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The Indian Automobile Industry: Technology Enablers Preparing for the Future

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Introduction

India has emerged as the fourth largest auto market in 2017 with sales increasing 9.5 per cent year-on-year to 4.02 million units (excluding two-wheelers) in 2017. It was the seventh largest manufacturer of commercial vehicles in 2017. The presence of established domestic and international original equipment manufacturers (OEMs), strong market in terms of both, the domestic demand and exports, and so on are driving the industry through technology which is changing the definition of competitiveness in automotive manufacturing industry. Factories are becoming more digitally equipped with smarter machines that produce smart products more efficiently. With the Industry 4.0 in the offing, the automotive

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companies are realising the value of adoption of new technologies to embrace the competition and grow in this fast changing dynamic market.

Against this backdrop, the study would examine the present status of the automobile industry and analyse how the adoption of emerging technologies among the companies is facilitating the Indian automobile industry to grow and remain competitive in this world. The chapter is divided into the following sections. The first section gives an overview of the automobile industry, discussing the trend in growth and production. Also, the export trends are discussed. The second section analyses the trend in production and export of auto components from India. This is followed by section 'The Changing Dynamics of Automobile Market', which discusses the enablers of changing competitive landscape in the industry. Section 'Technology Adoptions in Automobile Industry' highlights the technology adoptions in the Indian automobile industry. Section 'Government Facilitation for Technology Implementation' explains the government facilitation in this sector typically in adoption of technology to remain competitive, and section 'Labour Issues in Automobile Industry' briefly discusses labour issues and globalisation in the Indian automobile industry. Section 'Conclusion' provides the conclusion.

Overview of Indian Automotive Industry

While the automotive industry in India was set up in the 1940s, distinct growth rates were visible only in the 1970s. Cars were considered as ultra-luxury products, manufacturing was strictly licensed, expansion was limited, and there was a restrictive tariff structure. The decade 1985–1995 saw the entry of Maruti Udyog in the passenger car segment in collaboration with Suzuki of Japan, and Japanese manufacturers in the two-wheeler and commercial vehicle segments. After economic reforms took place in India in 1991, it is only in the mid-1990s that the automotive industry started opening up. Thus, the mid-1990s were characterised by the entry of global automotive manufacturers through joint ventures in India. Till the end of 1990s, the automotive industry in India was primarily dominated by Maruti Suzuki, Tata Motors, Hindustan Motors and Premier

Padmini in the passenger car segment (De 2011). Ashok Leyland, Tata Motors and Mahindra & Mahindra dominated the commercial vehicle segment while Bajaj Auto dominated the two-wheeler segment. After the year 2000, further policy changes were introduced and focus on exports was increasingly getting importance. Following that, the Core Group on Automotive Research & Development was set up in the year 2003 to identify priority areas for research and development (R&D) in India.[1] Turnover of the automotive industry in the year 1998–1999 was Rs. 360 billion and the industry provided employment to over 10 million people directly and indirectly. The contribution of the automotive industry to the Gross Domestic Product (GDP) during the same period was 4 per cent, rising from 2.77 per cent recorded in the year 1992–1993.[2]

The automobile industry is one of India's major manufacturing sectors, accounting for 22 per cent of the country's manufacturing GDP and 7.1 per cent of the country's GDP. As per Society for Indian Automobile Manufacturers (SIAM), Indian auto industry is the seventh largest in the world with an annual production of 17.5 million vehicles, of which 2.3 million are exported. The Indian automotive sector has a presence across all vehicle segments and key components. Auto industry comprises of passenger cars, two-wheelers, three-wheelers and commercial vehicles. In terms of volume, two-wheelers dominate the sector, followed by passenger vehicles. The industry had few players and was protected from global competition till the 1990s. After government lifted licensing in 1993, with the arrival of global players, the sector has become highly competitive. Automobile manufacturing units are located all over India. These are, however, concentrated in some pockets such as Chennai and Bangalore in the south, Pune in the west, the National Capital Region (NCR, which includes New Delhi and its suburban districts) in the north, Jamshedpur and Kolkata in the east and Pithampur in the central region. Following global trends, the Indian automotive sector also has most auto suppliers located close to the manufacturing locations of OEMs, forming regional automotive clusters. Broadly, the three main clusters are centred around Chennai, Pune and the NCR. Table 12.1 provides a summary view of automobile clusters in India.

