The New World of Electric Vehicles

Investment and M&A Trends

November 2022

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From Combustion Engines to Connected, Electrified Vehicles - The Big Disruption in the automotive industry

The auto industry has been hardware-oriented for over a hundred years.

The introduction of electrified vehicles and the ubiquitous presence of connectivity in consumers' lives has disrupted the innovation path of automotive design, supply chain and manufacturing. The share of software and electronics costs in the average vehicle grew, increasing from under 5% in the 1970s to ~ 40% by 2020.

The Big Disruption: The move from *Internal Combustion Engine (ICE)* to *Autonomous Connected Electric Shared (ACES)* vehicles will have similar hardware and software dynamics as in the PC and mobile phone markets.

The evolution of automotive software will reach a stage where independent software / OS providers, i.e. the equivalents of Windows and Android platforms will emerge, allowing OEMs to compete on features without having to themselves master both hardware and software, thereby bringing widely accepted standards, lower costs and new applications to the mass market.

Current Vehicle OS offerings:
Proprietary OS by automakers - VW, Mercedes Benz, Apple, Tesla
Third-Party Platforms – Red Hat Linux (IBM), QNX (Blackberry), Android Automotive OS (Google)

High fuel prices and climate change worries have shifted the tide in the favour of EVs,

with major automakers announcing committed numeric goals and timelines for EV production. For OEMs and their investors, it is difficult to get the timing right with many external factors and unknowns, such as the initial cost of EVs, charging infrastructure, cost and availability of batteries, and government subsidies, among others.

Most consumer surveys show that purchase price and range anxiety are the two most important limiters of EV purchases. Cost parity with fossil fuel vehicles is the biggest factor that will determine the timing and the rate of mass adoption of EVs.

Although the Total Cost of Ownership (TCO) of an EV beats that of an ICE vehicle, there's a sense of "range anxiety" among the consumers - that sinking feeling that they do not have enough charge to get to their next destination. Range anxiety is starting to wane due to improvements in single-charge mileage and the buildout of charging stations. But most experts agree that purchase price parity is needed for consumers to become "EV first" in vehicle purchase decisions.

India is one of the leading EV markets in the world

India is among the world's largest producers of two-wheelers and three-wheelers, selling over 20 million 2Ws and 1.2 to 1.4 million 3Ws annually, and currently has around 7.2 million registered three-wheelers on the roads. In the month of June 2022, nearly 45% of all three-wheelers sold in India – mostly rickshaws used in public shared mobility – were electric.

70% of 200 million registered vehicles in India are 2-Wheelers, with e2W being nearly 54% (~ 429,000 units) of all EVs sold in the FY 2021-2022.

China is the world's largest e2W market, with 33.9 million electric two wheelers (including e-bikes, e-mopeds, electric scooters, and motorcycles) produced in 2020.

Globally in Q1 2022, electric passenger EV shipments **exceeded 1.95 million units**, with passenger battery electric vehicle (BEV) shipments up 90% year over year, according to Counterpoint Technology Market Research. Counterpoint says EV shipments will go above 10 million units by the end of 2022 and 58 million units by 2030.

According to the Union of Concerned Scientists, **the top 5 annual global carbon emitters** (2019 data in Metric Gigatons and % of worldwide total) are:

1. China 9.9 GT or 29%
2. United States 4.7 GT or 14%
3. India 2.3 GT or 7%
4. Russian Federation 1.6 GT or 5%
5. Japan 1.1 GT or 3%

All five countries are part of the Paris Climate Accord. In both China and India (including 2 & 3-Wheelers), the adoption rate of EVs is above the worldwide average with wide-ranging government policy support for EV producers and consumers.

EVs are fundamentally different from combustion engine cars in their design. They have fewer parts, and different component costs with the battery accounting for half of the vehicle cost. In connected vehicles, automakers can deliver new features and fix problems with over-the-air software updates.

In EVs, unlike in ICE vehicles, all the power comes from batteries, and they must propel the vehicle while providing heat, air conditioning, and a rapidly increasing array of functions. As a result, there is a limited amount of energy for every function, from motive power to safety, communication, entertainment, and navigation.

These higher demands require higher energy capacities, faster battery charge/discharge rates, and more sophisticated electronic controls to ensure vehicle safety and performance. Currently, the Battery production industry is dominated by Asian companies, the frontrunner being China.

Battery cost, density, and performance breakthroughs are primary drivers in EV growth. Tesla has developed and patented a newer battery cell: the 4680. These cells have *five times* more energy with *six times* the power, enabling a *16% range increase* and faster acceleration.

