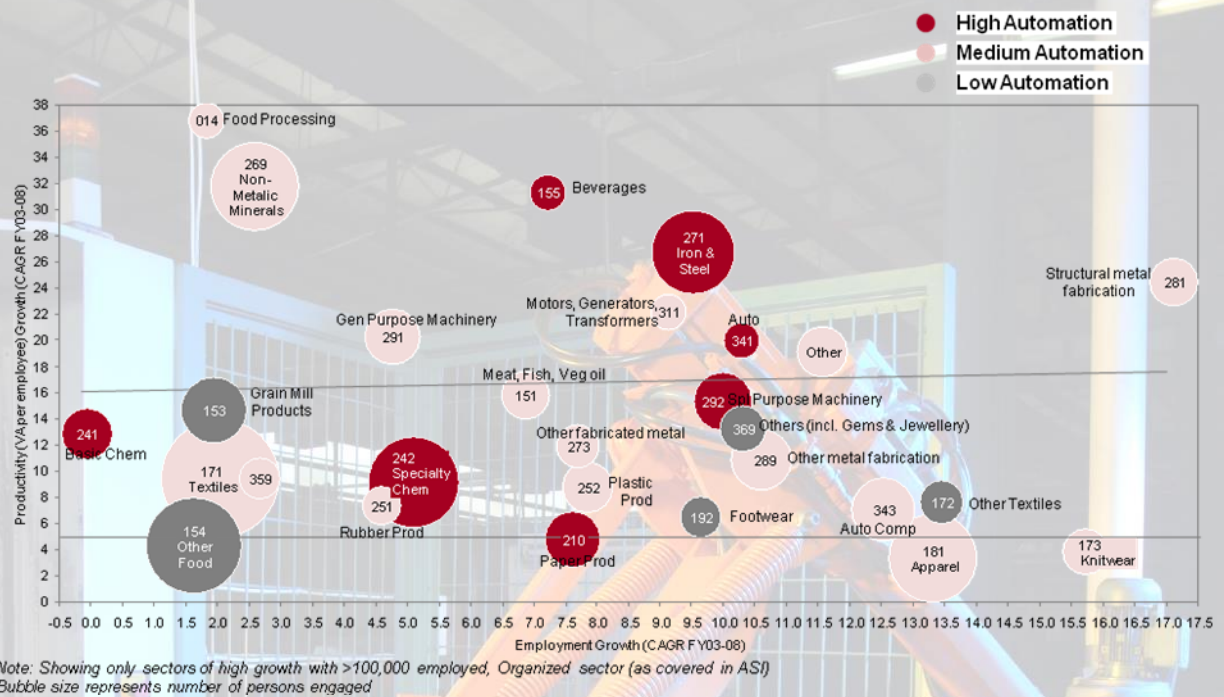
Table 2 : Automation in the “Star” Industries

	Level of Automation	Illustrative Industries
Petroleum Products		Refineries, petrochemicals
Transport Equipment		Auto, Auto Component, Railways
Machinery and Instruments		Machinery, equipment, precision instruments
Gems and Jewellery		
Other Manufactured Goods		Furniture, paper, toys,
Basic Chemicals, Pharmaceuticals & Cosmetics		Chloralkali, base chemicals, pharma, cosmetics
Manufacture of Metals		Aluminium, copper etc.
Plastic and Linoleum Products		Plastic & plastic components
Rubber, Glass, Paints, Enamels and Products		
Iron & Steel		
Leather and Manufactures		Leather, hides, shoe etc
Textile and Textile Products		Textile, knitwear, apparel, carpets etc.

Low High

Not surprisingly, the automation levels of these sectors have reflected in productivity growth. In this document, we define productivity as the ratio of the gross value added (GVA) to the number of people employed in that industry. If we look at the sub-sectors within these broad sectors which have been at the forefront of automation, we see that the sub-sectors with high productivity growth have also seen reasonable employment growth.

Figure 9 : Productivity Growth vs. Job Growth

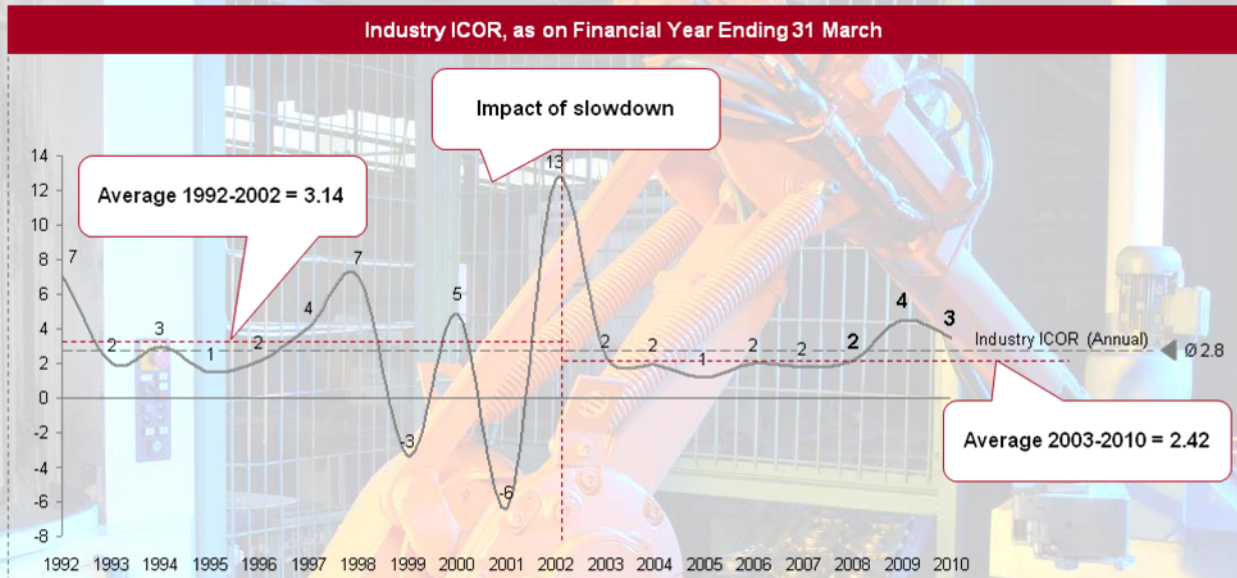


Source: NSSO, Avalon Consulting Research and Analysis

This is not surprising, as productivity growth makes India more competitive in that industry and also makes the industry more attractive to investors, thus creating more employment opportunities.

At a macro level, the increased adoption of automation is reflected in the changing Incremental Capital Output Ratio (ICOR) indicating that productivity enhancements has also been a key contributor to India's GDP growth in the past decade.

Figure 10 : Industry ICOR, as on Financial Year Ending 31 March



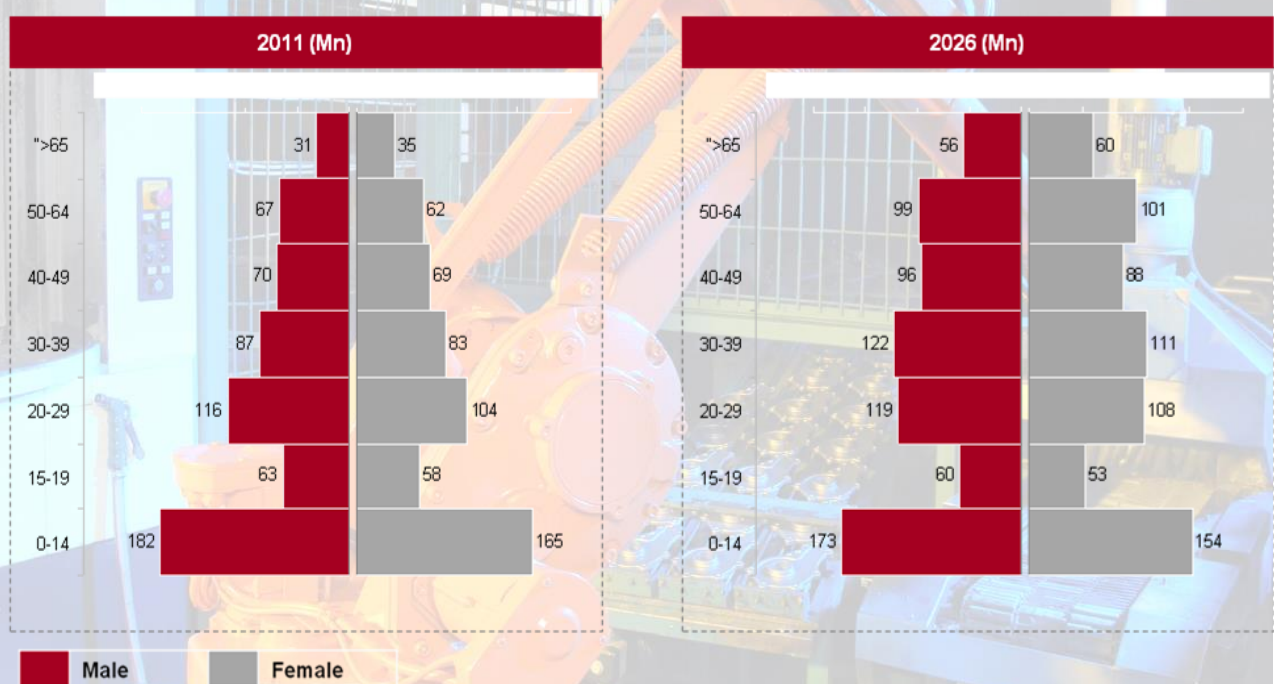
Source, RBI, NSSO, Avalon Consulting Research and Analysis

4.3 Macro Level Impact

Automation will create the kind of jobs required by an aspirational India

Given the demographics of India, finding gainful employment through appropriate job creation will be a key challenge for the youth in the coming decades. As per the projections in census 2011, by 2026, India will need to find jobs for ~186 million additional people belonging to the age group 15-65.