From Fig. 12.1, it is clear that the turnover of Indian industry remains over US$ 60 billion for most of the years between financial year 2011 (FY11) and 2016. The gross turnover of automobile manufacturers

Table 12.1 Automotive clusters in India

	List of companies			
North	Ashok Leyland	Amtek Auto	Bajaj Auto	Yamaha
	Force Motors	Eicher	Hero Group	Mahindra
	Piaggo	Honda SIEL	Escorts	Suzuki Motorcycles
	Swaraj Mazda	Maruti Suzuki	ICML	
		Tata Motors	JCM	
West	Ashok Leyland	Eicher	Renault–Nissan	
	Bajaj Auto	Skoda	John Deere	
	FIAT	Bharat Forge	Mercedes Benz	
	GM	Tata Motors	Tata Hitachi	
	M & M	Volkswagen	VOLVO Eicher	
East	Tata Motors	International auto Forgings		
	Hindustan Motors	JMT		
	Simpson & Co	Exide		
South	Ashok Leyland	Volvo	BMW	TAFE
	Ford	Sundaram Fasteners	Bosch	Daimler
	M & M	Enfield	TVS Motor Company	Caterpillar
	Toyota Kirloskar	Hyundai	Renault–Nissan	Hindustan Motors

Source: India Brand Equity Foundation (IBEF)

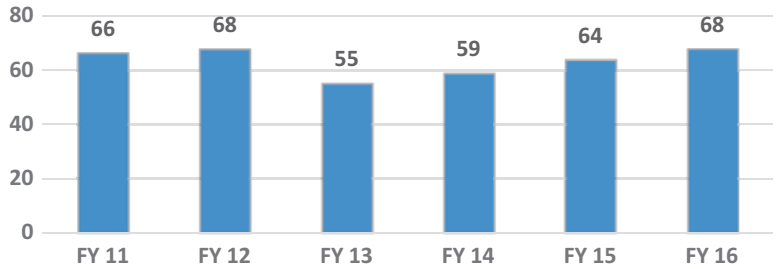

Fig. 12.1 Turnover in automobile industry (US$ billion). Source: Society of Indian Automobile Manufacturers (SIAM)

in India expanded at a Compunded Annual Growth Rate (CAGR) of 11.72 per cent during 2007–2015. However, in the last few years, it has slowed down a bit with stable production.

The domestic automotive market is largely diverse with demands in all kinds of vehicles ranging from two-wheelers to commercial vehicles. Two-wheelers and passenger vehicles dominate the domestic Indian auto market. Passenger car sales are dominated by small and mid-size cars. Two-wheelers and passenger cars accounted for 81 per cent and 13 per cent of over 24.97 million vehicles sold in FY18, respectively. Overall, automobile exports reached 4.04 million vehicles in FY18, implying a CAGR of 6.86 per cent between FY13 and 18. Two-wheelers made up 69.7 per cent of the exported vehicles, followed by passenger vehicles at 18.5 per cent, three-wheelers at 9.4 per cent and commercial vehicles at 2.4 per cent. Overall, automobile exports increased 20.78 per cent year-on-year during April–November 2018 (Fig. 12.2).

The industry is gaining worldwide recognition with a steady increase in the rate of growth of exports. India, being a prominent auto exporter, has strong export growth expectations for the near future. In 2014–2015, automobile exports grew by 15 per cent over the last year within which the passenger vehicles, commercial vehicles, three-wheelers and two-wheelers grew by 4.42 per cent, 11.33 per cent, 15.44 per cent and

