CUTS International

EXPLORING THE IMPACT OF ELECTRIC MOBILITY ON THE JOBS ECOSYSTEM

Literature Review

In the times of a global discourse on sustainable development, lowering carbon footprints and greening of the future, the shift to cleaner alternatives in terms of transport is critical. A paradigm shift is imminent, given the role played by transport in an economy and the plethora of negative externalities on the environment and human health, associated with the use of traditional `vehicles that operate on combustion of fossil fuels. Electric mobility or e-mobility, has been the chosen way forward in most of the developed countries and has also been gaining traction in India, aided by enthusiasm from the businesses and the government. Factors such as climate change, advancement in renewable energy, rapid urbanization, battery chemistry and energy security, etc. have further aided the adoption and development of Electric Vehicles (EVs).[1]

This paradigm shift in modes of mobility may open the gateways for new business opportunities such as battery infrastructure, auxiliary service, and in multi modal integrated transport, amongst others. Therefore, it may lead to the creation of a novel job ecosystem. For instance, according to the study[2] done by European Climate Foundation, with advent of EV in the global market approximately 5 lakhs to 8.5 lakhs jobs would be created by 2030 in research & development. In addition, another study[3] suggests that approximately 2o job would be created in allied sectors such as services, electrical equipment, manufactured fuels etc. by 2050. However, impact of EVs would be different in Indian job ecosystem both qualitatively and quantitatively

Futuristic Transport: India's EV Vision

As the world prepares to take up e-mobility in the drive towards a sustainable future, India is also warming up to the idea of a transition from conventional Internal Combustion Engine (ICE) vehicles to clean and green EVs. In order to ease out this transition, the Central Government has taken number of initiatives such as Fame-I[4], Fame-II[5] schemes and fiscal propositions in the Union

[1] https://niti.gov.in/writereaddata/files/document_publication/EV_report.pdf
[2] https://europeanclimate.org/
[3] https://www.camecon.com/wp-content/uploads/2018/02/ECF-Fuelling-Europe_EN_web.pdf
[4] https://pib.gov.in/newsite/PrintRelease.aspx?relid=191377
[5] https://fame2.heavyindustry.gov.in/

Budget[6], aimed at promoting e-mobility by providing financial incentives to the manufacturing sector and consumers. Similarly, several State governments have also formulated EV policies[7]. Some of these state policies have also set up targets for employment generation and investments. For instance, Karnataka has set up a target for 55,000 jobs by 2024 and the state of Tamil Nadu is aiming for 1.5 lakh new jobs due to roll out of EV policy in the state.[8]

In addition, the Central government initiated the National Electric Mobility Mission Plan in 2013[9] which aimed to infuse approximately 7 million EVs on road by 2020 and approximately 30 percent of total vehicle fleet of e-mobility in the country by 2030. According to government estimates, to achieve such targets, the sector would create 10 million specialized jobs[10]. In addition, the governments Automotive Mission Plan[11] 2016–26 envisions approximately 65 million direct and indirect employment opportunities to be created in the automotive sector over the next decade. To give e-mobility a further boost the Government of India has introduced the National Mission of Transformative Mobility and Battery Storage in March 2019, which will create and implement strategies for transformative mobility. Further, a Phased Manufacturing Programme for EVs and their components will be launched.[12]

Linkages between mobility and the jobs ecosystem

The transition from ICE vehicles enabled transport systems to battery-operated EVs is a complex one that involves multiple sectors and stakeholders. Thus, one of the crucial aspects of this is the integration of e-mobility into the existing localized transport frameworks, local livelihoods and job market in order to smoothen the transition and minimize the impacts on the stakeholders involved. At the outset the process requires significant transformations in the automobile manufacturing, electricity supply, power electronics, IT, transport infrastructure, transport service providers and allied sectors. This will lead to a disruption in the existing workforce in these sectors due to the potential redundancy of certain existing jobs and skills and at the same time a need for new jobs and skills to facilitate an inclusive and holistic transition.