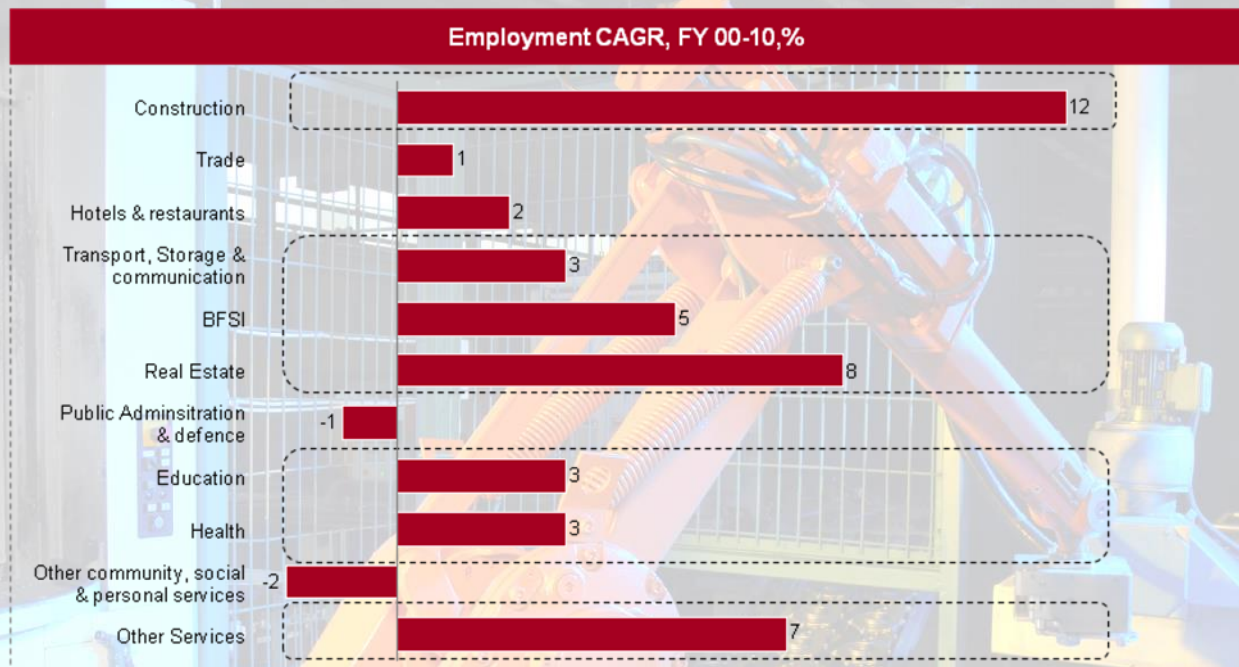
Figure 11 : Population (Mn) by gender and age-group, 2011, 2026 (P)



Source: Census 2011, Avalon Consulting Research and Analysis

Services remain the largest employer in India. Several segments within the Services sector have played and will continue to play a significant role in job creation in the coming years.

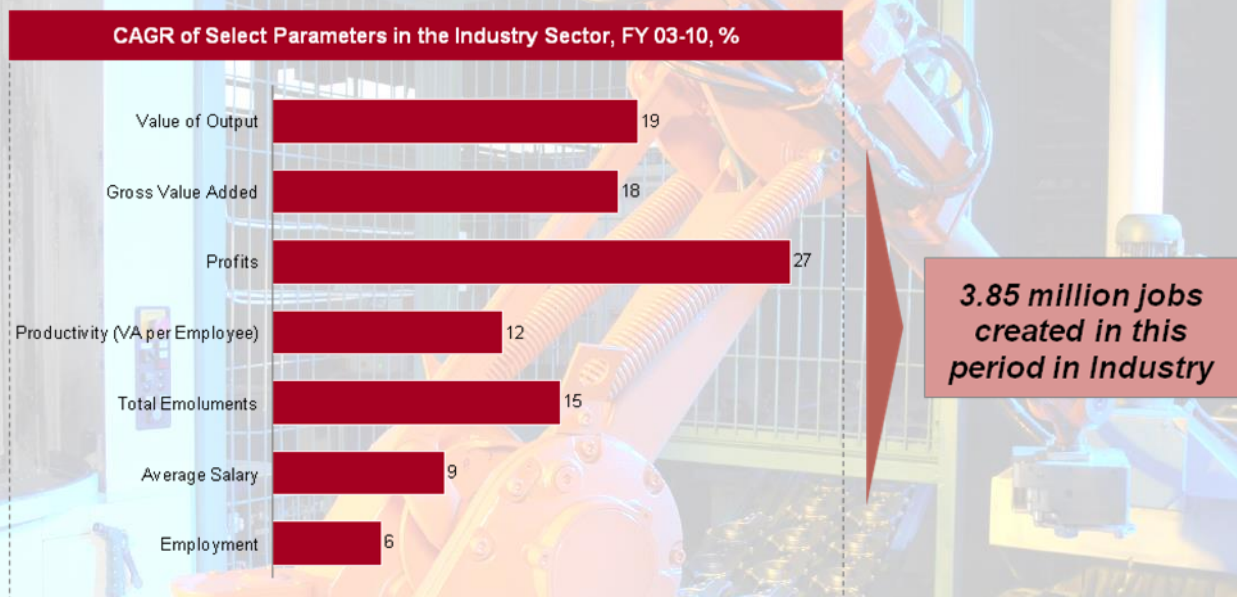
Figure 12 : Employment CAGR, FY 00-10, %



Source: RBI, NSSO, Avalon Consulting Research and Analysis

However, Industry will also need to pull its weight. High growth in industry will result in significant direct job creation – between the years FY03 to FY10, ~3.85 million new jobs were created in spite of the difficult market conditions in 2008 and 2009. The gains from productivity improvement was also shared with employees in a ~9% salary growth.

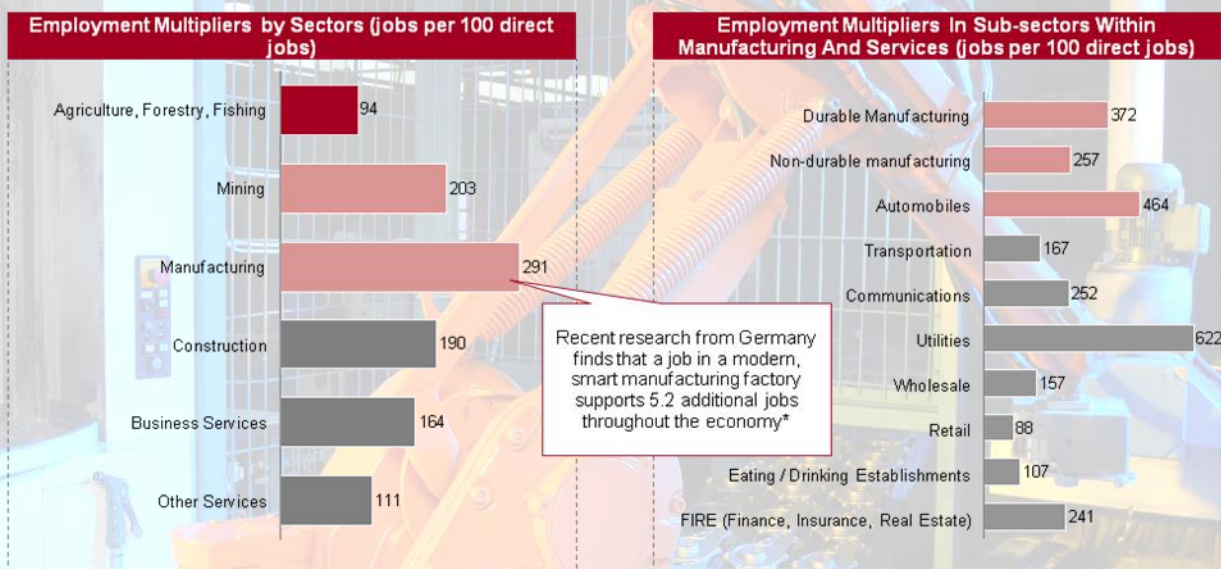
Figure 13 : CAGR of Select Parameters in the Industry Sector, FY 03-10, %



Source: NSSO, Avalon Consulting Research and Analysis

Industry also has a high employment multiplier - for each direct job, it creates ~2-3 other indirect jobs (in Manufacturing or Services). Thus all other factors remaining equal, a job in industry (especially manufacturing) can have a greater cascading impact on the economy. The multiplier effect is even higher (~5.2%) for smart manufacturing. Thus, even if the actual number of manufacturing jobs reduces due to increasing automation, the overall impact on employment can be positive.