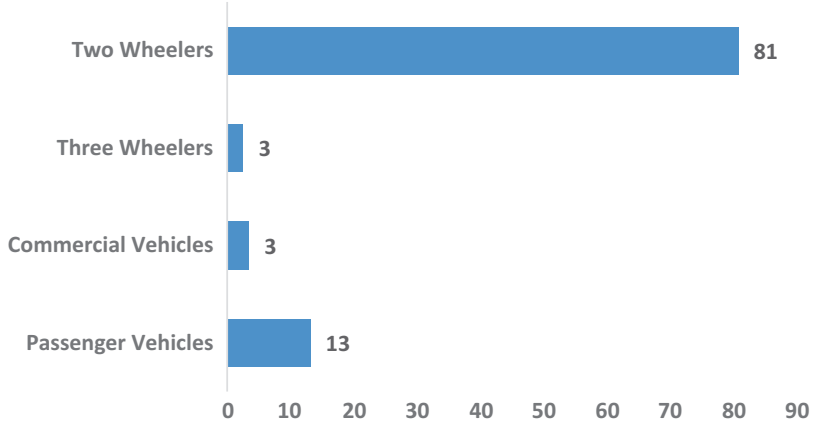

Fig. 12.2 Domestic market share of the major vehicles classified by type (2017–2018). Source: SIAM

17.93 per cent, respectively. The key exporters of passenger cars are Maruti Suzuki, Tata Motors and Hyundai Motors; the key exporter of multi-utility vehicles is Mahindra & Mahindra and the key exporters of two-wheelers are Bajaj Auto and Hero Group. India exports mainly two-wheelers followed by small passenger cars. In terms of values, India's major gain has been in the passenger car segment since 2013 (see Fig. 12.3). Slow growth is observed in the commercial vehicle segment. Though in terms of numbers, India's exports of two-wheelers experienced a jump, it is not fetching large export income as value wise export growth in this segment is much less than the value of car exports. Key destinations of exports are the west European countries, SAARC (South Asian Association for Regional Cooperation) members, Middle East and North America. The trend in growth of the automobiles can be seen from Fig. 12.3.

In the long term, the passenger vehicle segment is expected to grow to nine million units and the two-wheeler segment to 30 million units by 2020, according to Ministry of Heavy Industries and Public Enterprises. SIAM estimates that car sales in India will grow to five million vehicles by 2015 and to nine million by 2020. In fact, by 2050, Indian roads will top the world in terms of car volumes, running a total of 611 million vehicles.

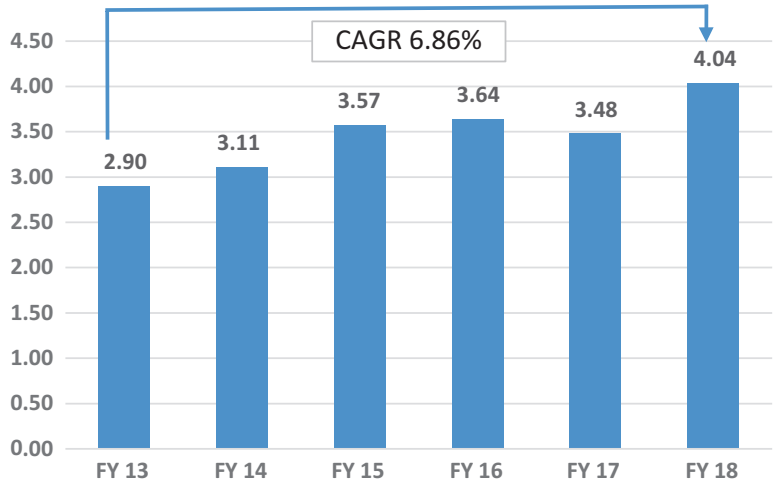

Fig. 12.3 Trend in export of automobiles from India (US$ billion). Source: SIAM

The Indian Auto Component Industry

The auto component industry, on the other hand, is also gaining its significance. Though globally it is not very prominent due to the demographic and maintenance of environmental standards, the industry has attracted a huge investment, and thus holds an important position in the domestic market. As seen from Fig. 12.4, the market size for auto component sector increased by 11.5 per cent, reaching to US$ 43.5 billion in FY16 from US$ 39 billion in FY15 and further to US$ 51.2 billion in FY17 with a growth rate of over 17 per cent. As per Automobile Component Manufacturers Association forecasts, automobile component exports from India are expected to reach US$ 70 billion by 2026 from US$ 13.5 billion in FY17. The Indian auto component industry aims to achieve US$ 200 billion in revenues by 2026. Growth of the domestic auto components industry is expected to reach 9–11 per cent in FY18 on the back of high growth expectation in domestic passenger vehicles and two-wheelers segments. Not surprisingly, the country has emerged as an outsourcing hub for international companies such as Ford, General Motors, Daimler Chrysler, Fiat, Volkswagen and Toyota (Fig. 12.5).

