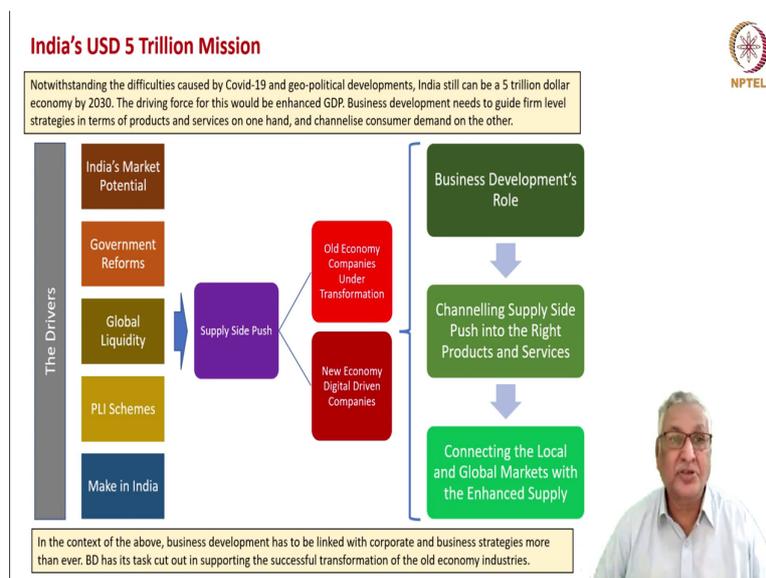


Business Development From Start to Scale
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Week - 03
Industry Structure and Company Analysis
Lecture - 13
Industrial Transformations

Hi friends. Welcome to the NPTEL course Business Development from Start to Scale. We are in week 3, with the theme of Industry Structure and Company Analysis. In this lecture, the 13th in the series, I will focus on Industrial Transformations. When I say industrial, it also includes business.

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India has a 5 trillion dollar mission. We have had difficulties caused by COVID-19 and more recent geopolitical developments. However, India can still aspire to be a 5 trillion dollar economy by 2030. The driving force for this would be enhanced GDP. Business development needs to guide at the firm level strategies in terms of products and services on one hand, and channelise consumer demand on the other.

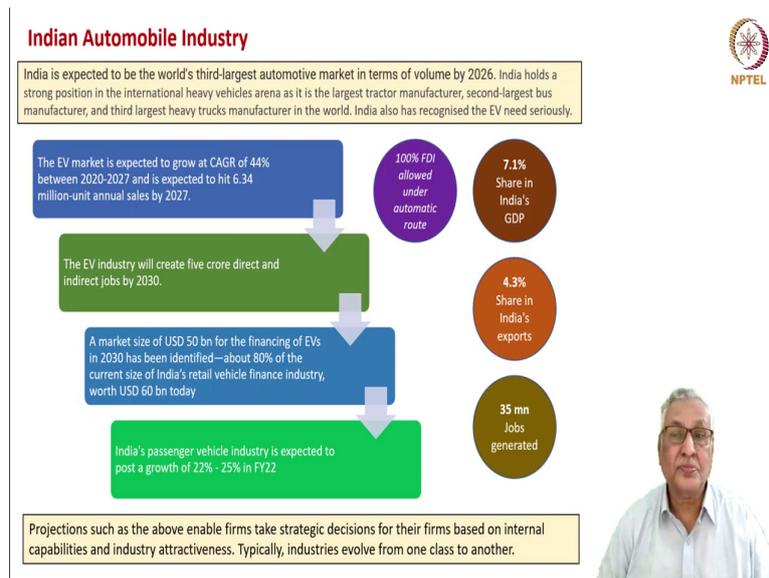
The way the private and public sector enterprise's function and create wealth would be a great support for India's 5 trillion dollar mission. The drivers for this mission are India's market potential, government reforms, global liquidity, PLI schemes that is production linked incentive schemes, and they make in India initiative. All of these things will provide supply side push. We also have two types of firms which are in this mission.

The first type, the old economy companies under transformation, be it the engineering firms or the shipping companies or the automobile companies. There are also new economy digital driven companies such as the Nikons, Zomatos, and Paytms of the world.

In this overall network, there is a strong role for business development. It needs to channel the supply side push into the right products and services. It must connect the local and global markets with enhanced supply. In the context of the above, business development has to be linked with corporate and business strategies more than ever.

Business development also has to be linked to the other functional strategies such as strategic marketing, development of strategic plans and things like that. BD has its task cut out in supporting the successful transformation of the old economy industries as well as smooth entry of new economy industries.

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I would consider now several industrial situations which demonstrate to us the kind of transformation that is on the anvil in each of these industries. All of these slides are very busy slides with lot of data and information, and it is not my intention to present each of these data points in this lecture.

However, I will pause for sufficient time for you to go through at a quick glance the data and information provided, and along with my speech you will be able to find out the contours of the emerging industries. India is expected to be the world's third-largest automotive market in terms of volume by 2026. We are presently the fourth-largest.

We have a strong position in the international heavy vehicles arena. We are the largest tractor manufacturer, second-largest bus manufacturer, and the third largest heavy trucks manufacturer in the world. It is not a main achievement considering that in the late 70s, we

were producing just 40,000 vehicles of all types. India also has recognized the electric vehicle need seriously.

We are going to have a situation where the EV market is growing to grow at rapid pace, expected to be 44 percent. We also have 100 percent foreign direct investment allowed under the automatic route in this industry. Even otherwise the industry has been contributing 7.1 percent share in India's GDP and 4.3 percent share in India's export.

35 million jobs are generated by the automobile industry. And all of these things are going to grow substantially manifold when the automobile industry transformation takes place. That is because the existing industry will be there, and an entirely new industry based on clean energy vehicles will be superimposed on this industrial structure.

Therefore, firms have to take strategic decisions, develop their businesses in a manner that they meet national goals, the climate goals, and also firms financial and physical goals. Typically, industries evolve from one class to another, and automobile industry is a classic example.

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Electric Mobility

Government of India targets 30% share for electric vehicles by 2030. The Automobile sector contributes 49% to India's manufacturing GDP and 7.1% to India's GDP. The 2nd AMP (Automotive Mission Plan) released by the Government outlines the plan to elevate the Automotive Industry to world-class levels.

EVs in Two-wheeler Segment
Expected to be valued at USD 2 bn by 2025 and penetration of 16% by 2025

EVs in Three-wheeler Segment
Expected to be valued at USD 0.6 bn by 2025 and penetration of 20% by 2025

EVs in Four-wheeler Segment
Expected to be valued at USD 1.5 bn by 2025 and penetration of 5% by 2025

As part of Paris agreement in 2015, India committed to reduce the emission intensity of its gross domestic product (GHG emissions per unit GDP) by 33% - 35% over 2005 levels by 2030. In order to meet its global commitment and mitigate adverse impact of the automobiles (ballooning oil import expenses and increasing air pollution), the Government is keen to shift the narrative towards electric vehicles. The electric vehicle market in India is expected to be valued at USD 2 bn by 2023.

With battery costs declining faster than anticipated, EV economics become favourable as battery costs decline; the five year TCO becomes favourable over any alternative in most markets.

The number of electric vehicles operating in the medium and heavy passenger vehicle category increased from 124 in 2018 to 1,356 as of 6 August 2021. 3.87 lakh Electric Vehicles and 6,740 Electric Buses were sold in India under FAME India Scheme as of August 2021. Additionally, consumers benefit from financial (e.g., subsidies) & non-financial (e.g., road access, registration privileges) incentives.



Electric mobility is the key driver of this transformation government of India targets although not mandated a 30 percentage share for electric vehicles by 2030. We are having 49 percent in manufacturing GDP and 7.1 percent as I said earlier in the overall GDP.

If the automobile mission plan proceeds as per the plan, the contributions are expected to be significantly higher, maybe 2 to 3 basis points. We are expected to be valued at 2 billion dollar electric vehicle market by 2025 with a penetration of 16 percent by 2025. Similarly, in two-wheeler segment, we are expected to have 20 percent penetration. As of now the electric vehicles in four-wheeler segment are expected to be only 5 percent.