Figure 14 : Employment Multipliers by Sectors



*** The Case for a National Manufacturing Strategy, The Information Technology and Innovation Foundation, USA**

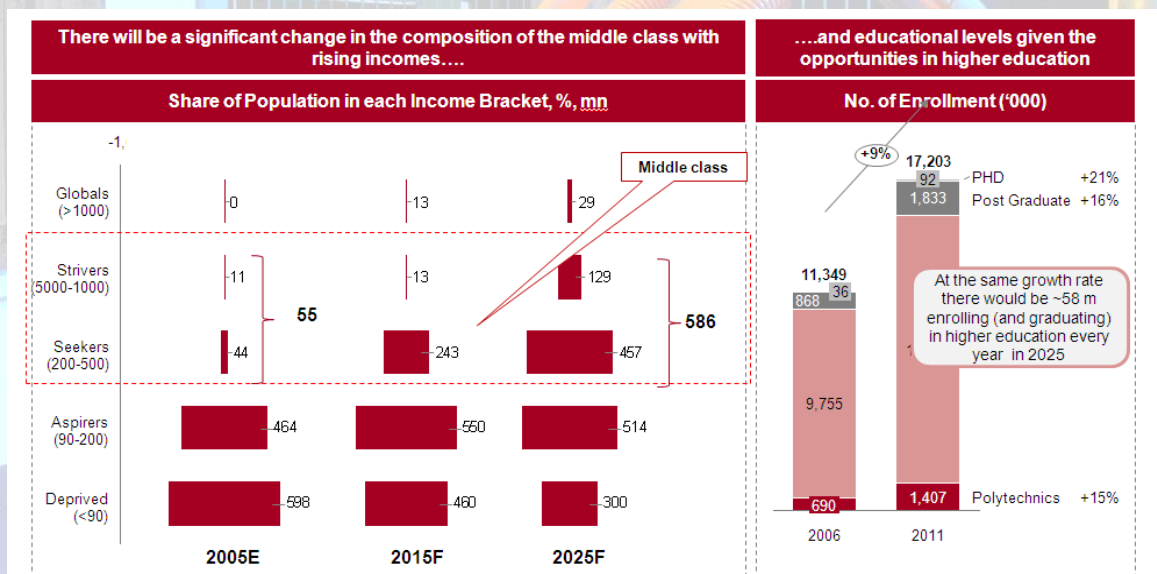
Source: Research by Economic Policy institute using US date (2003), Avalon Consulting Research and Analysis

There will also be a need to focus on the quality of jobs being created given the expected changes in the aspirations of the Indian youth in the coming decades.

In the past 5 years, the number of people enrolling in institutes of professional training and higher learning has increased at a CAGR of ~9%. Assuming a similar growth rate, India will have ~58 million educated youth ready to join the workforce around 2025¹. Similarly the composition of the middle class will change with rising income levels.

These trends will drive the aspirations of the new age working population, who would demand higher paying, more fulfilling jobs.

Figure 15 : Changing Aspirations of the Indian Youth



*** Note : Figures are rounded to the nearest integer and may add up to 100%**

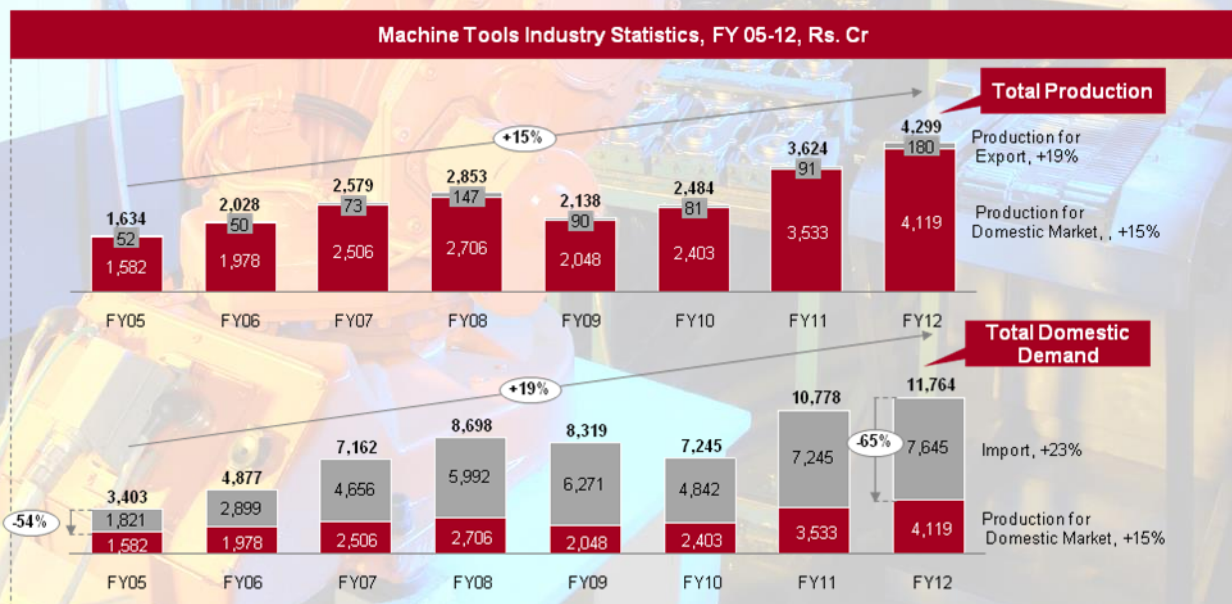
Source: Mckinsey Global Institute, Ministry of HRD, Avalon Consulting Research and Analysis

¹ There is a lag effect – if 58 million people enroll in 2025, they would graduate between 2028 and 2030, but this can be taken as a good indicative number

Increased adoption of automation (across Industry and Services) will meet the changing needs of job creation and consequently, the aspirations of the Indian youth in the coming decades. This will happen through 3 aspects of automation:

- Productivity growth driving higher value add per employee and supporting higher wages
- Changes in quality of jobs – unskilled or semi-skilled jobs like material handling would be replaced by skilled jobs like operation and maintenance of CNC machines and robots
- Development of an indigenous automation industry will significantly enhance the prospects of the machine tools industry in India – creating higher paying and more fulfilling jobs in R&D, sales, marketing etc.
- Indian machine tools industry is significantly dependent on imports. Most of the imports are of higher end machinery (CNC, etc.). The development of indigenous automation industry can thus result in the additional benefit of reducing imports and improving the trade balance.

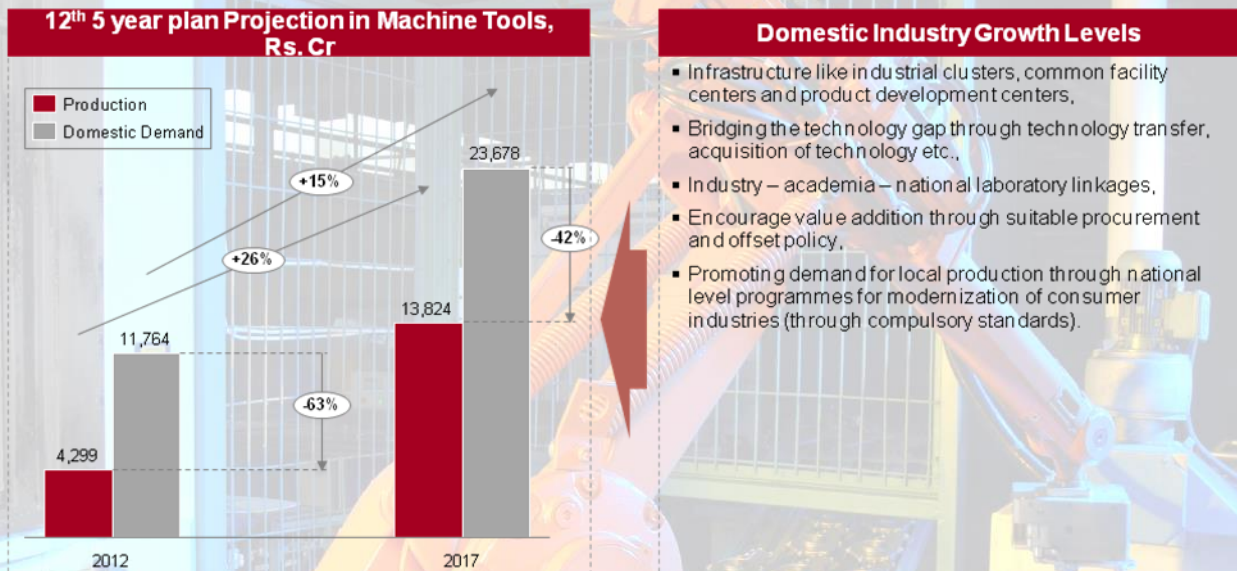
Figure 16 : Machine Tools Industry Statistics, FY 05-12, Rs. Cr