India's exports of auto components increased at a CAGR of 9.96 per cent, during FY09–17, with the value of auto component exports increasing from US$ 5.1 billion in FY09 to US$ 10.9 billion in FY17. Europe

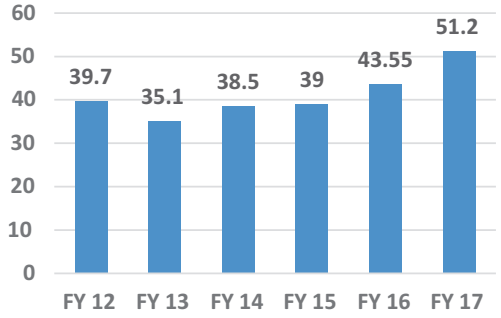

Fig. 12.4 Turnover of auto component industry in India (US$ billion). Source: ACMA

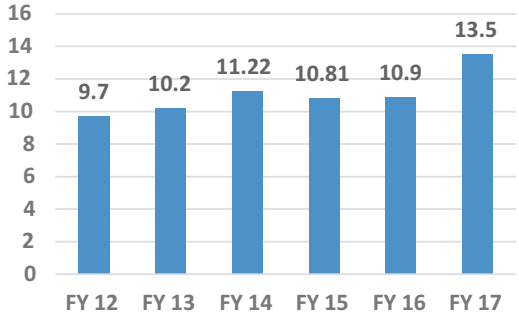

Fig. 12.5 Trend in export of auto components from India (US$ billion). Source: ACMA

accounted for a volume share of 35 per cent during FY17 in Indian auto component exports followed by Asia and North America with 27 and 26 per cent, respectively, in the same year. Though there are still some barriers in terms of access of updated technological skills, regulation of safety, maintenance of environmental standards and so on. The export figures of the auto component sector show that the sector is developing at a rapid pace, especially since 2009–2010. The major export destinations of auto components are the United States, United Kingdom, Germany, Italy, Thailand and so on. The growth rates both for turnover and for exports have gone down due to persistent global recession.

The Changing Dynamics of Automobile Market

The sector consists of an intricate and highly competitive, yet highly interdependent, value chain consisting of a complex supply chain of a number of 'tiers' of suppliers. At the OEM level, product development and manufacturing processes require large investments. As personal vehicles are one of the single most complex direct to consumer products sold today, capital investments are made at all levels of the value chain (Ernst and Kim 2002). Tier 1 and Tier 2 suppliers have significant investment in tooling and production equipment to support the OEMs at high volumes. Beyond CapEx, automakers and suppliers invest heavily in research and development of new models and features to look for an edge in the highly competitive global market.

In coming days, mobility providers (e-hailing, car sharing etc.), technology giants (consumer electronics and automobile software making companies etc.) and emerging market OEMs will define the dynamics of the value chain. As a result, the relationship between OEMs and component suppliers will be subject to the demand of consumers reflected through the modification warranted by tech companies and mobility providers (Fig. 12.6).