In order to get a comprehensive understanding of the job dynamics that will occur as a result of the transition to e-mobility it is important to firstly look at what constitutes an e-mobility ecosystem and how different it is from the ICE ecosystem. The following figure highlights the broad components of an ICE or automotive ecosystem.

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[6] https://www.thehindu.com/business/budget/tax-break-to-rev-up-electric-vehicle-sales/article28298483.ece, dated July 5, 2019

[7] https://inc42.com/features/paving-the-way-for-emobility-state-and-central-government-ev-policies-in-india/, dated December 31, 2019.

[8] https://kum.karnataka.gov.in/KUM/PDFS/KEVESPPolicyInsidepagesfinal.pdf & https://www.investingintamilnadu.com/wp-content/uploads/2019/Sep/TN%20E%20Vehicle%20Policy%202019-English.pdf

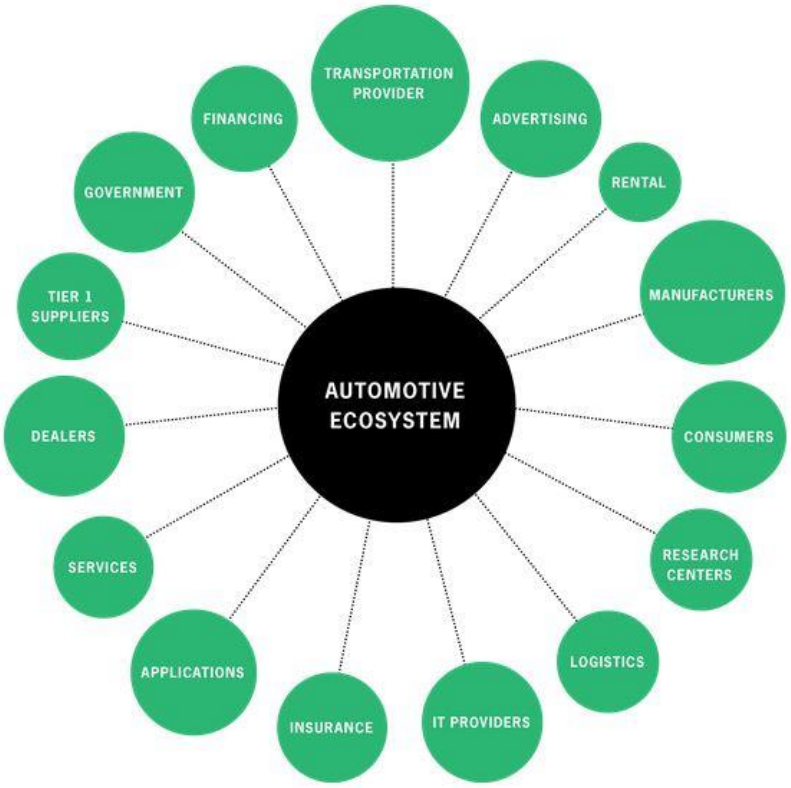
[9] https://pib.gov.in/newsite/PrintRelease.aspx?relid=191337

[10] https://www.businesstoday.in/current/economy-politics/e-vehicles-industry-electric-mobility-mission-create-10-million-jobs-in-future/story/346804.html

[11] http://www.siam.in/uploads/filemanager/47AUTOMOTIVEMISSIONPLAN.pdf

[12] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1567807

Figure 1: Components of the Automotive Ecosystem[13]



The major components of the ICE vehicles ecosystem include manufacturers, dealers, and consumers. Along with that the ancillary components of the ecosystem include stakeholders that engage in operation and maintenance, production of energy, insurance, mobility services and recycling and scrapping of vehicles. With infotainment and technological advancements, the ICE vehicles ecosystem is also undergoing a dynamic shit to include more ICT solutions including internet of things (IoT) based services.