Source: IMTMA, 12th plan document, Avalon Consulting Research and Analysis

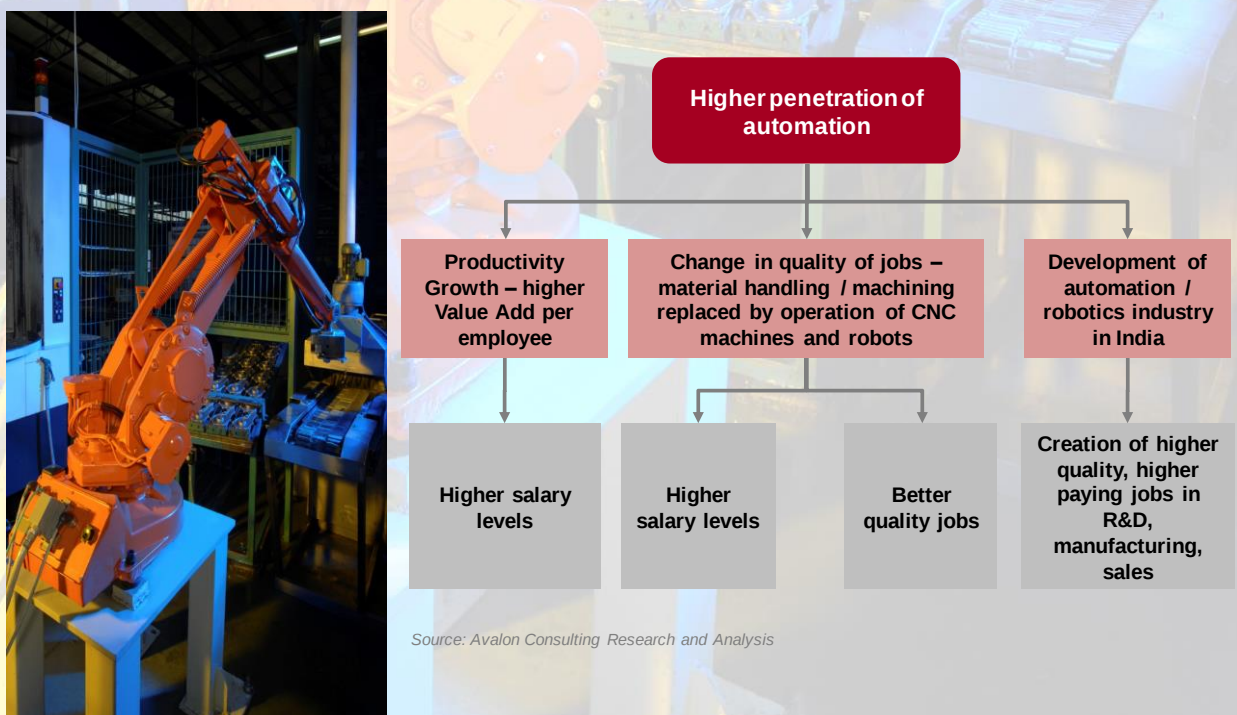
The 12th 5 year plan talks about bridging the domestic demand supply gap to ~40% of demand from the current 60%; but this is contingent on certain support parameters being met. Fostering domestic automation industry is a key enabler for the overall machine tools industry.

Figure 17 : 12th 5 year Plan



Source: 12th plan document, Avalon Consulting Research and Analysis

Figure 18 : Automation and Aspirational Jobs



Source: Avalon Consulting Research and Analysis

4.4 Micro Level Impact

Automation will improve the quality, productivity and safety standards of Indian Industry

There are 3 direct impacts of automation on the industry concerned:

- Automation drives competitiveness by reducing downtime, rest and changeover time, thus increasing the hours worked. It also improves the output per hour by doing jobs faster and results in higher output per worker because a worker now can manage multiple jobs or workstations.
- Automation improves quality of products and services by obtaining better precision and repeatability in operations
- Automation enhance safety in jobs by using robots in unsafe and accident-prone jobs like furnaces, handling unsafe chemicals, heavy material handling

Figure 19 : Factors Influencing Automation & Robotics growth



Enhanced Competitive-ness

- Less downtime / resting / changeover time
- Greater output per hour
- Higher output per worker



Improved Quality

- Ability to obtain higher precision
- Ability to obtain higher repeatability



Improved safety

- Ability to automate and use robots in hazardous work , e.g. furnaces, handling hazardous chemicals

India lags other leading countries of the world in industrial productivity (**Figure 20 : Industrial Productivity Across the World, 2008 (US \$)**). With increases in wages, India needs to bridge the productivity gap with her peers. This can only be addressed through widespread adoption of automation.

Figure 20 : Industrial Productivity Across the World, 2008 (US \$)



Source: World Bank, Avalon Consulting Research and Analysis

Even within India, some states like Karnataka that have higher adoption of automation have higher productivity and competitiveness (**Table 3: Competitiveness and Productivity of Indian States.**)

Table 3: Competitiveness and Productivity of Indian States

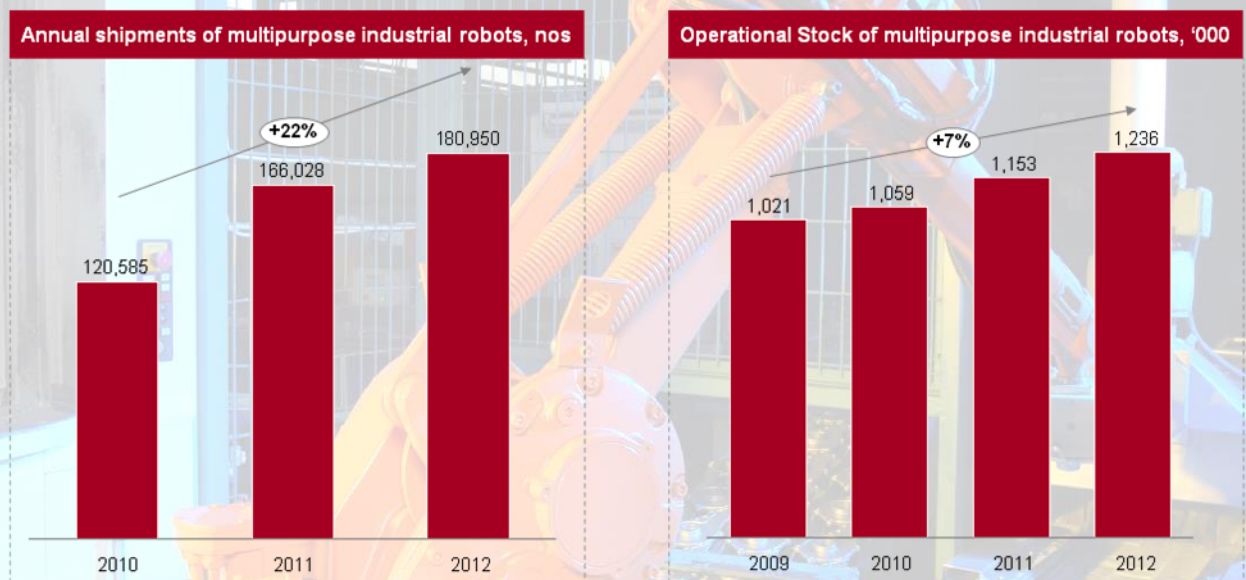
Competitiveness and Productivity of Indian States	
Rank, 2009	Indian States
1	Karnataka
2	Kerala
3	Gujarat
4	Andhra Pradesh
5	Haryana
6	West Bengal
7	Maharashtra
8	Delhi
9	Tamil Nadu
10	Punjab
11	Orissa
12	Bihar
13	Madhya Pradesh
14	Uttar Pradesh
15	Rajasthan

To enable even MSMEs to participate in this productivity improvement, Low cost automation can be a powerful tool. Already the government along with various industry bodies has undertaken projects to initiate small scale automation in specific sectors. An illustrative case study is presented in the annexure.