Market leaders in two-wheelers have started developing bikes that are 100 per cent indigenous. A very cost-sensitive segment such as tractors is at nearly 100 per cent localisation. Asia is emerging as the growth engine for the global automotive market, backed by its cost competitiveness, rising incomes, rapid urbanisation, improving infrastructure and the scope for greater vehicle penetration in most Asian countries. Automotive manufacturers are adopting a strong zero-defect policy, encouraging component manufacturers who do well on the zero-defect parameter and penalising those who do not. The global supply chain is more connected than ever before. This amplifies the impact of any unexpected changes—from exchange rate fluctuations and price volatility to geopolitical tensions or natural disasters. In recent years, many auto component manufacturers (mostly Tier 1) have gone beyond their role as part suppliers for automotive manufacturers to enter other segments of the value chain. Many companies are moving to operate as system integrators, such as offering electric mobility solutions, a computing platform for self-driven vehicles, a connected infotainment ecosystem, telematics solutions and smart supply chain solutions, among other things. Smaller companies seeking top-line growth and cost synergies are struggling in the face of increasingly complex technology and business models. More and more such

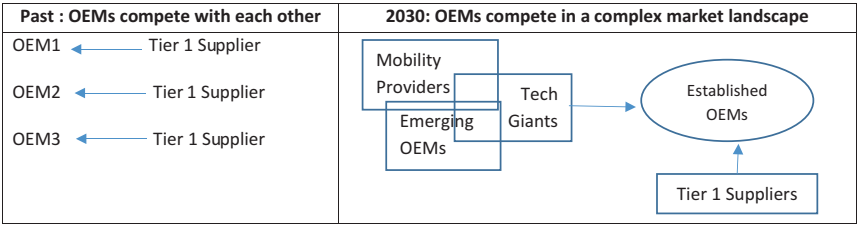

Fig. 12.6 The dynamic value chain. Source: Adapted from KPMG Automobile Outlook

companies end up merging or are taken over by bigger companies. Auto component manufacturers would need to keep pace with the changing needs of automotive OEMs, who in turn are coping with the dynamic expectations of the end customer, consolidation of platforms to reduce complexity and alterations in vehicle cost composition (Kimura 2006). While car production volumes have been rising, the number of vehicle platforms has fallen for most OEMs. This means automotive manufacturers could require simpler, more versatile components that are usable across multiple platforms. Product lifecycles for many car manufacturers have been shrinking. In India, as tastes shift and evolve and new entrants join the ranks of consumers, vehicle owners scout for fresh options more frequently than they did before, eager to upgrade or change their set of wheels. Rapidly evolving emissions and safety regulations as well as technological disruptions such as connectivity and e-mobility could underpin the demand for electronics at an OEM and customer level. For instance, it is expected that the implementation of Bharat Stage VI (BS-VI) standards will lead to a spike in demand for components like catalytic convertors, electronic fuel injection systems, oxygen sensors and intelligent battery sensors. OEMs around the world have been gravitating for a while towards a model of close collaboration with a small, informal group of auto component suppliers that grow and expand a business together (Grandori and Soda 1995). The World Bank has highlighted that only 47 per cent of automotive companies in India have internationally recognised quality certification, compared to 83 per cent in China.

The level of regulation is medium but quickly increasing. Emissions, fuel economy standards and crash safety have been at the centre of regulation for several decades now and are widely known and publicised. Safety recalls have been a recent topic of discussion with both 2013 and 2014 seeing record number of recalls industry wide. Regulations are increasing worldwide, and the lack of international standards leave OEMs with the high costs of certifying their vehicle platforms for use in multiple countries (Table 12.2).

Electric vehicles are one of the trends shaping the sector, now and in the future. Convergent factors such as increasing concerns over energy security, climate change and increasing oil demand from rapidly industrialising nations have created heightened interest in a variety of fuel-saving technology options. However, as electrification is not consumer driven but instead being driven by legislative requirements, market penetration of full electric vehicles will remain low.

Table 12.2 The changing market dynamics in India

Constantly shifting market dynamics		Changing OEM needs	Technological improvements and discontinuities	Evolving regulatory and trade environment
Make in India, for India and the World	The rise of the East	• Changing pockets of growth • Platform consolidation	• ACES gathering momentum • Industry 4.0	Emissions: BS-VI, EV, Methanol, CNG, fuel cells
Traceability and zero defects	Volatility and forcastability	• Shorter product lifecycle	• Advanced materials	Safety: Braking, cabin, rollover protection
Auto component manufacturers integrating up the value chain	Evolving adjacent industries in India	• Rise of electronics • Tier 1: Rationalisation	• Rise of new challengers from unrelated sectors	Scrappage: Lead use, reverse value chain
Consolidation in the global industry		• Tier 2 and 3: Quality	• Mobility as a service	Dynamic Global Trade policies

