

Greeting the Automobile Revolution

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Abstract: From the perspective of welcoming the automobile revolution, this study proposes that we should not evaluate the impact of the automobile revolution on the future economy and society by simply analyzing electric vehicles. The study expounds the characteristics and some attitudes of the automobile revolution to appreciate seven aspects of the automobile revolution.

Keywords: automobile revolution; subversive change; economic and social development

The world is currently experiencing a profound automobile revolution, supported by the rapid development of new energies and information technology, and compelled by the urgent need to save the planet, reduce carbon emissions, and protect the environment. Subsequently, we should not evaluate the impact of the automobile revolution on the future economy and society by simply analyzing electric vehicles.

First, the car, a machine that once changed the world, is now itself being changed. This has become a major point of consensus among the major automobile countries and related industries. With the proposal of timetables for banning fossil fuel burning vehicles by some countries and China's proposal of its dual credit scheme for electric vehicles, this trend is now more prominent. Rapid growth in electric vehicles may occur over the next five years or longer, as they meet or surpass the cost-effectiveness of fossil fuel-burning vehicles. However, each manufacturer has its own assessment of this development trend, an understandable phenomenon. It is noteworthy that we are experiencing "climate change," not "weather change." The automobile revolution has already arrived, and those who do not adapt appropriately run the risk of being overtaken. Histories of various industrial tragedies inform us that after the key moment for transformation was missed, it was already too late.

Second, there are two important dimensions related to the problems faced by traditional automobiles and their current revolution. First, traditional automobiles are not clean enough, and so a transition to electric, zero-emissions vehicles is necessary. Second, after more than a century of development, automobiles

have become extremely strong in a physical sense, but their conceptual development remains relatively simple, and has generally failed to progress beyond the mobile function of "moving from A to B." Subsequently, automobiles must be provided with a strong brain that applies human-machine interfaces to maintain a constant human connection to the outside world. This will form a "super smart mobile terminal" with more power than a smartphone, improving lives and mobility.

With the development of Internet technology, newly-established companies for producing electric vehicles are aware of the shortcomings of traditional vehicles, and they are working to address these problems. Compared with other major automobile producing nations such as the United States and European countries, this has become a major characteristic of the automobile industry in China. The authors of this paper believe that this is one of China's major advantages. As the Internet industry brings new ideas, technologies, and business models to the automobile industry, the future of the automobile has been redefined, and it is guaranteed that electric cars will be based on smart technology and will become network-connected and the future of mobility. This integration will provide sufficient resources for the automobile industry to meet the future head-on. After several years of preparation, the products of these companies have begun to appear on the market and engage competitively. The authors of this paper would like to remind readers that automobiles are comprised of tens of thousands of components, and producers have annual production scales of hundreds of thousands of high-speed mobile and software components combined into complex

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machines. There is a high threshold involved in guaranteeing high product quality, consistency, and stable production. New automobile producers must be sufficiently reverent to this point and must modestly study the traditional automobile industry in order to work steadfastly to address these problems.

Using 2020 as a benchmark, fierce competition will develop in this area, and a process of eliminating competition and reshuffling the industry will unfold.

Third, the independent transition from fuel-burning vehicles to electric vehicles is not particularly significant. Rather, the environmental friendliness and emissions reductions of electric vehicles are dependent on the supply of electricity from renewable energy sources. In addition, the effective use of large-scale renewable energy depends on the method of absorbing and storing intermittent electricity. Subsequently, electrical storage capabilities are a bottleneck facing China's future progress in the field of renewable energy.

Onboard batteries are "mobile micro-storage power stations," in addition to being "mobile micro-power supplies." By linking the energy Internet with renewable energy sources, an optimal combination can be formed. Although there are currently a variety of methods for energy storage, from the perspectives of flexibility, scale, and cost, onboard batteries are a fundamental path for resolving the intermittent nature of renewable energy. The huge number of electric vehicles in future will have large capacities for energy storage, which will be sufficient to guarantee the full development of renewable energy. It is predicted that by 2025 at the latest, the cost-effectiveness of electric vehicles will surpass that of fuel-burning vehicles, and the costs of solar power and wind power will be lower than the cost of fossil fuels. Subsequently, the powerful market forces will promote the current automobile and energy revolutions, helping to achieve clean mobility and green living.

Fourth, the automobile revolution has caused a systematic and ecological transformation. In this way, the automobile revolution resembles the smartphone, which not only replaced function phones, but also subverted many industries like photography, videography, retail, payment, and social networking industries, while also spawning new industrial patterns and business models. Electric vehicles do not simply replace petroleum with electricity, but rather are a leading and cornerstone product, which will propel a new stage of the industrial revolution. Electric vehicles have the power to integrate new developments and new potentials in information technology, networking, smart-technology, big data, and cloud computing, in addition to new technologies, new materials, electricity, electronics, and advanced manufacturing. In this way, electric vehicles will become a major platform for the integration of many industries and will promote technological progress and structural upgrading. Furthermore, changing the path of technological development will bring about structural adjustments to the energy, raw materials, manufacturing, and service industries, in addition to causing

employment restructuring and largely reshaping the industrial ecosystem.