The e-mobility jobs ecosystem

On the lines of organization theory, Raphael Giesecke, in his paper "The Electric Mobility Business Ecosystem: An Initial Agenda for Future Research Needs, Based on Organisation Theory" [14] divides the Electric Mobility Business Ecosystem (EMBE) into five broad components which are interlinked for value creation across the ecosystem.

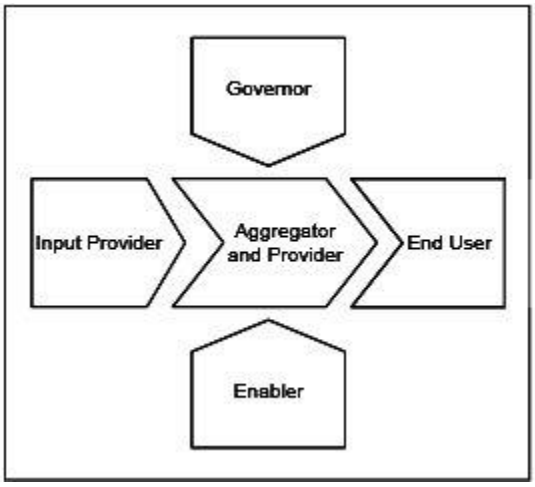
- The first is the 'input provider' who provides the initial hardware and software inputs to the system and are subsequently transformed and aggregated (E.g. EV components manufacturers, electric power generators/producers)

[13] https://journal.jabian.com/digital-is-driving-waves-of-auto-industry-innovation/
[14] https://www.researchgate.net/publication/269298965_The_electric_mobility_business_ecosystem

- The second is the 'aggregator and provider' who is responsible for developing or aggregating the inputs into comprehensive end products (E.g. EV manufacturers, Operation and Maintenance providers, e-mobility operators)
- The third component is the 'enabler' who provides tangible and intangible support to the operations of the ecosystem (E.g Charging services providers, ICT solutions providers, Research and Development providers)
- The fourth component in this ecosystem is the 'governor' who governs the operations of the ecosystem by setting and implementing rules and standards (E.g. Regulatory authorities, user groups, NGOs)
- Finally, the fifth component is the 'end user' who is the creator of demand for e-mobility, consumer of e-mobility products and also a feedback linkage for other players in the EMBE (E.g. Cab aggregators, Mobility service providers). The presence of such a vast and networked business ecosystem highlights the depth and spread of the e-mobility sector, much beyond the automobile industry

These broad components can be represented with the help of the following diagram.

Figure 2: Components of an EV Ecosystem



Source: The Electric Mobility Business Ecosystem: An Initial Agenda for Future Research Needs, Based on Organisation Theory

While core components such as manufacturing, operation and maintenance and service provision remain consistent with the ICE ecosystem, the functions and roles within each of these components become much more diverse, opening up the sector to a different job roles and new opportunities. Further, the dynamic nature of each of these roles reveals a tremendous potential for creation of employment opportunities across the spectrum of e-mobility.

Similarly, according a report by IEA[15] the electric mobility ecosystem has three major value chain components - the electric vehicle, the charging infrastructure and the energy value chain.

[15] http://www.ieahev.org/assets/1/7/IEA-HEV_TCP_Task_24_-_Final_Report.pdf

- The direct components of the vehicle value chain include raw materials, after-market of the raw materials (including batteries, power electronics, lightweight design and materials and electric motors), manufacturing, sales and after-market of the finished product (including maintenance and recycling). The allied sectors of the vehicle value chain are certification, mobility, financing, research and development and skill development (education and training)
- In case of the charging value chain the direct components are manufacturing, installation, operation, service delivery and a market. The allied components include smart grid and metering along with that of the vehicle value chain
- The energy value chain involves generation, transmission and distribution components along with service delivery as direct sectors, while smart grid and metering, research and development and skill development remain the ancillary components

The interlinking of these three value chains is critical for the facilitation of e-mobility at the local and national level. It is also imminent that the development of the e-mobility sector will have spill-over impacts on the allied sectors in the ecosystem, in terms of enhanced growth and increased employment opportunities.