5 Automation requires an Agenda for Change to help realise its potential and meeting our growth aspirations

Globally, robotics is seeing an uptrend with rapid increase in volumes year on year (CAGR of ~22% over the past 3 years). The worldwide robot stock is also increasing at a healthy 7%. (see Figure 21 : Robotics Trends)

Figure 21 : Robotics Trends



Note: Numbers for 2012 are estd

Source: IFR, Avalon Consulting Research and Analysis



This growth is driven by certain specific sectors which are also critical for India's growth targets within industry. Ten years ago, 90% of robots were being bought by auto companies - now, only 50% of robots made today are bought by car manufacturers. Robots are slowly finding uses in warehouses, laboratories, research and exploration sites, energy plants, hospitals, even outer space. Industries using robots include

- Aerospace
- Automotive manufacturing and supply
- Chemical, rubber and plastics manufacturing
- Electrical and electronics²
- Entertainment-movie making
- Food stuff and beverage manufacturing
- Glass, ceramics and mineral production
- Printing
- Wood and furniture manufacturing

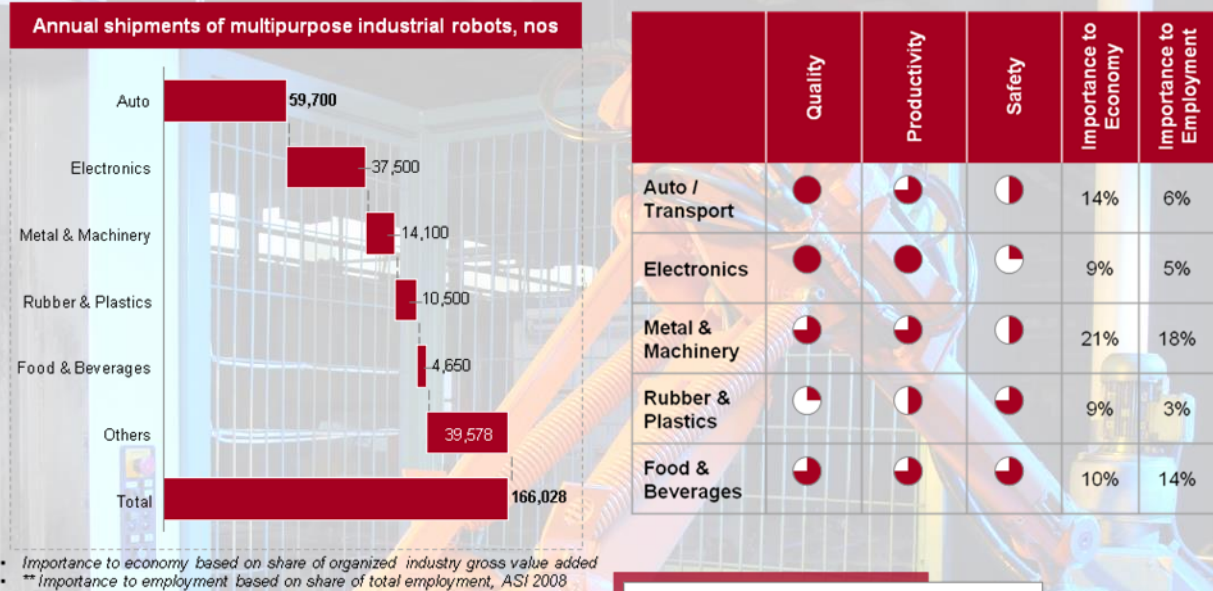
Tasks being performed by robots include:

- Assembling products
- Handling dangerous materials
- Spraying finishes
- Inspecting parts, produce, and livestock
- Cutting and polishing
- Welding, etc.

² The ones in bold are currently the most important from a robotics point of view.

Looking at the key sectors purchasing robots in 2011, we see that most of these sectors are also key sectors in the Indian economy as identified earlier.

Figure 22 : Annual shipments of multipurpose industrial robots

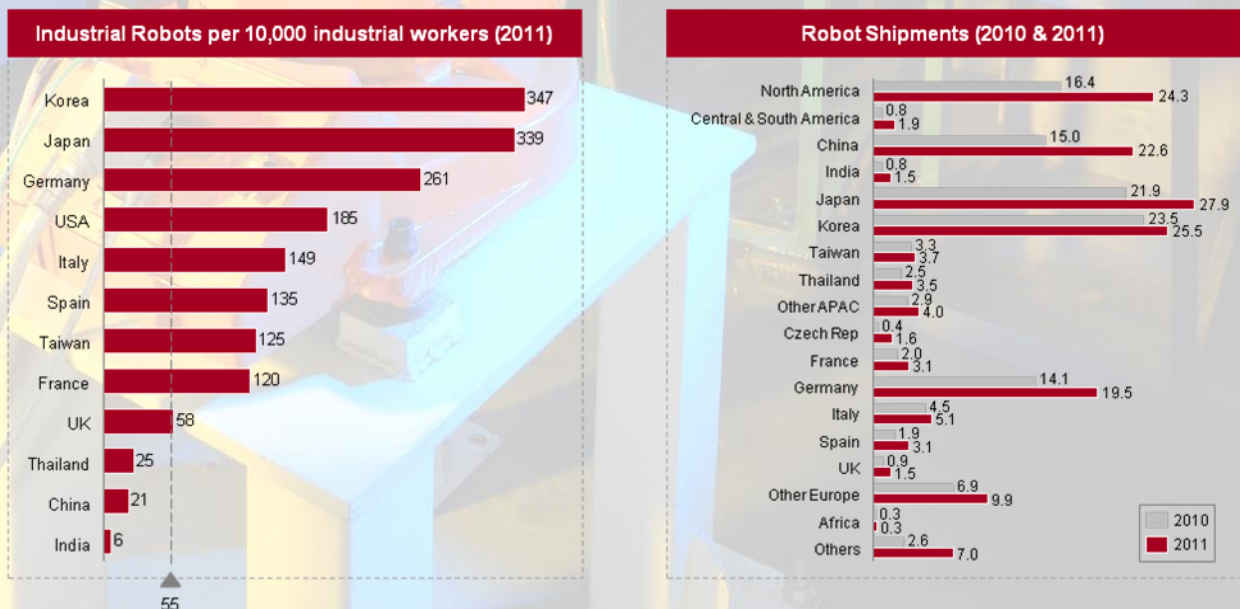


It stands to reason that in India too, such sectors would require automation

Source: IFR, ASI, Avalon Consulting Research and Analysis

Despite a more rapid adoption of automation in the past decade, India's penetration of robots in industry lags way behind industrialized countries – and also Asian competitors.

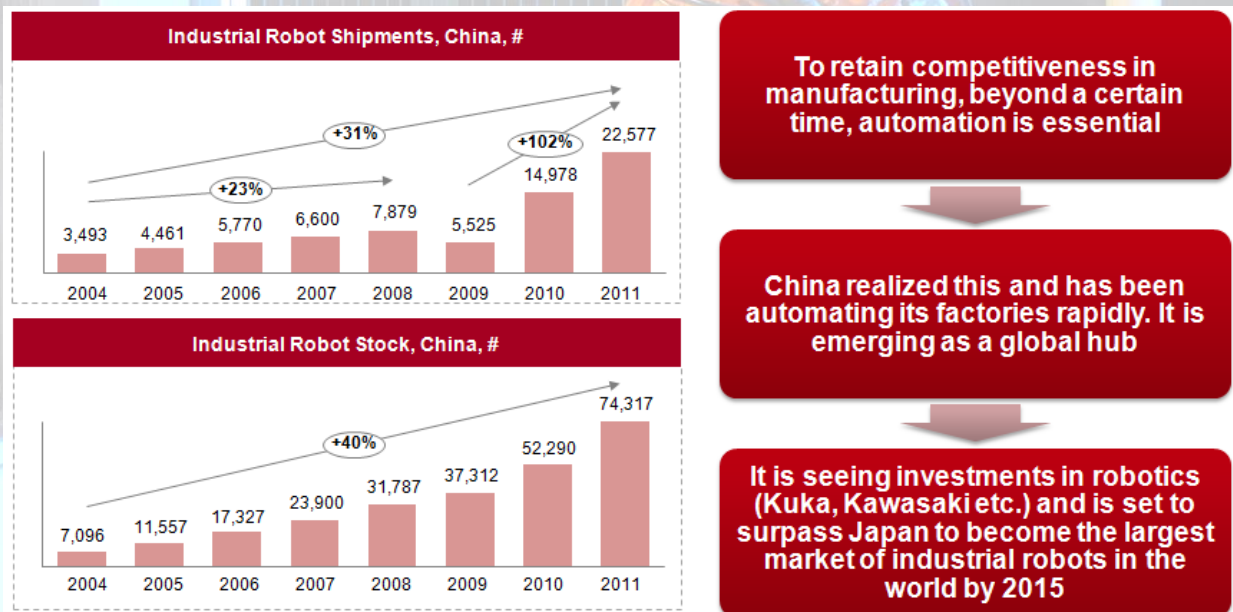
Figure 23 : Industrial Robots Penetration