But together with hybrids flex fuel vehicles hydrogen, we will be able to achieve even 50 percent share in the four-wheeler market as we look forward for the future. The fame policy

of the government of India to incentivize the electric mobility is also paying off with several transport undertakings wanting to have electric vehicle services.

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Indian Electric Automobile Industry

E-rickshaws category stands at 0.7 million units a year and has grown rapidly in the last 5 years. It is primarily based on Lead Acid batteries and close to 50% of this market is completely unorganized and unregulated. By 2024-25, as much as 40 per cent of the e-rickshaw market is expected to be li-ion battery based.

Charging stations do not need a separate licence under the Electricity Act of 2003

An outlay of Rs 10,000 cr has been made for FAME-II over 3 years till 2022. Around Rs 9,000 cr has been set aside for incentives and Rs 1,000 cr has been kept for charging infrastructure

India's passenger vehicle industry is expected to post a growth of 22% - 25% in FY22

FAME
Through this Scheme, the Government of India intends to optimally incentivize potential investors, both domestic and overseas, to set-up manufacturing facilities with emphasis on maximum value addition and quality output and achieving pre committed capacity level within a pre-defined time period

Customers of 2Ws are expected to be one of the early adopters of electrification. 2W fleets are likely to shift to EVs much more rapidly. High vehicle utilization and easy home or workplace charging would drive the uptake in the commercial 2W segment. The electric two-wheeler market in India is emerging on account of increased government policies supporting battery-powered vehicles, the growing awareness toward the environment, increasing petrol prices, and stringent emission norms. Business Development efforts from the industry will help in this transformation.

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The Indian electric automobile industry is not going to be just an industry; it is going to be an entire net ecosystem or network. We need charging stations, we need battery swiping stations, and we need new fuel making companies that whether it is flex fuel or whether it is hydrogen fuel. Customers of two-wheelers are going to be in the lead in terms of electric revolution.

However, passenger cars and also lighter end of trucks are not going to be far behind. A new concept of electric mobility is going to take place in the passenger sector, wherein the transport undertakings would expect the manufacturers to offer electric mobility as a service that is going to be eMaaS, Electric Mobility as a Service.

So, business development efforts are required for the electric automobile industry to take routes and spread itself in multiple directions creating a virtuous ecosystem through networking efforts with all the vendors, channel partners and other stakeholders.

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Auto Component Industry

The Indian automobile component industry has emerged from the shadows of the OEM industry to drive its business. However, the industry is at a point of inflection with the electric transformation underway, which will only accelerate.

- The rapidly growing auto market in India is expected to reach USD 300 bn by 2026
- Automotive aftermarket segment in India is expected to reach USD 32 bn by 2026
- Auto Components industry exports to grow 5X in next 10 years

2.3% of India's GDP High Job Potential 5 Mn job potential

13% over 6 years Strong Growth Opportunity for New Technologies

OEM, Spare Parts and Export Potential Hybrid/EV Potential 1.5 Mn vehicles

Opportunity to lead the change	Responsibility to collaborate with OEMs
Tie up with global EV ecosystem	Network with other industries

The industry has many challenges of phaseout of many ICE related components (at least from OEM demand perspective) and the phase-in of new generation components for which technologies and investments are needed.

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Unlike to the automobile industry is the automobile component industry. Initially, it was in the total shadow of the original equipment manufacturing industry that is the end automobiles. However, today the automobile company industry has emerged from the shadows. It is an industry in its own right, with its own production capabilities.

With its own ability to serve other engineering and other infrastructure sectors, and more importantly a hub of export production. It covers 2.3 percent of India's GDP, has high job

potential, 5 million jobs to be exact. Over the last 6 years, it has been demonstrating a 13 percent growth rate.

And there is a huge opportunity for new technologies because of the clean mobility options that I have outlined. And we are expecting new components to be required for millions of vehicles. Now, what is the opportunity that the auto component industry has now? One, it has the opportunity to lead the change.

It has the responsibility to collaborate with original equipment manufacturers. It has the responsibility to tie up with the global electric vehicle system. And it has to network with other industries. The industry has many challenges of phasing out the current industry structure. Several components that are required for internal combustion engines.

Be it the cylinder head, the crankshaft, or the camshafts, and the valves etcetera will no longer be required, if it is electrification. But at the same time, if hydrogen is going to be the dominant fuel, at least in certain segments of the automobile industry such as trucks and buses, it is quite possible that the existing architecture of internal combustion engine will be retained, substantially with hydrogen playing its part.

Therefore, the phase out of the established technologies and the phase in of the new technologies cannot be a major reaction. It has to be carefully planned for in association with the technology developers as well as the original equipment manufacturers.

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Auto Components: The Transition

The USD 49 bn (FY20) Auto Components industry in India is expected to grow to USD 200 bn by 2026. Auto parts industry exports, valued at USD 14.5 bn in FY20, is likely to grow at an annual rate of 23.9% to reach \$80 bn by 2026.

Growth Drivers	
<p>USA, Germany, UK, Thailand and Italy are the top destinations for exports.</p>	<ul style="list-style-type: none">•Expanding R&D hub <i>8% of the country's R&D expenditure is in the automotive sector</i>•Emerging global sourcing hub <i>Proximity to markets such as ASEAN, Europe, Japan and Korea</i>•Cost competitive <i>Excise duty reduction in vehicles will spur demand</i>•Sixth largest vehicles manufacturer in the world <i>India expected to be the third largest market by 2026</i>•Favourable trade policy <i>100% FDI allowed and no restrictions on import-export</i>•Atmanirbhar Bharat <i>PLI schemes in automobile and auto component sector with financial outlay of Rs 57,042 crores introduced under Atmanirbhar Bharat 3.0</i>
<p>Aftermarket segment which includes tyre, battery, brake parts, is expected to reach USD 32 bn by 2026 from USD 9.8 bn currently.</p>	
<p>The overall industry which accounts for 2.3% of India's GDP currently, is set to become the 3rd largest in the world by 2025.</p>	
<p>Auto component industry could see certain divergence in strategy at the apex level and marketing at the functional level.</p>	

The auto components industry in its phase-in of new generation EV components is cushioned in this transformation by the parts support that millions of vehicles on road require.



The growth drivers for this transformation of becoming a 200 billion dollar industry by 2026 which is very ambitious, is going to happen because of the following. One, expanding R and D have 8 percent of the country's R and D expenditure which is in the automotive sector needs to be doubled.

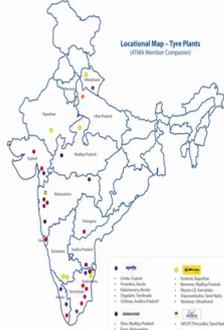
We need to be the global sourcing hub for all the emerging and established automobile hubs including Japan and Korea. We need to be cost competitive by cost of manufacture as well as by the tax structure. We need to become a supplier for the sixth largest vehicle manufacturing company in the world, and we need to have a favourable trade policy.

And auto components are going to play a major role in the Atmanirbhar program that is the self-reliance program of the Narendra Modi government. There are already many developed countries which are the top destinations for exports, USA, Germany, UK, Thailand.

We also have a strong aftermarket segment because the demand for aftermarket products is linked to the population on the roads. We could see some divergence in strategy at the apex level and marketing at the functional level.

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The Indian Tyre Industry



Locational Map - Tyre Plants
(66 Member Companies)

No. of Tyre Companies	41
No. of Tyre Plants	66
Industry Turnover 2019-20	Rs 60,000 Crore (USD 8.5 Bn)
Exports 2019-20	Rs 12,840 Crore (USD 1.8 Bn)
Export Intensity	21.4%



Apollo Tyres

Bridgestone

CEAT

Continental

GoodYear

JK Tyre

Michelin

MRF

TVS Eurogrip



Let us look at the Indian tyre industry. It is also an established industry closely allied to the automobile industry. There are as many as 41 tyre companies in India with 66 tyre manufacturing plants. The output is valued at 8.5 billion dollars, and the exports is as high as

1.8 billion dollars is one of the industries which has got very high export intensity at 21.4 percent.