Source: IHS Markit

Technology Adoptions in Automobile Industry

The role of technology has been crucial for the companies in the automobile sector. Many companies are trying to enhance customer experiences using technologies. They are also raising the bar of customer expectations to redefine competition and gain a competitive advantage. Companies are leveraging technology to improve product quality, operation planning or even factory design (Nag et al. 2007). Innovation in the sector has been imperative for staying competitive in the market. Some of the most important ways through which the firms in the sector are remaining competitive are highlighted below.

Digitalising Factory Operations

Digitalisation of the factory operations has been one of the key instruments which firms are adopting. This not only improves the precision but also maintains the standards as per the requirement. Government of India in its strategy paper on artificial intelligence argues strongly for smart mobility for a developing country like India with a focus on solving several problems such as route optimisation, assisted driving, congestion management apart from several technical modules in production process.[3] It is expected that automation and digitisation will change the landscape of Indian auto industry as production process will move from volume based mass production to value based system. Volume based production has been improving the system through shop floor customisation but connected manufacturing offers the auto sector unique opportunities that would facilitate new business models and innovative products with greater integration of functions through embedded systems. Automation, combined with connectivity are expected to provide more real-time data for analysis and continuous improvement. Indian industries are gearing up for this new reality.[4] Modern automobile factories require a balanced combination of digital tools and human interface. The following are highlighted as some of the key ways of implementation of digital technology in factory operations.

Tracking of Assets and Products

Asset tracking is one of the most common activities in factory operations, especially for companies which are asset intensive. Advancements in technologies are enabling companies to create enhanced solutions to track their assets.

Remote Monitoring of Production Processes

Digital technology enables companies to send process-related data directly to the cloud and perform many operations with it. Companies can store this huge volume of process-related data in a big data store and later analyse it to find patterns. They can monitor live streaming from the production process from anywhere in the world through various mobile devices. They can get notifications by email or SMS if required in certain situations.

Predictive Maintenance

A predictive maintenance solution takes into account various parameters such as temperature, pressure, vibration, revolutions per minute and flow rate from machines through the sensors and applies analytics technologies to understand the probable time for failure based on the historical instances of failure and the corresponding parameter values. A match in the streamed equipment data with pre-identified failure patterns triggers alarms and notifications indicating a deterioration of machine health and the potential for equipment failure.

Flexible Manufacturing

Radio frequency identification (RFID) is used to track products and their movements during the product lifecycle. RFID attached to a product can hold information about the production process needed to manufacture that product. Thereby, it can guide the product through its production process without human intervention. The machines, robots and other

components of the production system will follow the instructions from the RFID chip to produce the product.

Augmented Reality–Based Solutions for Training Workforces

Augmented reality (AR)–based training solutions are already used in multiple companies belonging to industries such as automotive, aerospace and logistics. Many other companies are exploring the idea of creating such solutions.

Technology in Product and Customer Experience

Products are being designed to capture data about themselves through embedded sensors, processors, software and connectivity. The data can then be sent to the cloud and analysed for after-sales product performance. Companies can capture the pattern of how certain products are actually getting used by the customer and this can be a valuable input for future product development. Companies can also respond fast to provide after-sales service to the customer if the captured data suggests any problem with the product. A few automotive, heavy machinery and energy sector companies, among others, have started using such solutions.

Technology in Product Design and Prototyping

Virtual Reality and Augmented Reality in Product Development and Prototyping

Virtual reality (VR) in the product development and prototyping space has its advantage. It provides a close to real-life interactive experience. So, engineers can verify fit or compatibility of components and inspect photorealistic 3D objects in virtual space. AR-based solutions are also used for product development. AR can superimpose the 3D designs on a user's view of reality. Therefore, using such solutions, it is possible to compare life-size 3D holograms generated out of the computer-aided design (CAD) model with a physical prototype or even a product.