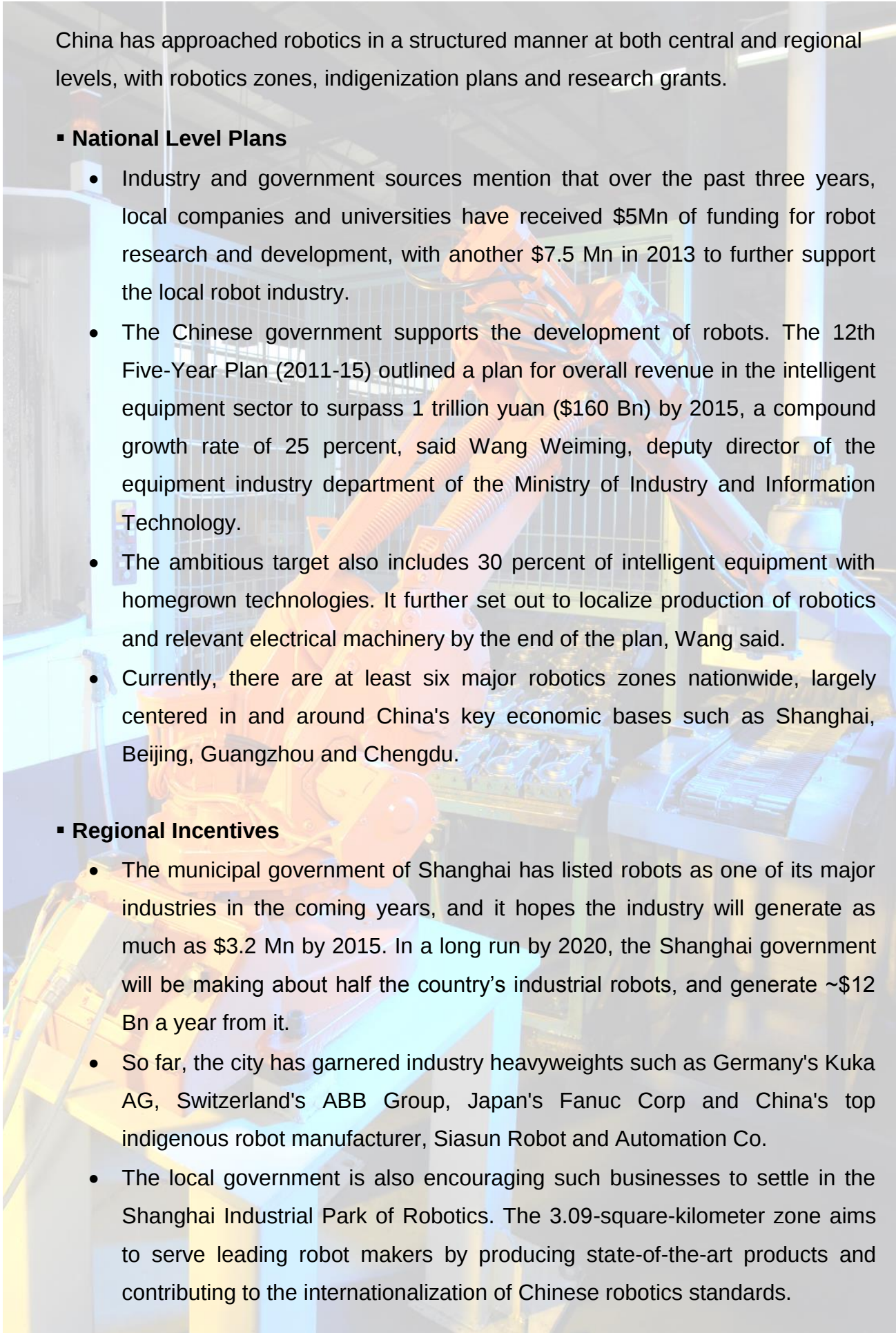
Source: Avalon Consulting Research and Analysis

China has started the journey ~7 years back and is emerging as a global hub for automation and robotics (Figure 24 : Industrial Robots in China). Apart from China's ageing demographic profile, the focus on automation has been driven by an understanding that beyond a certain point, automation is necessary to retain manufacturing competitiveness (from both productivity and quality perspective). India needs to catch up to remain competitive.

Figure 24 : Industrial Robots in China



Source: Avalon Consulting Research and Analysis



China has approached robotics in a structured manner at both central and regional levels, with robotics zones, indigenization plans and research grants.

▪ **National Level Plans**

- Industry and government sources mention that over the past three years, local companies and universities have received \$5Mn of funding for robot research and development, with another \$7.5 Mn in 2013 to further support the local robot industry.
- The Chinese government supports the development of robots. The 12th Five-Year Plan (2011-15) outlined a plan for overall revenue in the intelligent equipment sector to surpass 1 trillion yuan (\$160 Bn) by 2015, a compound growth rate of 25 percent, said Wang Weiming, deputy director of the equipment industry department of the Ministry of Industry and Information Technology.
- The ambitious target also includes 30 percent of intelligent equipment with homegrown technologies. It further set out to localize production of robotics and relevant electrical machinery by the end of the plan, Wang said.
- Currently, there are at least six major robotics zones nationwide, largely centered in and around China's key economic bases such as Shanghai, Beijing, Guangzhou and Chengdu.

▪ **Regional Incentives**

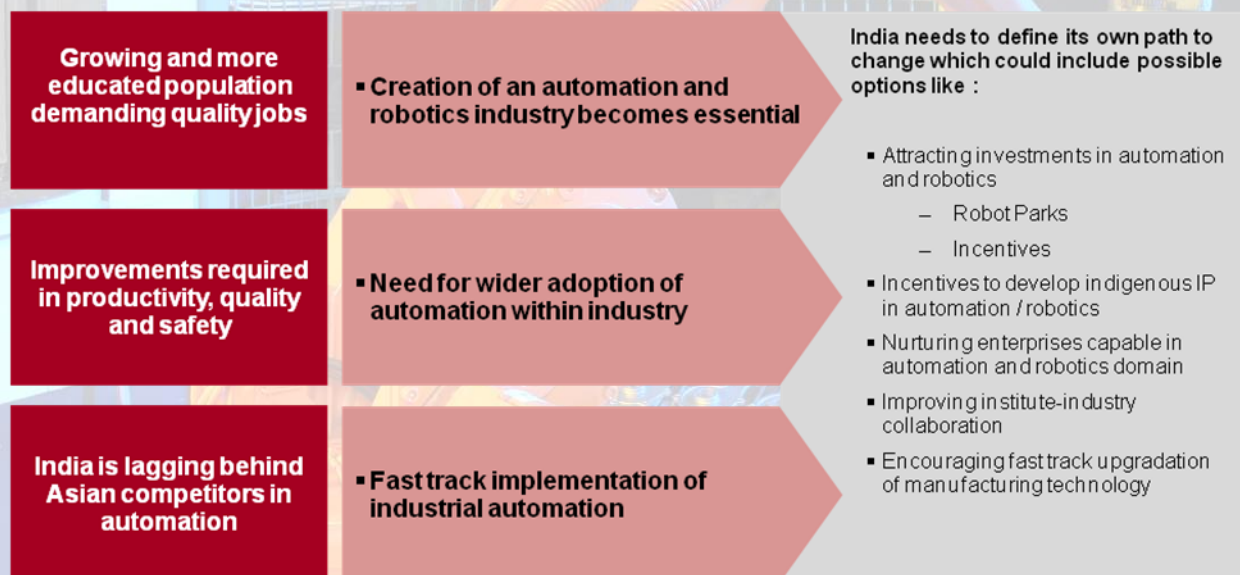
- The municipal government of Shanghai has listed robots as one of its major industries in the coming years, and it hopes the industry will generate as much as \$3.2 Mn by 2015. In a long run by 2020, the Shanghai government will be making about half the country's industrial robots, and generate ~\$12 Bn a year from it.
- So far, the city has garnered industry heavyweights such as Germany's Kuka AG, Switzerland's ABB Group, Japan's Fanuc Corp and China's top indigenous robot manufacturer, Siasun Robot and Automation Co.
- The local government is also encouraging such businesses to settle in the Shanghai Industrial Park of Robotics. The 3.09-square-kilometer zone aims to serve leading robot makers by producing state-of-the-art products and contributing to the internationalization of Chinese robotics standards.

- However, the government is yet to subsidize its own enterprises, Zhao noted Zhao Yong, chief operating officer of robot-china, an online information provider for the domestic industry. "It will probably take another five years to get those details right on track.