In comparison, the automobile waves have probably an export intensity of 10 percent. The names I have listed here Apollo Tyres, Bridgestone, CEAT, Continental, GoodYear, JK Tyre, Michelin, MRF and TVS Eurogrip, illustrate the kind of depth and breadth the tyre companies in India have in terms of providing tyres for every conceivable automobile.

Looking at the map, you can see that the tyre industry is pretty well spread out. Particularly, in Tamil Nadu and Kerala, given the proximity to the rubber manufacturing state of Kerala. In Maharashtra given the proximity to engineering and automobile industry, and in certain other regions of the country mainly with reference to the logics cost and advantages that accrue along with the automobile component dispatches.

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This is the segmental production. The total tyre production has been going up substantially a significant annual rate of growth, but due to COVID it has taken some kind of dip over the last 2 years. Out of the various tyres that are produced two-wheeler tyres naturally account for the maximum share by numbers, followed by passenger car, medium and heavy commercial vehicles, light commercial vehicles, and tractor tyres.

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The segmental exports are also substantially different. In terms of the tyre exports, total tyre exports have been to the value of 335 lakhs, and in truck and bus segment it has been 36.24, and in terms of the form agriculture it has been 34. Passenger car 22 and 2, 3-wheeler 37. It is and off the road tyres it is 21. Therefore, it is more or less uniformly distributed across the various segments of the vehicle industry, which requires tyres of all sizes.

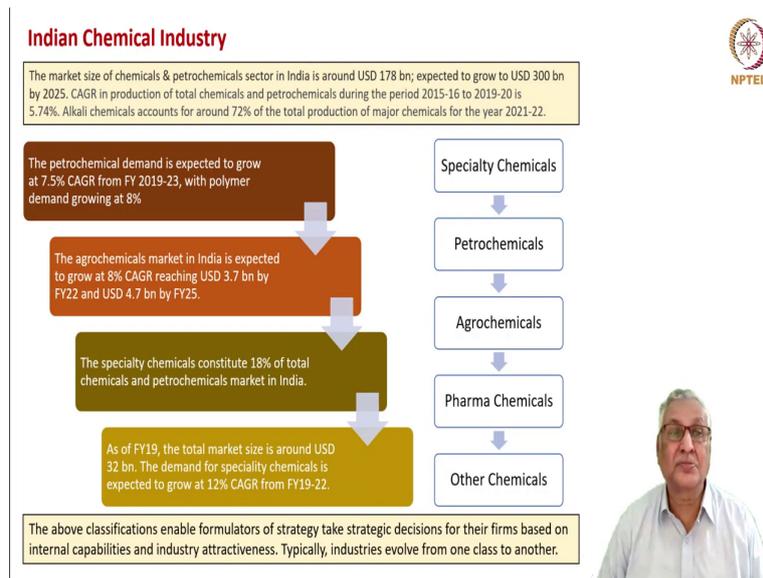
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Global Tyre Industry Turnover



Within the global tyre industry turnover, you can see that there has been periods of high growth and there also have been periods of decline, and again rejuvenation of the growth. As far as the Indian industry is concerned, the expectation is that the tyre industry will continue to have a forward-looking growth direction.

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Let us look at another industry, chemical industry. This is one of the industries which is going to have great potential in the context of the China plus 1 strategy, that is being looked at by several companies which have chemicals as their inputs. The petrochemical demand is expected to grow at 7.5 percent.

And within that the polymer demand is expected to grow at 8 percent. Agro chemical market is also expected to grow at 8 percent. However, the specialty chemicals would be growing at even faster clip. As of now the specialty chemicals constitute 18 percent of the total chemicals and petrochemicals market in India.

And the types of chemicals where there could be higher emphasis in future would be the specialty chemicals which are constituted into petrochemicals, agrochemicals, pharma chemicals and various other chemicals including those which are used in the paints and other

industries. Again, these classifications help the strategist to take appropriate business development approaches for the chemical industry.

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Growth Drivers for the Indian Chemical Industry

Manufacture of chemicals and pharmaceuticals is not soft on environment. With China clamping down on pollution, shift of the chemical industry from China to India in part seems to be underway. Some triggers from India are as below.

- Rising disposable income, median age of population, urbanisation and growing penetration and demand from rural markets
- Shift in production and consumption towards Asian and Southeast Asian countries in all sectors leading to increasing demand for Chemicals and Petrochemicals
- Shift in consumer preferences towards a healthier lifestyle and environment-friendly products
- Opportunity to produce USD 111 Bn worth of chemical products by 2023 for domestic requirements
- Production Linked Incentives scheme for manufacturing of Advanced Cell Chemistry Battery under Atmanirbhar Bharat Abhiyaan

The Indian chemical industry needs to act on multiple fronts to handle the opportunity in India and abroad while meeting the environmental concerns.

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What are the growth drivers for the Indian chemical industry? The Indian chemical industry is an input to far more number of industries than we are aware of. Any household item has a touch of chemicals either embedded or externally seen in one form or the other.

And the rising disposable income median age of the population urbanization and growing penetration and demand from rural markets are contributing to the growth of the Indian chemical industry. Similarly, the shift in production towards Asian and Southeast Asian countries is also going to provide a big boost.

People like a healthier lifestyle and environment friendly products therefore, the chemical industry itself is likely to be disrupted in terms of more environment friendly products. There is a huge opportunity to produce USD 111 billion worth of chemical products by 2023 for domestic requirements.

And the production linked incentive scheme for manufacturing of Advanced Cell Chemistry Batteries under Atmanirbhar Bharat Abhiyaan is also going to provide a great boost. We have to act under different canopies with different thrust areas to be able to handle this opportunity in India and Abroad. And we have to also meet the environmental concerns.

The ability of the Indian chemical industry to be climate friendly, to be environmental friendly, is going to be the big clincher as far as the globalization of the Indian chemical industry is concerned. After the Indian chemical industry, we have got the oil marketing and oil refining.

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Indian Oil Marketing Companies

India has three major public sector oil companies which are both refiners and marketers of oil and petroleum products.



IndianOil Bharat Petroleum HINDUSTAN PETROLEUM CORP. LTD.

Company	Turnover 2020-21
IndianOil	Rs 514890 Crore (USD 68.7 Bn)
Bharat Petroleum	Rs 236889 Crore (USD 31.6 Bn)
Hindustan Petroleum Corp. Ltd.	Rs 235785 Crore (USD 31.4 Bn)



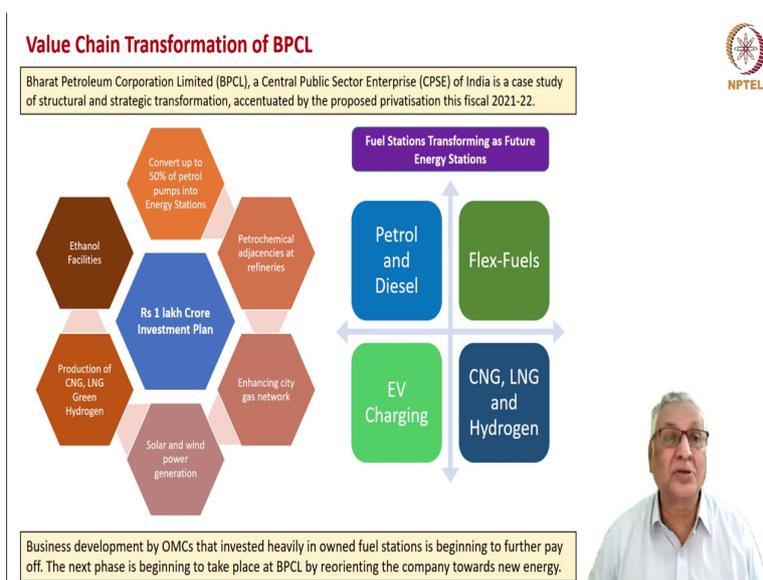
Given the extensive pan-India national distribution network and fuel stations, the 3 oil majors are known as oil marketing companies (OMCs) as much as oil refinery companies. The above turnovers are 20 to 25% lower than their peak pre-Covid fiscal performance.