In the Indian context, a study by CEEW[16], divides the EV ecosystem into seven broad categories of stakeholders, the EV manufacturers (which include the component manufacturers, the battery manufacturers and the vehicle manufacturers), the financiers of the EV ecosystem (including banks, NBFCs, venture capitalists, capital markets and insurance companies), the charging infrastructure value chain (including power electronics manufacturers, electric vehicle supply equipment manufacturers and charging service providers), the digital technology value chain (ICT solutions provider), the customers (including cab aggregators, fleet operators, rental operators, freight and logistics operators and individual customers), the after-sales services value chain (including battery swapping, repair and maintenance and battery and vehicle recycling) and finally the regulators which govern the ecosystem (including Government departments and regulatory bodies). The study creates a distinction between the EV ecosystem and the conventional automobile ecosystem in terms of the value chain of the former being a combination of the automobile value chain along with power electronics and electrochemicals.

EV and the Workforce: Potential Job Losses and Gains and their Attributes

The automobile industry is one of the major job creators across the spectrum of employment, in upstream i.e. core manufacturing areas, mining, automotive parts etc. as well as in downstream for instance, allied services – servicing/ repair works, fuel supply, logistics amongst others. EVs are technologically advanced as compared to ICE vehicles. Thus a shift from ICE to EV will have a two-pronged impact on the upstream and core automobile manufacturing. It will lead to discontinuation of numerous critical components used in the existing fossil fuel-based vehicle due to different architecture of the EVs. Secondly, since the standard operating procedure of EVs would be different, jobs associated to production will also be affected

[16] https://www.ceew.in/sites/default/files/CEEW-IndiaElectricVehicleTransitionReportPDF26Nov19.pdf

With the growth of e-mobility sector the conventional ICE vehicle sector is the one which is set to undergo major disruptions in terms of redistribution of power, markets, skills and jobs. As the manufacturing processes change the skills required will undergo a subsequent change which will lead to potential job losses in the automotive sector. However, it will also lead to newer job creation in manufacturing and allied sectors in the e-mobility ecosystem, as newer roles with specific skillsets come up and the sector gets integrated with telecommunication, transport and electricity. Along with a direct impact on employment, the shift is also likely to lead to lower fuel consumption and hence savings on the oil import bill, which will lead to a higher GDP and eventually create additional jobs in the economy. The impact on employment is expected to be net positive suggests examples from the EU, with about 500,000 – 850,000 potential jobs estimated to be created by the move. However, what is needed to fuel that is a focus on indigenous manufacturing and reduction in import dependency.[17]

On similar lines, a report on the macroeconomic impacts of a shift from ICE or petroleum vehicles to plug-in electric vehicles (PEV), highlights that the petroleum displacement that will occur as a result of the shift to electric vehicles will lead to overall savings in the economy that will boost goods and services of the local economy and in turn lead to creation of newer jobs and a boost in GDP.[18]

Studies from USA further suggest that a shift to Electric Vehicles will generate newer jobs in the EV charging value chain and battery manufacturing industry along with employment generation in the EV manufacturing sector. The potential job profiles and skills will vary from unskilled roles to skilled ones. In operation and maintenance, sales and support services, unskilled job roles will be created, while semi-skilled roles will be created across design and development, manufacturing, operation and maintenance, allied infrastructure development, sales and support services. Research and development of newer technology for improving efficiency of vehicles will bring about newer opportunities in the skilled domains of the workforce while their production will add more labour to the factory floor.[19]

However, the impact of e-mobility on the jobs ecosystem will be extremely different in the Indian scenario, as compared to the impacts in European and US. This is because the workforce needed in manufacturing powertrain[20] in India is approximately 2000-2500, as compared to less than 200 workers needed do the same in USA.[21] In addition, auto parts suppliers and labour intensive workforce engaged in manufacturing processes such as castings, forging etc. would be severely affected.