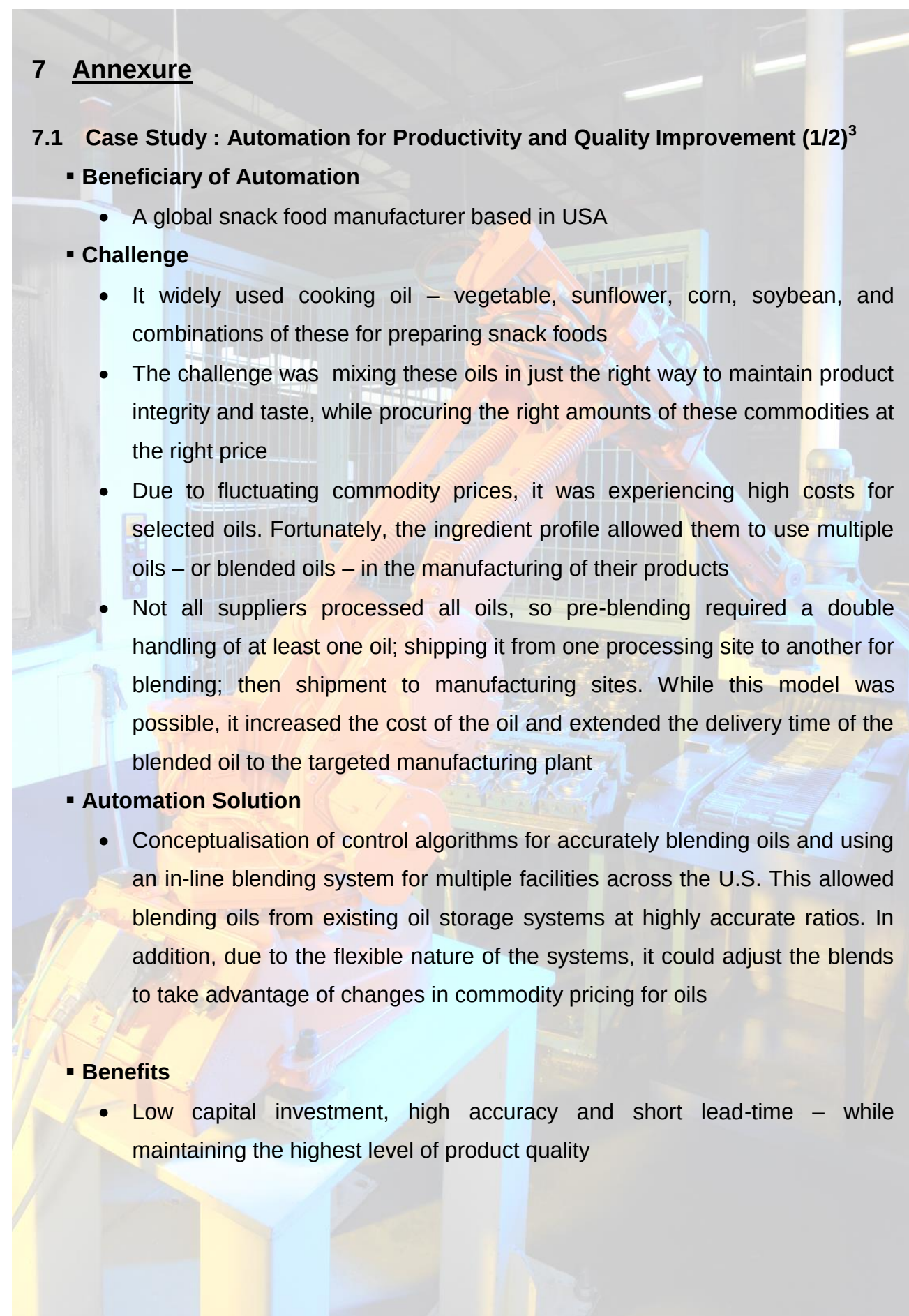
6 India needs to chart its own path as part of this agenda for change

India needs to adopt its own path as part of the Agenda for Change to ensure faster adoption of Automation to help realize its potential and meeting our growth aspirations. India can borrow best practices and policies from other nations, but the ultimate path she takes should reflect her demographic-social conditions, aspirations and capabilities.

Figure 25 : Defining India's Path



Source: IFR, Avalon Consulting Research and Analysis

A background image of a factory interior featuring several robotic arms, likely for automated manufacturing or assembly. The scene is dimly lit with some overhead lights visible.

7 **Annexure**

7.1 **Case Study : Automation for Productivity and Quality Improvement (1/2)**³

▪ **Beneficiary of Automation**

- A global snack food manufacturer based in USA

▪ **Challenge**

- It widely used cooking oil – vegetable, sunflower, corn, soybean, and combinations of these for preparing snack foods
- The challenge was mixing these oils in just the right way to maintain product integrity and taste, while procuring the right amounts of these commodities at the right price
- Due to fluctuating commodity prices, it was experiencing high costs for selected oils. Fortunately, the ingredient profile allowed them to use multiple oils – or blended oils – in the manufacturing of their products
- Not all suppliers processed all oils, so pre-blending required a double handling of at least one oil; shipping it from one processing site to another for blending; then shipment to manufacturing sites. While this model was possible, it increased the cost of the oil and extended the delivery time of the blended oil to the targeted manufacturing plant

▪ **Automation Solution**

- Conceptualisation of control algorithms for accurately blending oils and using an in-line blending system for multiple facilities across the U.S. This allowed blending oils from existing oil storage systems at highly accurate ratios. In addition, due to the flexible nature of the systems, it could adjust the blends to take advantage of changes in commodity pricing for oils

▪ **Benefits**

- Low capital investment, high accuracy and short lead-time – while maintaining the highest level of product quality

³ Source: Rockwell Automation

7.2 Case Study : Automation for Productivity and Quality Improvement (2/2)⁴

▪ Beneficiary of Automation

- Ash Grove, a leading cement manufacturer based in Kansas, USA

▪ Challenge

- To produce the clinker used in cement-making, Ash Grove used mined limestone, mixed it with other ingredients, and heated the material in a kiln. The clinker would then go through a cooling process before the ball mills grounded it into cement
- Workers at Ash Grove had trouble servicing the three ball mills each month. For technicians to enter the mill for servicing, they used an antiquated 60-horsepower generator motor to rotate the mill inch-by-inch until it reached an exact position. The process of manually positioning equipment, called “spotting,” became difficult because technicians had no effective way to accurately apply torque to the medium voltage motor directly from the power system – the technique used to slowly rotate the mill. In addition, cogging, abrupt starting and stopping of the motor, caused mechanical and electrical damage to the equipment causing plant downtime