We have 3 major public sector oil companies company which are both the refiners and marketers of oil and petroleum products and their giant companies. They have pan India national distribution and the retail infrastructure. They have got turnovers which are continuously growing given the demand for the petroleum products in India.

While electrification is going to lead to a slowdown, but the growing rate of industrialization would ensure that at least for the next 5 to 10 years, the growth profile of the oil refining and oil marketing industry gets established. However, the oil companies are not smug to this fact. They are trying to change the value chains of their companies.

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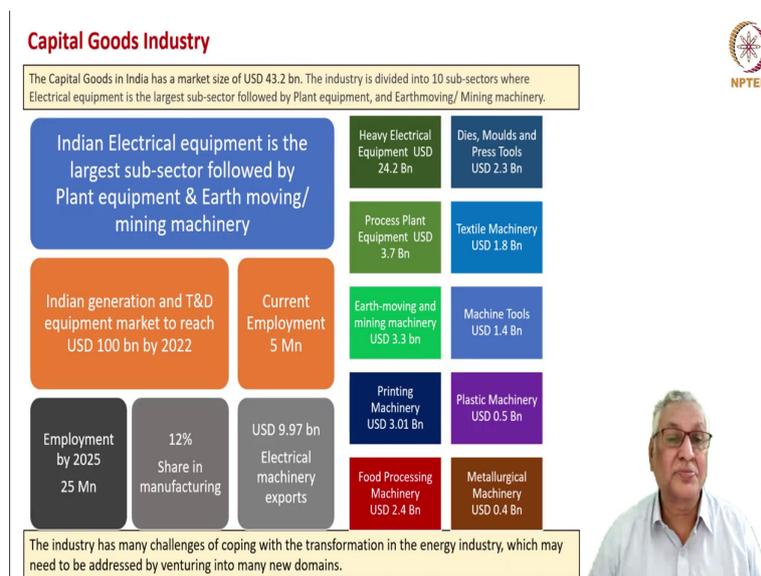
A classic example is the value chain transformation of Bharat Petroleum Corporation Limited, which is the Central Public Sector Enterprise of India is a case study of structural and strategic transformation, which will happen when you are going to have industrial transformation. It was to have had a privatization. This fiscal that is 2021-22, but it is now postponed because of the requirements for a better valuation.

The company has got a 1 lakh crore investment plan in Indian rupees. The idea is to convert as many as 50 percent of petrol pumps into energy stages; that means, any type of energy will be supplied in those petrol pumps, not merely petrol or diesel. They are also going to establish petrochemical adjacencies at the refineries. There is going to be a thrust on enhancing city gas network.

BPCL is committed to solar and wind power generation besides production of CNG, LNG and Green Hydrogen. Ethanol facilities and blending facilities are being set up. In fact, Indian Oil Corporation has taken the lead to establish a dedicated plant for ethanol production which also will use up this stubble which is being brought out of the farm operations in Punjab and northern parts of India.

And it will achieve two purposes. One, it provides the feedstock for the ethanol production. Two, it eliminates the pollution caused by the burning of farms stubble. Business development by OMCs has invested in the past on owning of the fuel stations, but this is now going to be the new competitive advantage for these oil marketing companies, because this can be repurposed to be energy stations and suppliers of clean energy for the automobile industry and the road transportation industry.

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Now, let us look at the capital goods industry. It is a huge industry a market size of 43 billion US dollars. It has 10 subsectors, heavy electrical equipment, dies, moulds and press tools, process plant equipment, textile machinery, earth-moving and mining machinery, machine tools, printing machinery, plastic machinery, food processing machinery, and metallurgical machinery.

This illustrates the diversified skills India has in terms of the capital goods design and production. Of these of course, the heavy electrical equipment which go into thermal power plants hydrogen hydro power plants are the largest. We are the largest subsector in terms of electrical equipment followed by plant equipment and earth moving mining machinery.

The Indian generation and transmission and distribution equipment market is expected to reach 100 billion dollars by 2022, which means that what you see as 24 billion dollars is going to have a huge run up towards that number. Current employment is 5 million, and the expected employment by 2025 is 25 million. The share in manufacturing is about 12 percent and electric machinery is exported to the tune of 10 billion dollars.

But the biggest challenges for the industry are in terms of coping with the transition towards the clean energy. And this needs to be addressed by venturing into many new domains. Again, in this area the established companies are taking the initiative to have supplemental lines of clean energy equipment.

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BHEL: The Transition

BHEL is one of the largest engineering companies of India (RS 502 billion turnover) engaged in design, engineering, manufacturing, construction, testing and servicing of a wide range of heavy equipment required by India's core sectors.

Growth Drivers

- Ageing equipment requires energy-efficient replacements
Opportunity for Transmission & Distribution (T&D) sector
- Huge market potential
Target industry size of \$ 100 bn by 2022
- The potential for closing import-export gap
The Capital Goods imports to India is approximately 3X the exports
- Massive power capacity addition in future
Infrastructure, Power, Mining, Oil & Gas, Steel & Automotive
- Nuclear capacity expansion
Significant business opportunity

BHEL needs to compete with new technologies from overseas majors even as the core customers comprising power plants, public utilities and distribution companies and transportation companies focus on low carbon footprint.



BHEL, the largest engineering company capital goods company of India with a 502 billion turnover in rupees is engaged in the design, engineering, manufacturing, construction, testing, and servicing of a wide range of heavy equipment required by India's core sector. And what is it doing? It is looking at the customer profile in terms of state electricity goods, DISCOMs, railways, core sector companies and others.

And getting into other areas such as renewables, transportation, low carbon capture and things like that. BHEL would want to play a big role in the clean railway transportation industry as well. So, while it has to support the ageing equipment of the established thermal and hydro plants, it also has to cater to the new energy industry that is coming up in a big way.

BHEL needs to compete with the new technologies from overseas wages even as the core customers comprising power plants, public utilities, and distribution companies and

transportation companies focus on low carbon footprint. The challenge for BHEL is immense, but the management is gearing up to achieve that new transition very quickly.

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Business Development

Business development has to answer many intriguing questions and provide many novel solutions in contemporary industrial and business evolution. Incremental projections have no place while even quantitative models will fall short.

Automobile Industry	<ul style="list-style-type: none">Retaining customers for ICE vehicles and switching customers from ICENetworking with various stakeholders for EV infrastructure	Chemical Industry	<ul style="list-style-type: none">To support migration from China, Indian companies need to market themselves to global sponsorsEnhanced capacities need to be marketed to a spectrum of national and global industries
Automobile Components Industry	<ul style="list-style-type: none">A new level of B2B marketing to blend service to ICE and EV, locally and globallyA new level of B2C marketing to serve ICE vehicle population on ground	Oil Industry	<ul style="list-style-type: none">The oil industry has to reorient its marketing for diversification into multiple new energy domainsFrom the current simple paradigms of co-branded cards, the game has to be elevated to collaborative networking
Automobile Tyre Industry	<ul style="list-style-type: none">An industry which is not impacted by ICE or EV phase-out and phase-insNeed to find options that enhance global exports, given that this is one "part" that is completely insulated	Capital Goods Industry	<ul style="list-style-type: none">The need to understand the business transformations underway in each of the B2B segments, and market accordinglyThe need to go beyond the definition of the capital goods business for utilising new industrial opportunities

Companies in current times, let alone the future times, are required to focus more on business and industrial transformations than on just revenues and profits. The role is one of partnership with the CEO for strategic change.



So, when you look at these 6 industries, the role of business development is in terms of answering many intriguing questions that arise. The kind of phase out and phase in of established and new industries, and providing novel solutions in a contemporary industrial and business evolution.

Incremental projections have no place; even quantitative models may have little benefit when the kind of structural change is going to take place in all the industries. So, in respect of automobile industry, the questions are how do you retain the customers for ice vehicles and also simultaneously switch the customers from ice to new energy vehicles, how do we network with various stakeholders for the electric vehicle infrastructure.