To add to the problem of job losses, at present, the existing workforce in India is deficient in required skills and capacity according to a study by CEEW. Currently, more than two-thirds of the electronic equipment used in OEM are being imported from China and European markets. But,

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[17] https://www.transportenvironment.org/sites/te/files/publications/Briefing%20-%20How%20will%20electric%20vehicle%20transition%20impact%20EU%20jobs.pdf

[18] https://caletc.com/wp-content/uploads/2019/05/EERA-PEV-Economic-Impacts-and-Employment-Growth.pdf

[19] https://www.iedconline.org/clientuploads/Downloads/edrp/IEDC_Electric_Vehicle_Industry.pdf

[20] Powertrain = Engine Assembly and Gear Assembly

[21] https://www.financialexpress.com/industry/electric-vehicles-will-kill-jobs-see-shocking-emerging-facts/874976/

according to the study approximately 25 percent additional core manufacturing jobs may be created, should the set target of 30 percent of EVs production in total passenger segment vehicle production be achieved. While, this could be a major area of job creation, the need of the hour is reskilling and capacity building of the existing workforce to achieve the set target of EV mobility in the market.[22]

The Ministry of Skill Development and Entrepreneurship is in the process of developing a specialized curriculum to ensure adequate skilled and trained workforce for the electric mobility industry.[23] Such a workforce is expected to have expertise in infrastructure, design, testing, battery manufacturing and allied services amongst others. In addition, the Automotive Skills Development Council in collaboration with Automotive Research Association of India is developing specific occupational standards for EVs along with a training and capacity building framework for technicians, supervisors, and helpers working in allied services.[24]

Way Forward

While, it is understood, that the advent of EVs will affect the existing transport framework at the national level, it is also expected to disrupt its jobs ecosystem at the city level. However, due to absence of relevant data on transition of mobility space, primarily in the context of jobs lost and jobs created it is imperative to study the livelihood opportunities affected and potential opportunities created due to the transition to a technologically advanced and eco-friendly mobility space.

Potential List of Stakeholders for Interview

Sl. No.	Stakeholder Category	Potential Stakeholders
1.	Government Stakeholders	• PSUs including BHEL, NTPC • State and City level transportation utilities
2.	Original Equipment Manufacturers (OEMs)	• Mahindra and Mahindra Plant, Bagru, Rajasthan • Ashok Leyland • Goenka Electric Motor Vehicles Pvt. Ltd • EV Motors India • Fortum India • Gayam Motor Works • Ather Energy Bosch India • Lithion

[22] https://www.ceew.in/sites/default/files/CEEW-IndiaElectricVehicleTransitionReportPDF26Nov19.pdf
[23] https://inc42.com/buzz/govt-release-course-meet-skill-shortage-ev-sector/, dated May 15, 2019
[24] https://www.businesstoday.in/current/economy-politics/e-vehicles-industry-electric-mobility-mission-create-10-million-jobs-in-future/story/346804.html, dated May 15, 2019

		• Olectra Greentech • Tata Motors • Toyota Kirloskar Motor • Twenty Two Motors Pvt Ltd
3.	EV charging infrastructure providers	• Gegadyne Energy • WeCharge Technologies Pvt Ltd • Plugin India
4.	ICT Solutions providers	• KPIT Technologies
5.	E-mobility service providers	• Lithium cabs • Ola Cabs • Shuttl • SmartE • Blue Smart Mobility
6.	Industry Associations	• SIAM • Society of Manufacturers of Electric Vehicles (SMEV)
7.	Workers' Associations	•
8.	Research and Development	• Hero Electric India Energy Storage Alliance (IESA) • Indian Institute of Technology Madras – Centre for Battery Engineering and EVs (C-BEEVs) • NITI Aayog
9.	Other Stakeholders	• Recycling and Scrapping units for ICE vehicles • Fuel refilling stations