This can improve the quality assurance process and provide the ability to discover defects fast during the product development phase. It can also reduce the inspection time during the quality control process. Such a solution has saved nearly 96 per cent of the inspection time for a ship-building company.

Digital Twin

Digital twins are virtual models of physical assets such as products, processes, systems or facilities. Digital twins are being used by companies in various ways. Some of the companies are using them to plan, design and construct factory building and infrastructure. The technology can support testing, simulation and commissioning of factory buildings.

Rapid Prototyping using Additive Manufacturing

Additive manufacturing offers a cost-effective and faster way to prototype. Often, prototyping for a newly designed product may involve expensive operations like a production run. It may also involve investments like mould alteration before the design is even verified. In such cases, additive manufacturing lowers cost and time (Table 12.3).

Table 12.3 Major steps taken up by India on technology upgrading and mobility

– The Automotive Mission Plan 2016, which aims to increase domestic production of automobiles, increase automotive exports and address environmental and safety challenges
– The National Automotive Testing and R&D Infrastructure Project, which has been set up to enable the industry to adopt and implement global performance standards by establishing nationwide automobile testing agencies
– The National Electric Mobility Mission Plan 2020, which provides incentives to manufacturers of and purchasers of electric cars
– The Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles scheme, which provides monetary incentives to producers and purchasers of eco-friendly vehicles in the country

Source: https://gettingthedealthrough.com/area/95/jurisdiction/13/automotive-india/

Government Facilitation for Technology Implementation

The initiatives of the Indian government, such as 'Make in India' and 'Digital India', are efforts to foster technology adoption and global standards in the industries. The government is promoting the adoption of 'Industry 4.0' and smart manufacturing throughout the manufacturing sector.

One of the premier institutes of India is building India's first smart factory with a seed fund from a global aviation giant. This factory collects an enormous amount of data from literally every object. It even collects data from the posture of a worker and determines when the worker needs rest after analysing posture data and other data from his working field. In a nutshell, the factory is self-aware.

The government of India's push for electric vehicles under the Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles in India scheme will help the automotive industry to upgrade their products by using the latest technology. The government's initiative for a comprehensive study on Zero Emission Vehicles (Zevs): Towards a Policy Framework is an important step in this direction. As part of this initiative, the government is procuring electric vehicles from the country's renowned auto manufacturers. It is also bringing electric vehicles under a lower taxation rate. All big automotive OEMs in India are gearing up to use this new technology in their products. Renowned battery companies are researching advanced battery technologies to support these vehicles.

In another initiative to curb environmental pollution, the government of India has decided to adopt Bharat Stage VI as the minimum standard for automotive manufacturing (Automotive Mission Plan 2016). Once implemented, this will require a significant step forward by moving two levels at a time. Bharat Stage V, which was compliant with Euro V standards, will be skipped completely. The implementation timeline is within the next few years. This regulation change and associated implementation are expected to bring technology-driven changes in the automobile value chain, including auto ancillary sectors which are related to the manufacturing of engine and fuel components.

Moreover, the government of India's 'Smart Cities Mission' to develop smart cities across India is expected to boost the usage of sensors, connected objects and emerging technologies. It is also expected to provide improved infrastructure. All of these will ultimately benefit the manufacturing industry as well as many other industries.

The government of India is aiming for 5G network connectivity in India by 2020. The large network service providers in India are working on technologies that can support and enable 5G connectivity. The prospect of 5G connectivity in the next few years will provide a boost to IoT initiatives across industries.

State governments are also taking many initiatives to boost technology adoption. A few state governments have set up partnerships with information technology companies to spread digital awareness, promote technology adoption and develop skills for digital transformation. Some of them are conducting state-level hackathons to develop solutions in challenge areas like fintech, tourism and transportation. They are also trying to build their states into hubs for selected technologies.

Keeping all these trends and expectations in mind, the government launched the Automotive Mission Plan (2016–2026) which aims to make India one of the top three manufacturers and exporters of vehicles and components. It is possible only when India adopts most modern technology and employs skilled workforce. Already, the automobile industry is recognised as the main engine in the 'Make in India' initiative and a lot of investments are made for skill development. Government is also focussing on improving fuel or emission norms, safety regulations, end-of-life policies for vehicles and so on. Fiscal and better tax regime is proposed to finance the growth of the industry along with investment in R&D and participation in global value chain.