As far as the automobile components industry is concerned, we need to have a new level of B2B marketing to blend service to ICE as well as EV, locally and globally. We also we also need to have a new level of B2C marketing to serve the ICE vehicle population on ground in terms of the aftermarket space support, service support.

As far as the automobile tyre industry is concerned, at one level it is not impacted whether the vehicle is going to be ICE or electric vehicle. However, we need to find out how we need to and how we could enhance global exports given that this is one part that is completely insulated.

Irrespective of the chemical industry we need to support the migration from China and make sure that we benefit from the China one policy of the global companies. We need to have enhanced capacities and also we need to market those capacities to a spectrum of national and global industries. And as I said earlier, we need to have environmentally friendly production of chemicals.

As far as the oil industry is concerned, it needs to reorient itself to cleaner energy options it needs to rebrand itself as the supplier of energy rather than as the supplier of fossil fuel-based petrol and diesel. Capital goods industry has its task cut out in terms of dove tailing with the renewable energy industry of all types and also getting into newer avenues such as the rail transportation.

Companies in current times let alone the future times are required to focus more on business and industrial transformations than on just revenues and profits. Earning revenues and profits is a day-today transactional activity. But transformation of the business of the industry for future sustainability is going to be the biggest challenge for business development. The role is one of partnership with the CEO for strategic change.

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A Case Study on Ather and Ola Electric



Let us look at a case study of Ather and Ola Electric, in respect of the industrial transformation.

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Indian Automobile Industry: Production Trends (Units)

Category	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Passenger Vehicles	3,465,045	3,801,607	4,020,267	4,028,471	3,424,564	3,062,221	3,650,698
Commercial Vehicles	786,692	810,253	895,448	1,112,405	756,725	624,939	805,527
Three-Wheelers	934,104	783,721	1,022,181	1,268,833	1,132,982	611,171	758,088
Two-Wheelers	18,830,227	19,933,739	23,154,838	24,499,777	21,032,927	18,249,941	17,714,856
Quadracycle	531	1,584	1,713	5,388	6,095	3,836	4,061
Grand Total	24,016,599	25,530,967	29,094,447	30,914,877	26,353,293	22,652,108	22,933,230
Of Which Scooters						5,570,000	



As by now you know the Indian automobile industry is one of the largest industries in India in its peak or at its peak, the industry has produced 31 million vehicles of which as many as 25 million vehicles or in terms of two-wheelers. We have a sizable passenger vehicle production of 4 million vehicles, commercial vehicle production of 1.1 million vehicles, three-wheel production of 1.3 million vehicles and very small quadracycle production.

Although, because of COVID and the softening of the economic cycles, the production has come down; we are now having a situation where the capital expenditure cycle is on the uptick and similarly the various parts of the automobile industry are moving up. Also, the supply chain disruptions the semiconductor supply disruptions that we had in the last 2 years are easy, and we are going to have much higher production of automobiles as we go forward.

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Global Electric Vehicles Sales - 2021



- Global Electric Vehicle sales reached 6.75 million units in 2021, 108 % more than in 2020 (Global EV Outlook 2021 Report).
- A multi-government programme called Electric Vehicle Initiative has set a goal of 30% market share for battery power car, buses, trucks and vans by 2030.
- To limit global warming below 2 degrees Celsius (Paris Agreement), the world will need 500 million electric vehicles by 2030.
- India which is not part of the above group plans to sell increasing numbers of electric vehicles.

Year	2016	2017	2018	2019	2020	2021
Electric Vehicles Registered in India	51,129	87,554	1,31,554	1,16,308	1,19,648	8,70,141

- For India to be a leader in electric vehicles, a comprehensive policy covering not only the automobile industry but also the battery industry and the materials industry as well as establishing a national infrastructure of battery charging and swapping stations is required.
- Rather than be a skeptical or reluctant player, the Indian automobile industry must assume a proactive lead role, in policy partnership with the Central and State Governments to design, develop and manufacture electric (and hydrogen) powered vehicles.



In this, the global electric vehicles are going to be an important constituent. If you see the table from 2016 to 2021, the production of electric vehicles has gone up in an amazing way from 51,000 vehicles in 2016 to 8,70,000 vehicles in 2021. In order to limit global warming below 2 degrees Celsius as per the Paris Agreement, the world is expected to need 500 million electric vehicles by 2030.

There is also a multi-government program called electric vehicle initiative for getting 30 percentage of market share for battery power cars, buses, trucks and vans by 2030. For India, to be a leader in electric vehicles, we need a comprehensive policy covering not only the automobile industry, but also the battery industry, various other clean energy options and the charging and recharging infrastructure on a national scale.

We need to have an Indian automobile industry which is not just a bystander. We need not be waiting for the opportunity to be mandated. The automobile industry has within itself the capability to take the lead and become a global leader in electric vehicle as also clean energy vehicle production.

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Major Two-Wheeler Manufacturers in India

Company Name	Year Established	Products	Manufacturing Facility	Annual Capacity
Hero MotoCorp	1984	Motorcycles Scooters E-scooters	Dharuhera, Gurgaon, Neemrana, Haridwar, and Halol	9 million units
Bajaj Auto	1945	Motorcycles Three-wheelers	Wali, Chakan, Pant Nagar	7.5 million units
TVS Motor Company	1978	Motorcycles Scooters Mopeds Electric vehicles	Hosur, Mysore, Nalagarh	5 million units
Honda Motorcycle & Scooter India Pvt. Ltd	1995	Motorcycles Scooters Electric generators	Manesar, Tapukara, Narsapura, Vithalapur	7 million units
Yamaha Motors India	1955	Motorcycles Superbikes Scooters	Faridabad, Surajpur, Kancheepuram	0.9 million units
Mahindra Two-wheelers	2008	Motorcycles Scooters	Pithampur	0.6 million units
Suzuki Motorcycle India	1981	Motorcycles Scooters Big Bikes	Gurgaon	0.75 million units



Now, let us look at the major two-wheeler manufacturers in India. I am focusing on the two-wheelers mainly because they are the current hub of electrification in the automobile industry. We have Hero MotoCorp, Bajaj Auto, TVS Motor Company, Honda Motorcycle and Scooter India Private Limited, Yamaha Motors, Mahindra Two-wheelers and Suzuki Motorcycle India.

They have annual capacities ranging from a humble 0.6 million units to a strong 9 million unit capacity.

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Select Electric Two-wheeler Developers/ Manufacturers - India

Company Name	Year Established	Product Name	Prototype(s) Developed?	Manufacturing Facility/Annual Capacity	Month of Commencement of EV	Investors	Funding Received	Total Investment Plan
Hero Electric	2007	Photon Optima Nyx Flash Atria Dash Eddy	Yes	Ludhiana/75,000 units	November 2021	Gulf Islamic Investments, OMS	\$29.5 million	Rs.700 crore
Okinawa Scooters	2015	Ridge-R30 Lite Ipraasie +	Yes	Khushkhhera-Rajasthan/5 lakh units	October 2021	Hindustan Media Ventures	Rs.150 crore	Rs.200 crore
Ampere Electric	2007	Magnus Zeal EX	Yes	Ranipet, TamilNadu/1 lakh units	June, 2020	Greaves Cotton	\$13.7 million	Rs.700 crore
Ather Energy	2013	Ather 450K Ather 450 Plus	Yes	Bengaluru, Karnataka/1.1 lakh units	January, 2020	Flipkart Co-founder Sachin Bansal	\$35 million	Rs.130 crore
Bajaj Auto	1945	Bajaj Chetak Electric	Yes	Akuri-Pune/500000 units	January 2020	Self	-	Rs.650 crore
TVS Electric	2018	TVS iQube Electric	Yes	Hosur-TamilNadu, Mysore-Karnataka, Nalagarh-Himachal Pradesh/1 lakh units	2021	TVS Motors	-	Rs.1000 crore
Bgauss	2020	BB A2	Yes	Chakan Plant, Pune/90,000	October 2021	RR Global	Rs.125 crore	Rs. 125 crore
Ola Electric	2017	Ola S1 Ola S1 Pro	Yes	Krishnagiri-TamilNadu/10 million units	August 2021	Matrix Partner, Tiger Global Management and Softbank	\$250 million	Rs 2400 crore




And there are also several electric two-wheeler developers and manufacturers which have established their bases in India. Hero Electric, Okinawa Scooters, Ampere Electric, Ather Energy, Bajaj Auto, TVS Electric, Bgauss and Ola Electric are some examples. Of these Ather energies.