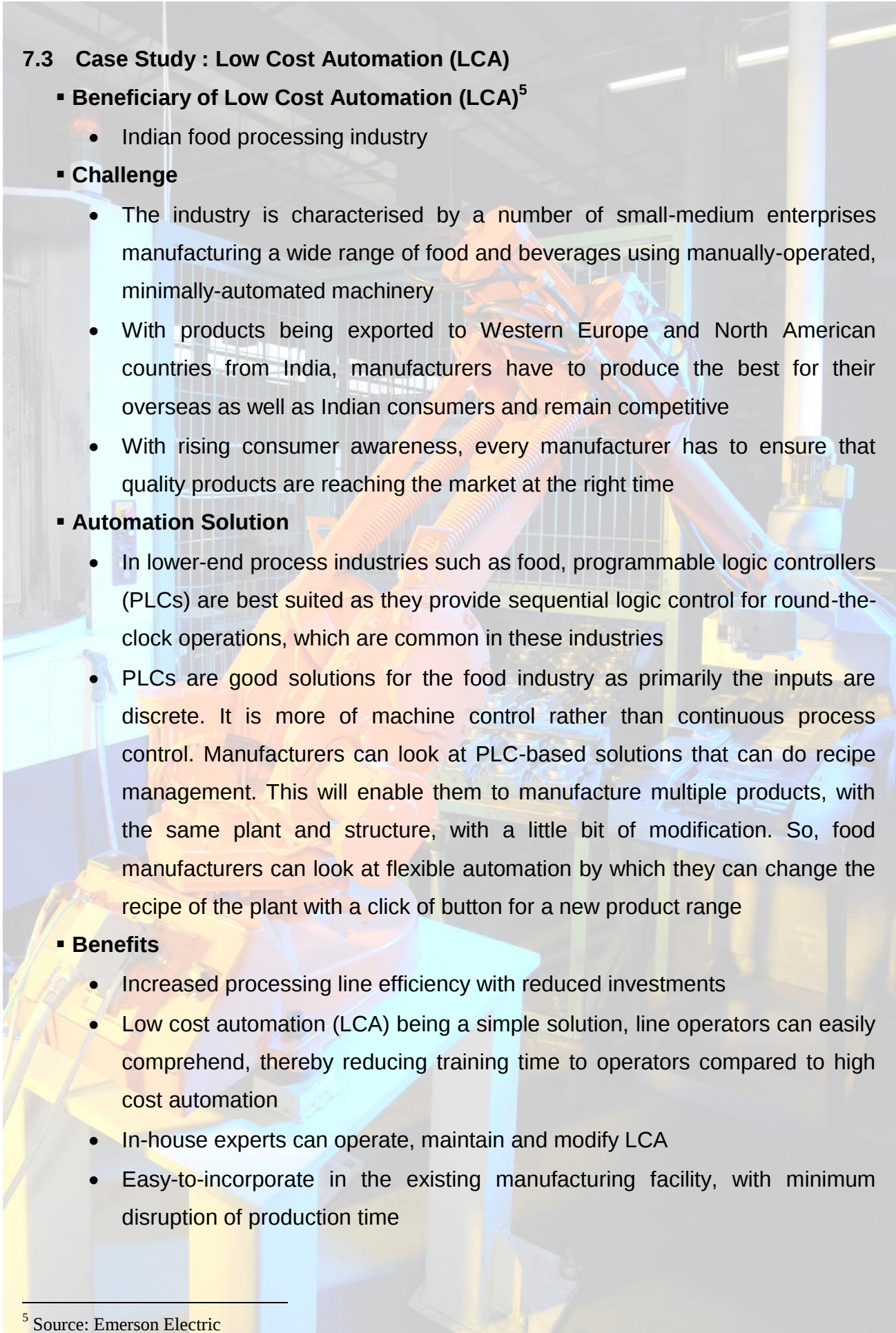
▪ Automation Solution

- Replaced the generators that powered the mill spotting with preconfigured, 480 V, 450 HP, AC variable frequency drives
- AC drives power three existing 4,000 V, 2,300 HP AC motors exclusively during the spotting process to efficiently rotate the ball mill and bring it to a controlled start and stop

▪ Benefits

- Over 90% plant uptime and thus increased production
- Reduced mechanical wear on the equipment and maintenance costs
- Reduced energy consumption, resulting in energy cost savings

⁴ Source: Rockwell Automation



7.3 Case Study : Low Cost Automation (LCA)

▪ Beneficiary of Low Cost Automation (LCA)⁵

- Indian food processing industry

▪ Challenge

- The industry is characterised by a number of small-medium enterprises manufacturing a wide range of food and beverages using manually-operated, minimally-automated machinery
- With products being exported to Western Europe and North American countries from India, manufacturers have to produce the best for their overseas as well as Indian consumers and remain competitive
- With rising consumer awareness, every manufacturer has to ensure that quality products are reaching the market at the right time

▪ Automation Solution

- In lower-end process industries such as food, programmable logic controllers (PLCs) are best suited as they provide sequential logic control for round-the-clock operations, which are common in these industries
- PLCs are good solutions for the food industry as primarily the inputs are discrete. It is more of machine control rather than continuous process control. Manufacturers can look at PLC-based solutions that can do recipe management. This will enable them to manufacture multiple products, with the same plant and structure, with a little bit of modification. So, food manufacturers can look at flexible automation by which they can change the recipe of the plant with a click of button for a new product range

▪ Benefits

- Increased processing line efficiency with reduced investments
- Low cost automation (LCA) being a simple solution, line operators can easily comprehend, thereby reducing training time to operators compared to high cost automation
- In-house experts can operate, maintain and modify LCA
- Easy-to-incorporate in the existing manufacturing facility, with minimum disruption of production time

⁵ Source: Emerson Electric



Automotive Component
Manufacturers Association of India

The Automotive Component Manufacturers Association of India (ACMA) is the apex body representing the interest of the Indian Auto Component Industry.

Its active involvement in trade promotion, technology up-gradation, quality enhancement and collection and dissemination of information has made it a vital catalyst for this industry's development. Its other activities include participation in international trade fairs, sending trade delegations overseas and bringing out publications on various subjects related to the automotive industry.

ACMA's charter is to develop a globally competitive Indian Auto Component Industry and strengthen its role in national economic development as also promote business through international alliances.

ACMA is represented on a number of panels, committees and councils of the Government of India through which it helps in the formulation of policies pertaining to the Indian automotive industry.

For Exchange of Information and especially for co-operation in trade matters, ACMA has signed Memoranda of Understanding with its counterparts in Australia, Brazil, Canada, Egypt, France, Germany, Iran, Italy, Japan, Malaysia, Pakistan, South Africa, South Korea, Spain, Sweden, Thailand, Tunisia, Turkey, UK, USA and Uzbekistan.

ACMA represents over 670 companies, which contributes more than 85% of the total auto component output in the organised sector. In the domestic market, they supply components to vehicle manufacturers as original equipment, to tier-one suppliers, to state transport undertakings, defence establishments, railways and even to the replacement market. A variety of components are being exported to OEM's and after-markets world-wide.

ACMA is inseparably linked with the auto component sector and hence forms the channel through which business contacts are established with the Indian Automotive Industry.

ACMA is an ISO 9001:2008 Certified Association

Further information and data on the Indian automotive industry is available on the ACMA Website: www.acma.in



SIAM

Society of Indian
Automobile Manufacturers

SIAM is an important channel of communication for the Automobile Industry with the Government, National and International organisations. The Society works closely with all the concerned stake holders and actively participates in formulation of rules, regulations and policies related to the Automobile Industry.

SIAM provides a window to the Indian Automobile industry and aims to enhance exchanges and communication, expand economics, trade and technical cooperation between the Automotive Industry and its international counterparts.

With its regular and continuous interaction with international bodies and organizations it aims to facilitate up gradation of technical capabilities of the Indian Industry to match the best practice worldwide.

SIAM also interacts with worldwide experts to assess the global trends and developments shaping the Automotive Industry. It has been actively pursuing issues like Frontier Technologies viz. Telematics: Promotion of Alternative Fuels including Hydrogen Energy for automotive use through cell vehicles and Harmonisation of Safety and Emission Standards etc.

Dissemination of information is an integral part of SIAM'S activities, which it does through various publications, reports, seminars and conferences.

SIAM organizes the biennial Auto Expo series of trade fairs in co-operation with Confederation of Indian Industry (CII) and Automotive Component Manufacturers Association of India (ACMA).

SIAM has been striving to keep pace with the socio-economic and technological changes shaping the Automobile Industry and endeavour to be a catalyst in the development of a stronger Automobile Industry in India.



Automation Industry Association (AIA) founded in 2004, is India's apex automation industry body, with over 50 high tech automation companies. The technologies they represent encompass electrical automation, mechanical automation, continuous and batch process automation, robotics, machine vision, assembly and material handling systems, sensors, controllers, actuators, communication devices, HMI, real-time software, simulation, training, and a host of interface and supporting sub-systems

AIA has pioneered the vendor-neutral approach in spreading knowledge and creating awareness on Global standards and practices. The Automation Centres of Excellence established at IIT Madras and Apollo Knowledge Institute, Vadodara are national facilities supported by AIA. For more details about our membership and programmes, visit www.aia-india.org or write to director@aia-india.org



Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the growth of industry in India, partnering industry and government alike through advisory and consultative processes.

CII is a non-government, not-for-profit, industry led and industry managed organisation, playing a proactive role in India's development process. Founded over 117 years ago, it is India's premier business association, with a direct membership of over 7000 organisations from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 90,000 companies from around 400 national and regional sectoral associations.

CII catalyses change by working closely with government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialised services and global linkages. It also provides a platform for sectoral consensus building and networking. Major emphasis is laid on projecting a positive image of business, assisting industry to identify and execute corporate citizenship programmes. Partnerships with over 120 NGOs across the country carry forward our initiatives in integrated and inclusive development, which include health, education, livelihood, diversity management, skill development and water, to name a few.

The CII Theme for 2012-13, '**Reviving Economic Growth: Reforms and Governance**,' accords top priority to restoring the growth trajectory of the nation, while building Global Competitiveness, Inclusivity and Sustainability. Towards this, CII advocacy will focus on structural reforms, both at the Centre and in the States, and effective governance, while taking efforts and initiatives in Affirmative Action, Skill Development, and International Engagement to the next level.

With 63 offices including 10 Centres of Excellence in India, and 7 overseas offices in Australia, China, France, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 223 counterpart organisations in 90 countries, CII serves as a reference point for Indian industry and the international business community.

Confederation of Indian Industry

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Avalon Consulting is an international management consulting firm that advises clients across the world on Strategy, Business Transformation and Transactions. It is part of the 20 year old, 1360-people Avalon Group with offerings across the knowledge value chain including Market Research and Marketing Analytics.

Avalon offers end to end services – from solution design to implementation. Avalon's clientele includes corporates in manufacturing and service sectors, Financial Institutions, Private Equity & Venture Capital firms, Governments, Industry Associations, etc. in 14 countries including India and South Asia, West Asia, SE Asia and China.

Avalon has offices in Delhi, Mumbai and Chennai with a new office opening in Singapore in 2013.

It has executed assignments in over 80 countries including India, China, S.E. Asia, Europe, USA and the Middle-East.

Avalon executes projects in various sectors including auto and auto components, engineering, chemicals, pharmaceuticals, healthcare, education etc.

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