Widely available EV charging infrastructure can clearly help drive consumer acceptance of EVs. Publicly available EV charging infrastructure is as critical as advanced EVs. Without it, consumers will not buy EVs. Who owns that infrastructure and how it is financed and deployed varies from country to country.

The bleeding edge of Technology in EVs

Internal vehicle networking is experiencing rapid technological advancements from Controller Area Network (CAN) to Flexible Data-rate CAN and Automotive Ethernet.

With external networking, EVs become platforms capable of offering network services and generating recurring revenues from consumers who become subscribers. Auto OEMs currently face significant challenges and obstacles before designing cellular or satellite Internet into their vehicles and offering subscription services. Consumers now expect their mobile phones and apps to be their primary source of data and content services in the vehicle.

The need for visually-oriented sensing drives both internal and external networking advancements.

Progress in external connectivity for vehicles will be slow and difficult because of several factors coming to play at the same time.

Adoption of Autonomous Vehicles is in the early stages, even in developed markets. Currently, a handful of Autonomous Level 2 systems are being sold with luxury vehicles. At ADAS Level 2, the vehicle can control both steering and accelerating/decelerating. Level 2 systems provide support in areas such as speed and distance control, steering and lane changes. The automation isn't self driving because a human sits in the driver's seat and can take control of the car at any time.

Autonomous vehicle technologies and shared vehicle ecosystems are attracting significant pieces of auto tech investments. Top luxury brands such as Tesla, Mercedes Benz and BMW are introducing new autonomous technologies in luxury cars.

Other than luxury car makers, investments in autonomous hardware and software have come from VC funds investing in startups that will supply the technology for autonomous and (Autonomous Driving Assistance Systems) ADAS use cases.

In large markets like India, Vehicle-sharing offers investors an immediate mass market, ready cash flow, and profits. With the financial benefit of not owning a vehicle and being able to move a large upfront cost to very small on-demand payments, shared vehicle services are a very scalable business. As a result, the shared mobility sector attracts late-stage VC and PEfunds, SPACs and IPOs.

More than $100 Billion has been invested in non-autonomous shared-mobility companies, mainly by venture capital and private equity players. Companies such as Ola (India), Didi (China), and Gojek (Indonesia) among others, have all reached valuations from $5 Billion to $30 Billion.

How is the Indian Automotive Industry responding to this disruption?

Most of the auto industry's R&D spending, investments from venture capital and private equity investors, and governments have moved to Autonomous Connected Electric and Shared (ACES).

Traditionally, most automakers did not have sufficient software and cloud skills to adapt to the new EV world. In addition to going through The Big Disruption, they must compete with the new breed of pure-EV competitors starting with Tesla.

We note three kinds of responses from incumbent automakers to their urgent need to incorporate software:

1. Building software engineering capabilities and teams
2. Partnering with software, semiconductor companies and service providers
3. Making strategic acquisitions of companies with automotive software IP and expertise.

Report Authors and Acknowledgements

This report was prepared by Vasudha Madhavan of **Ostara Advisors,** in partnership with Mukesh Ahuja and George Jones of **Woodside Capital Partners** and Sri Purisai of **RiSo Capital.** The authors would like to acknowledge Priyamvad Ranade of Ostara Advisors and Alex Casey of Woodside Capital Partners for their contributions to the research and analysis in this report. We also thank Nihar Patel of RiSo Capital for his insights based on thirty years at top global automakers, and Vamshi Kandalla, Automotive Networking, Semiconductor, and Systems ecosystem executive, for his contributions

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About Woodside Capital

Woodside Capital Partners is a leading global independent investment bank delivering strategic and financial advice to emerging growth companies in the technology sector. We know how to close the deal through mergers and acquisitions (M&A), capital raising, private placement, or strategic partnering to get results for our clients.

About Ostara Advisors

Ostara Advisors is India's first and only Electric Mobility-focused boutique investment banking firm. Founded by Ms. Vasudha Madhavan in 2015, the firm is credited with several firsts, including advising on India's first Electric two-wheeler M&A deal in 2018 and raising one of India's largest funding rounds from Global and Indian private equity and corporate venture funds for a leading electric three-wheeler maker in 2022. The firm brings decades of experience executing capital-raising strategies and crafting business combinations to drive win-win M&A outcomes for its clients.

About RiSo Capital

As an early-stage/ seed investor that invests in India-based startups solving global problems, RiSo Capital believes in partnering with entrepreneurs to actively work towards realising their dreams and achieving their goals.