And IIT Madras Research Park incubated start-up established as early as in 2013. So, it is a matter of pride for the Indian Institute of Technology that such a path breaking initiative has come from the IIT, Madras Research Park.

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Electric Vehicles in India

The EV domain in India, more particularly the electric two-wheelers segment, has grown rapidly, from just couple of products five years back to more than fifty EV brands as of today

ATHER

- An early pioneer, Ather Energy was the first IITM incubated start-up to venture into EVs in 2013. It is now backed by Hero.
- The company, currently, has two scooters on sale, 450 Plus and 450X.
- From a little over two dozen cities, Ather plans to be in 100 cities by FY 2023.
- Ather moved production to its new plant in January 2021, which has a capacity of 110,000 units a year.

OLA ELECTRIC

- Ola, a late starter, moved aggressively into the EV space from 2018.
- Ola currently has two models on offer, Ola S1 and S1 Pro.
- Ola Electric is setting up what it claims to be the biggest electric two-wheeler producing plant in the world with a capacity of 10 million.
- Ola Electric, which has investments from Hyundai and Kia, apart from other investors, plans to get into electric four-wheelers soon.



So, when you look at the electric vehicle development in India two models come up, one is the Ather model and the second is the Ola electric model. Ather model was an early pioneer, and it was the first start-up venture in the electric vehicles in 2013, which is now backed by Hero. It has two scooters on sale 450 Plus and 450X.

It is now present in over two dozen cities and the company wants to be in 100 cities by FY 2023. And the company will have 110,000 units as an annual production target. Ola is a late starter. We know that Ola is a company famous for its right handling business. But it has been late started in the electric business.

However, it has moved aggressively into the EV space from 2018. It has two models on offer Ola S1 and S1 Pro. Ola electric is setting up a huge facility claimed to be the biggest electric two-wheeler producing plant in the world with a capacity of 10 million. It has investments

from Hyundai and Kia, apart from other investors and it plans to get into electric four-wheelers also soon.

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Ather's Approach



- ❑ About 90 per cent of the Ather 450 is localised, with the cells imported from LG, Korea.
- ❑ Large bulk of the parts coming in from vendors in South India, the factory operates on a 1 to 2 day stock system.
- ❑ The factory will have a capacity of 100,000 EVs and 120,000 Lithium-ion batteries.
- ❑ Ather 450 Plus and 450X, currently two products on offer, are developed indigenously by the IIT Madras Research Park incubated start-up.

Source: Overdrive.in

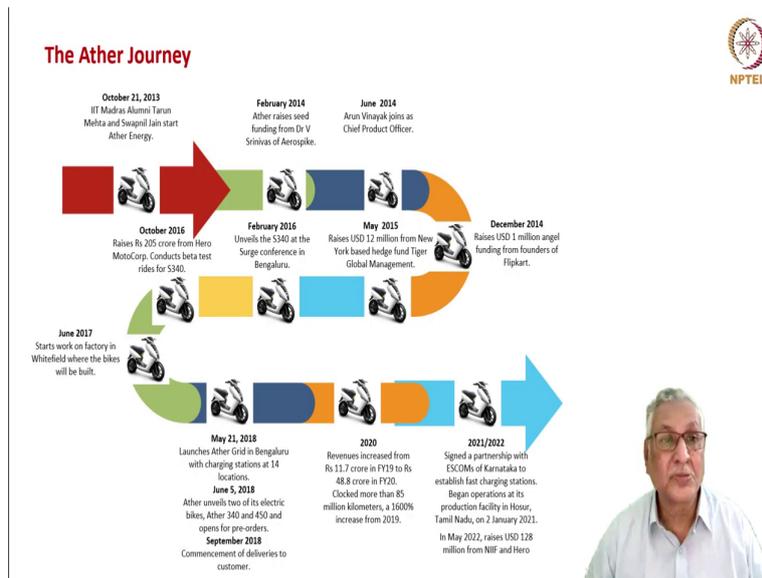


Athers approach is that it must be slow, steady, and measured in its approach. About ninety percentage of the Ather 450 is localized and the cells are imported from LG, Korea, known for its quality and technology. Large bulk of the parts are coming even today from vendors in South India, the factory operates on a 1-to-2-day stock system which is a kind of just in time ecosystem that is operating for Ather.

The factory will have a capacity as I said of 110,000 electric vehicles and 120,000 lithium-ion batteries. The surplus of lithium-ion batteries will go for the servicing and after market requirements as well as for battery swapping requirements if that were to be the route taken

by Ather. Ather scooters are developed indigenously by the IIT, Madras Research Park incubated start-up.

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The Ather journey started in October 2013, raising seed capital and then moving into hedge funds for their subsequent capital grounds, and roping in Hero MotoCorp for additional funding and then finally, launching the electric vehicles and then making them more popular. Now, it has Athers own retail showrooms in big cities and Airone cities.

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Ola's Approach



- ❑ An ambitious plant set in a large 500-acre site
- ❑ Two dedicated supplier parks at the site
- ❑ Expected to feature over 3,000 robots in the manufacturing and assembly lines
- ❑ Ola S1 and Ola S1 Pro are currently the two products on offer
- ❑ Products stated to be engineered and developed by Ola

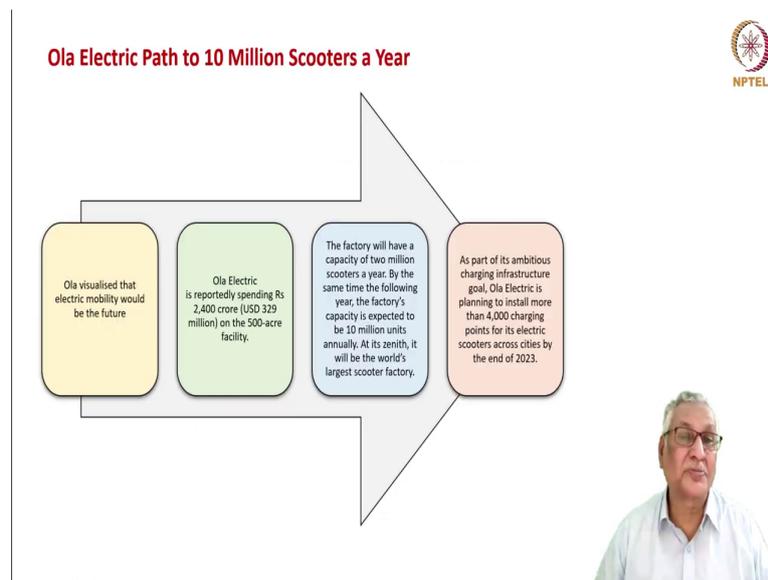


Source: Overdrive.in

Ola's approach is completely different. It has planned an ambitious plant in a large 500 acres site. It has also established two dedicated supplier parks at the site. The company wants to establish as many as 3000 robots in the manufacturing and assembly lines. By way of comparison, Maruti Suzuki which has a tradition of passenger car manufacture for nearly 4 decades has 7000 robots on its lines.