Labour Issues in Automobile Industry

Democratic governance structure and several constitutional rights provide Indian workers a bargaining power with the management. India has also witnessed vibrant trade union movement in the past. It introduced Minimum Wage Act in 1948 and later Social Security Act for unorgan-

ised workers in 2008. This is important as the long tail of the value chain in the industry ends up with some kind of informalisation. Though the laws are in place, some studies have identified a decline in compliance and a rise in unfair practices (Sreenivasan and Tripathy 2014). Automobile sector has long supply chain with numerous Small and Medium Enterprises (SMEs) engaged at various levels with different level of technology infusion. Given the strong backward and forward linkages, promoting SMEs in the auto sector has been central to the industrial policy of India. SMEs act as subcontractors to large firms, following the production requirements and specifications of the latter. The SMEs also try to regularly upgrade their technologies through vertical and horizontal integration networks of OEMs. After the entry of many international OEMs in India, the relationship between OEMs and SME suppliers has undergone a substantial change. Earlier, OEMs used to take some amount of risk by having JV relationship with SMEs or some kind of collaboration for development of the products or even sometimes financing product development (Ruigrok and Tulder 1995). However, the relationship has become more 'cost based' gradually, which increased the risk of SMEs in taking up investment to fulfil the requirement of OEMs. As Indian industry is now globally linked, this has clearly increased the risks for SMEs who are now directly facing the ups and downs of global demand. This in turn has an effect on the labour relationship. More skilled and productive employees are in demand due to infusion of technology, and slowly, there is an erosion of unproductive labour. Several authors, such as Remesh (2017), argue for more proactive policies from government on labour management so that the automobile sector can contribute meaningfully to Indian economy. Studies highlight labour issues in companies like Suzuki, Hero Honda, Toyota, GM as a demonstration of changing labour relations in India due to the advent of globalisation. Barnes (2014) highlights that auto cluster now relies upon a well-entrenched regional labour contracting system in order to lower labour costs and minimise the impact of collective bargaining and trade unions. Most workers in medium-to-large auto assembly and components firms are hired by labour contractors. A report in Business Today (July 17, 2016)[5] indicates that strikes and lock-outs in automobile firms are due to salary disputes and lay-offs. Companies employ contractual workers considering the cyclical nature of the market with a huge salary

disparity between permanent and contractual workers. Nowak (2016) has brought up an important issue analysing the labour unrest of 2011 and 2012 in Suzuki factory. Due to huge difference in salary and other benefits between permanent and contractual labour, different trade union organisations are in conflict among themselves, which weakens the overall trade union movement. The article also highlights that labour unrest at ancillary level has an industry-wide impact as many SMEs supply different OEMs simultaneously.

Due to more automation, several auto majors are now trying to shift some of their operations to other countries. At the juncture when India is eyeing for an improved position in the global automobile market, labour disputes continue to haunt the OEMs. It is only the vibrant domestic market which acts as a binding force for these OEMs to continue and expand their business operation in India. India requires to bring a balance among productivity, skill development and contractual employment system; otherwise, it is going to affect its export performance. Lastly, it is important to note that labour disputes in automobile industry have been under control mostly in recent times due to active involvement of the Indian judiciary.

Conclusion

Overall, technology adoption among companies in the automobile sector is increasing. Industry bodies are generating more awareness about new technology options by providing a common platform to industry leaders, academia, service providers and consultants. At the same time, emerging technologies are going to change the manufacturing landscape in a significant way. There will be new opportunities for developing products and services as the fourth industrial revolution is going to bring sweeping changes in automotive manufacturing and automotive component manufacturing. Competition is expected from nontraditional players. Government has already undertaken certain initiatives to embrace the new technologies in the sector. India is set to create an example of a productive manufacturing environment by leveraging the emerging technologies embracing the new digital industrial revolution in the automobile sector.

Notes

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