Automobiles themselves are no longer inanimate objects. Rather, they can undergo constant upgrading iterations and can continuously satisfy and improve user experiences. Mobility service providers have become more important users, and so their vehicle requirements are treated with more importance. Automobile sales volumes will be suppressed, and requirements for reliability and durability will increase. As core technologies and software and hardware components change, the vertical integration of the division of industrial labor will be disrupted, and horizontal modularization will assume a leading role. Automobile producers will no longer share one-off purchasing relationships with their horizontally aligned partner factories or vertically aligned mobility service providers and users. Instead, they will have long-term cooperative relationships with these actors. As a result, companies that produce complete vehicles will derive most of their profits from sustained value-added services, and the development of new business models for future automobile production and services will accelerate.

Fifth, the principles of "electric vehicles + Internet + autonomous driving" will help to promote mobility sharing. For example, DiDi was founded in 2012, and after a short five-year period of operation, in 2017 the company provided more than 7.43 billion mobile mobility services for 450 million users across more than 400 Chinese cities, an average of more than 20 million each day. In addition, the carpooling services provided by *Didi Hitch* and *Didi Express* offer more than 1.05 billion ride-share seats. Through different methods and services, car sharing satisfies the mobility needs of different groups. The trends in ride sharing are developing at a pace of about 30% annually. In China, people have developed a strong relationship with the Internet, and these new generations of consumers live their daily lives on the Internet and are more receptive to the concept of "owning less, sharing more." Many traditional urban transportation systems centered on the automobile have become overloaded, forming major problems for large cities. By combining mobility sharing with the concept of "electric vehicles + Internet + autonomous driving," it is possible to create new development space for restructuring urban transportation and mobility and develop new visions for rebuilding urban transportation systems.

Sixth, not only do future automobiles provide a large space for development, but they also offer a huge space for imagination and innovation. Electrification is only the first iteration of the current automobile revolution. Fully unleashing the potential social benefits of the cars of the future relies on innovation in areas such as network integration, smart technology, and mobility services. China's electronic information companies and Internet services. China's electronic information companies and Internet companies have strong economic and technological power, and they should seize the opportunities provided by the automobile revolution. Mobility service companies should constantly innovate their service models, carefully cultivate their customer

groups, and share this ten trillion yuan market. Automobile companies should take note of SAIC MOTOR and Changan, which have invited the cooperation of partners in the Internet industry. Internet companies should learn from the examples of companies like Alibaba, Baidu, and Tencent, which have inserted themselves into the automotive sector, jointly creating China's bright future in the automobile industry. Changing "product definitions" have provided new opportunities for emerging brands. Tesla is the first success in this new environment but will certainly not be the last. China's companies must fully cherish the opportunities generated by this situation in which those who can change their development orientations quickly are given an advantage. They should change their passive attitude towards petroleum burning automobile brands and raise the status of their brands to the level of corporate strategy. Chinese companies should use new concepts and new business models to produce top-quality products and services and create excellent brands.

Seventh, the government must prepare for the large-scale introduction of future vehicles to the market. Future vehicles are major cornerstone products, which connect the energy, transportation, technology, and consumer revolutions together. They are the basic units of smart transportation and smart cities, combining green energy, smart energy networks, future mobility, and next-generation mobile communication. It is expected that by 2030, Chinese production and sales of electric vehicles will top 15 million units and that different grades of autonomous driving

technology will be generally ubiquitous, with ownership surpassing 80 million vehicles. In order to realize these predictions, energy structures must be adjusted, smart energy networks must be constructed, transportation infrastructure must be upgraded, and next-generation mobile communication technology must be supported. Additionally, industry chains must be adjusted, jobs must be transferred, and laws and regulations must be amended; evidently this is a vast industrial revolution. Each element of this revolution must be carried out over a long period, and they will affect society as a whole. This is necessary for industrial development and cannot be accomplished by corporations alone. As such, the government needs to make contingency plans, execute top-level designs, provide market and social expectations, and strategically make progress. In this sense, it would be wise for the government to establish a timetable for this process.

When compared to almost any other country, China has more eagerly anticipated this automobile revolution, in addition to the energy revolution, technological revolution, industrial revolution, and transportation revolution. Renewable energy is the foundation of this disruptive transformation of the automobile industry, which constitutes a deep integration of electrification, network technology, smart technology, and sharing. These areas happen to be precisely the areas in which China has exhibited strong development over several years and possesses relatively strong comparative advantages. If China seizes the opportunity, it has a high chance of success.