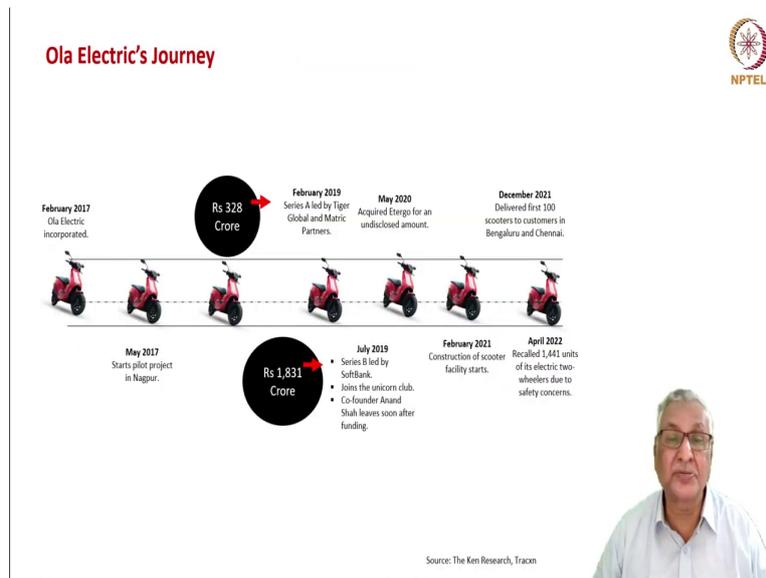
Ola S1 and Ola S1 Pro are currently the two products on offer. They are stated to be engineered and developed by Ola, but it looks as though some overseas studios have provided part support.

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The path to 10 million scooters is paved by the 4 factors. One, a firm vision that electric mobility would be the future. Two, the need for investing substantially in capital facilities to be able to erect entry barriers and to have the necessary throughput. Then, and it is zenith aspiring to be the world's largest scooter factory. And, planning to install simultaneously a charging infrastructure all over the country.

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The Ola electric's journey has been from 2017 to date. And it has been going very smoothly except that in April 2022; it had to recall as many as 1441 units due to safety concerns related to the fires. It has had investment by Soft Bank and it also joined the Unicorn Club in 2019.

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ICE and Electric Two-wheelers: Specification Comparison



Parameter	Honda Activa 125	Ather 450X	Ather 450 Plus	Ola S1	Ola S1 Pro
Engine Type/Motor Type	Four-stroke, Fan-cooled, BS-VI Engine	PMSM Motor	PMSM Motor	Mid Drive IPM Motor	Mid Drive IPM Motor
Engine Capacity (CC)	124	NA	NA	NA	NA
Engine Max Power/Motor Power	8.29 PS @ 6500 rpm	6000 W	5400 W	8500 W	8500 W
Max Speed (KM/PH)	93.84	80	80	90	115
Fuel Consumption	55 km/l	116 km/charge	116 km/charge	181 km/charge	181 km/charge
Dimensions (LxBxH) in MM	1850*707*1170	1800*700*1250	1800*700*1250	1859*712*1160	1859*712*1160
Wheelbase (MM)	1260	1278	1278	1359	1359
Ground Clearance (MM)	169	160	160	165	165
Kerb Weight (KG)	111	108	108	121	125
Storage Capacity (L)	18	22	22	36	36
Ex-Showroom Price (Rs)	84,667	1,27,286	1,13,000	85,099	1,10,000



This is a comparison of the specification of ice and electric two-wheelers, and in respect of certain capabilities, the electric vehicles are proving to be as capable as the established ice engine vehicles.

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Ola Electric Charging Points: Highlights

Ola electric launched its first electric scooter in the Indian market on August 15, 2021. The company also unveiled the roadmap of its 'Hypercharger Network'. Below are the five highlights about the plan.

The hypercharger rollout has begun across cities, with Ola planning to cross more than 4000 charging points by 2023.

Ola Hypercharger Network will be the widest and densest electric two-wheeler charging network in the world, with more than 100,000 charging points across 400 cities.

The Ola Scooter will include a home charger that will require no installation and customers will be able to charge the scooter by plugging into the regular socket at their home.

These charging points will be deployed as stand-alone towers as well as in popular locations such as BPCL pumps, malls and IT parks.

The Ola hypercharger network is being built which will help customers monitor the charging process in real-time on the Ola Electric app.



Ola is also coming up with a charging system which it calls hyper-charger network which will have 4000 charging points by 2023 which will be deployed at all the BPCL pumps, malls and IT parks. It would have customers with the ability to monitor through an app, the charging requirements. It will also provide home charging and there would be an expansion possibility to as many as 100,000 charging points across 400 cities.

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Ola Electric's Bookings: Appeal of Electric or Power of Marketing?

- While official data suggest that 1.44 lakh electric two-wheelers were sold in FY21, Ola Electric recorded 5 lakh unit pre-bookings in a month
- On December 31, 2021, the company announced that all Ola electric scooters that have been booked have been delivered to customers (a claim contested).
- Ola Electric isn't operating the standard dealership network, instead all bookings are done online.



Ola electric has done something which no automobile company has done to date in India. It has gone completely digital in terms of booking and the sales process. Whether it is the appeal of electric or the power of marketing, the future will tell. But Ola electric has shaken up the conventional selling processes through the digitization mechanisms it has opened up.

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Ola's First Electric Car to be Launched by 2023/24?



- Ola electric two-wheeler, launched on August 15, 2021, has been well received by the customers.
- However, the fires in electric scooters, including in Ola's, while charging and in transit have raised serious concern on design, quality and safety standards
- **Ola has announced its intention to launch electric cars by 2024; Ola has also announced development of connected automobiles.**
- Presently, OLA is establishing a global design hub in Bengaluru



Ola is also planning to launch an electric car by 2023-24. Many experts believe that it is an ambitious plan. In fact, a far too ambitious plan given the glitches that are being experienced already in the electric scooter segment. The important fact is that, however, much the electric vehicles are needed in a nation's ecosystem, no one should and can cut short the development process.

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Likely Structural Change in the Indian Two-Wheeler Industry

In the coming four to five years, the transition from petrol to electric two-wheelers will take place through partial substitution of existing models and incremental market creation through demand elasticity

Declining battery prices and policy actions of governments around the world to tackle climate change have led to a gradual adoption of electric vehicles and a shift away from Internal Combustion Engine (ICE) vehicles.

01 India's electric two-wheelers (e-2Wheeler) and allied segments can generate around an annual revenue of USD 30 billion by 2030, following an investment of USD 20 billion over 2022-30.

02 By fiscal 2026, the cost of electric two-wheeler and petrol two-wheeler should be equal, resulting in around 30 percent lower total cost of operating an electric vehicle. This would take the electric two-wheeler mix to around 35 percent by the fiscal year 2026 from 1 percent now.

03

Projection by Moneycontrol.com



Because this structural change in the electric vehicle industry, growing as part of the two-wheeler industry has to be on the basis of reliability, durability, and quality. It also has to be based on progressive decline of the prices, so that customers are able to make a wise and appropriate choice between ice vehicles and the new generation electric vehicles. These are the twin challenges that are facing the electrical vehicle industry.

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100% Made in India Electric Vehicles

The import duty on EVs in India is 100 percent if the CIF (cost, insurance, and freight) value is more than USD 40,000, and 60 percent if the CIF value is less than USD 40,000. The Government can also look at inviting foreign players to set up units, especially four-wheeler units, in India by cutting down import duties, provided they start with high indigenous content and completely indigenise their products in good time.

The Government of India is taking several initiatives to promote electric vehicles. Lately, the Government has urged local electric vehicle makers to curb imports of components from China and instead set up manufacturing facilities in India. It is projected that it will take another three to five years for India's dependence on China to reduce.

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The entry of large auto players such as Tata Motors, Mahindra & Mahindra, TVS Motor, and Bajaj Auto is seen as a boost for the EV space in India as these companies have the capability to increase production volumes and Tata Motors has demonstrated its indigenous electric vehicle development capability.

At present the EV market in India is only one percent of the total sales in the auto industry. Due to this small percentage, many of the components to make EVs are imported from China. Nearly, 29 percent of all the imports of the Indian automobile industry come from China, including key components used in power train and chassis.

The Government of India is taking several initiatives to promote electric vehicles. Lately, the Government has urged local electric vehicle makers to curb imports of components from China and instead set up manufacturing facilities in India. It is projected that it will take another three to five years for India's dependence on China to reduce.



To achieve 100 percent made in India electric vehicles, you need to have high import duty on fully built electric vehicles and low import duty on the components that go into it. Similarly, there must be several initiatives to curb imports of cheap components from China and make the local industry self-reliant and self-sufficient. Big automobile groups such as Tata Motors, Ashok Leyland, Mahindra and Mahindra, TVS motor, Bajaj Auto getting into the electric vehicle space.

Some directly by their divisions, and some in organically through their subsidiaries is going to be a big boost for the electric vehicle space in India, because these groups have got the capability to scale up and scope up the electric vehicle production in various segments.

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TVS's Dedicated EV Focused Vertical



TVS has announced that it is investing Rs 1,000 crore in its dedicated EV-focused vertical. The new TVS electric vehicles are expected to hit the road in another 24 months.



TVS is planning to enter all possible segments such as end-to-end delivery market, commuter space, premium scooters and even high-performance sports motor cycles.

The company will continue to manufacture its ICE powered offerings and the new breed of EVs will run parallel to existing portfolio.



TVS is one great example of having an electric vehicle focused vertical where 1000 cores are dedicated for an EV focused product development and manufacture. But the company is also going full speed on having more efficient ICE powered vehicles to supplement the requirements till the electrification is complete.

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Recent Safety Concerns on Electric Two-wheelers in India

While the sale of electric vehicles has more than doubled in 2021, the recent incidents of electric vehicles catching fire has triggered concerns for the prospective buyers and the regulators.

The trigger for fire accidents in electric vehicles is reportedly the overcharging of the battery which leads to heat releasing reactions, and consequent fires. The thermal management system may not be designed for the Indian hot weather conditions. Other reasons could be manufacturing defects or improper usage by customers.

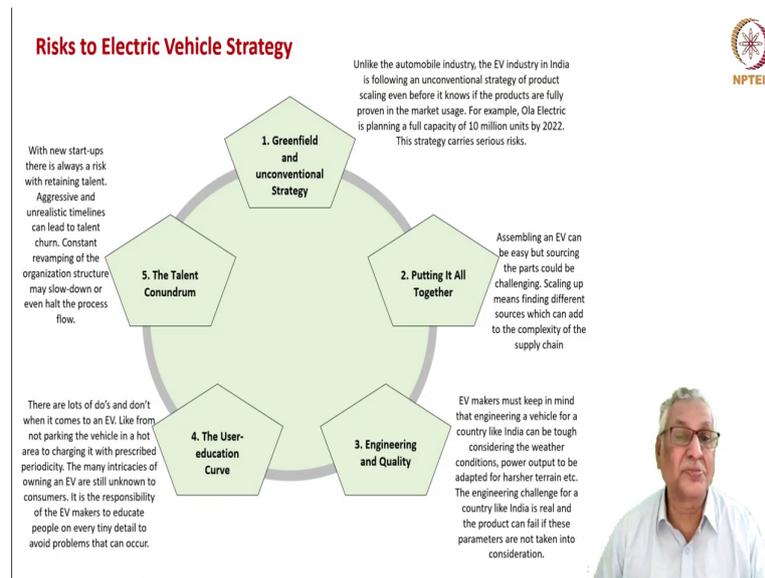
The government has announced that the entire EV ecosystem will be reviewed by an expert committee and once the report is submitted, it is expected to put out guidelines for testing standards, manufacturing, storage and transportation. More regulations can be expected, especially for low-speed electric vehicles currently exempt from certification.



There have been recent safety concerns on electric two-wheelers in India. It is reported strongly in the popular press and the government has set up a committee, and from the preliminary inferences that are provided, it looks like the thermal management system is at fault.

And some of the battery components that have been imported or tuned for low temperature environments rather than the high temperature environment that exist. In addition to that, there seem to be some issues in how the customers are charging the electric vehicles through the normal electrification networks.

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So, the risk for electric vehicle strategy are in terms of these 5 factors. 1, it is a green field and unconventional strategy of trying to bring to the market in the fastest possible time and overcoming the homologation standards. So, even as the manufacture and marketing is taking place, the homologation standards for electric vehicles.

Certification standards are getting evolved in a progressive manner. There is a little element of risk involved in this. Secondly, assembling of an electric vehicle is not going to be the same as assembling of a mechanical scooter or car. It is going to be a little different optimization of the various constituent systems because all these systems are electrical and electronically tied together.

3rd, no one can ignore the importance of high engineering and high quality in electric vehicle development. And we need to have the highest levels of these two factors, so that India

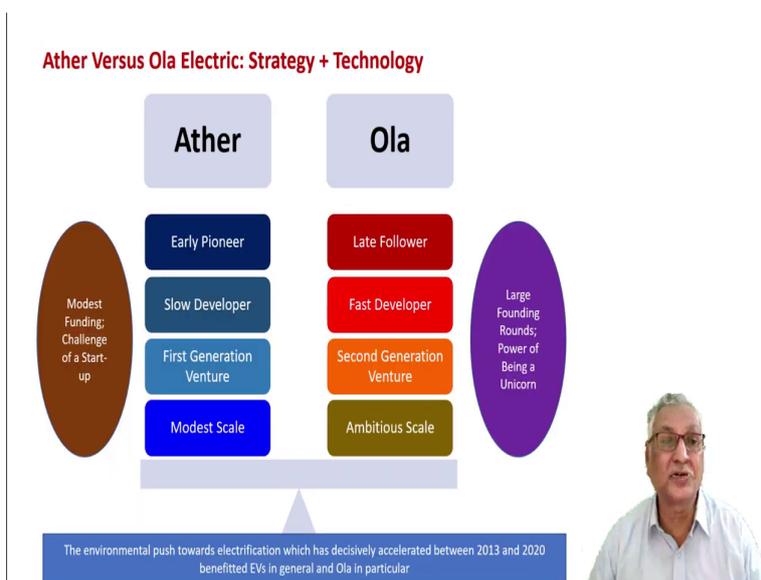
attains a global production. And fourthly, the user himself or herself also needs lot of education there are lots of dos and do not's which need to be followed as far as the electric vehicles are concerned.

Like as an example, not parking the vehicle in a hot area, to charging it with prescribed periodicity. There are many intricacies of owning an electric vehicle that are still unknown to consumers. Electric vehicle manufacturers have a great role in educating the customer support this. On one hand the digital access is going to be helpful, on the other hand lack of established dealer network could be the handicap.

So, every tiny detail needs to be provided to the customers for them to be up to speed on the safety system and operational requirements of an electric vehicle. And finally, the talent conundrum, when you have an electric vehicle industry, moving along at a fast clip along with the established industry and when the skill sets are going to be quite different.

Talent is going to be in short supply, and as more companies enter the field there is going to be a battle on war for talent and that is going to be leading to constant revamping of the organization structure or slowing down or even hurting of the process flow in the electric vehicle. So, there are risks to the electric vehicle strategy.

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When you look at Ather and Ola electric, you can see this as a combination of strategy and technology. Both are required. Ather has been an early pioneer, but a slow developer. It is a first-generation venture which has been conceptualized and is still being operated on a modest scale.

As a result, it has got modest funding and it has faced all the challenges of a start-up over the last 9 years of its inception and growth. Ola, on the other hand, has been a late follower. It came 5 years after Ather, but it came aggressively. It has been a fast developer. It is a second-generation venture because the first generation venture is the ride handling Ola's company.

And it has come up with an ambitious scale, large founding rounds, power of being a unicorn. The environmental push for electrification has decisively accelerated between 2013 and 2020.

It has benefited all the electric vehicles in general, but Ola in particular. With this we come to the end of this lecture on Industrial Transformations.

I am sure you would have found the data and information provided in respect of multiple industrial transformation, very educative and very helpful. This shows the level of reorientation that is occurring in the Indian industrial and business system.

And the case study, I have given of Ather and Ola electric also illustrate how entrepreneurship is going to drive the kind of transformation that we are going to see in several industries and in several businesses. This is going to be the key for the success of India's 5 trillion dollar economic mission to be accomplished latest by 2030.

Thank you very much for your kind attention. I look forward to seeing you in the next lecture.