VIETNAM AUTOMOTIVE BUSINESS AT A CROSSROADS: A JUMP TO FUTURE TECHNOLOGY

Nguyen Duc Bao Long, Nguyen Ngoc Huy, Nguyen Thi Le Van

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LIST OF ABBREVIATIONS

1.	AAF	ASEAN Automotive Federation
2.	ACES = CASE	Autonomous driving, Connected vehicles, Electrification of the powertrain, Shared mobility
3.	ASEAN	Association of Southeast Asian Nations
4.	BEV	Battery Electric Vehicle
5.	CAGR	Compound Annual Growth
6.	CBU	Complete Built Unit
7.	CKD	Complete Knock Down
8.	DCU	Domain Control Unit
9.	E/E	Electrical and Electronic Components
10.	ECU	Electronic Control Unit
11.	EV	Electric Vehicle
12.	EU-FTA	EU-Vietnam Free Trade Agreement
13.	FCEV	Fuel Cell Electric Vehicle
14.	FDI	Foreign Direct Investment
15.	FTA	Free Trade Agreement
16.	GHG	Greenhouse Gas Emissions
17.	GSO	(Vietnam) General Statistic Office
18.	HV	Hybrid Vehicle
19.	HW	(Automotive) Hardware
20.	ICE	Internal Combustion Engine
21.	IMF	International Monetary Fund
22.	IR4	Industrial Revolution 4.0
23.	ISS	Idling Stop System
24.	LCC	Low Cost Car
25.	LCGC	Low Cost Green Car
26.	ODM	Original Design Manufacturer

27.	OEM	Original Equipment Manufacturer
28.	PHEV	Plug-in Hybrid Electric Vehicle
29.	QCD	Quality - Cost - Delivery
30.	R&D	Research & Development
31.	REE	Rare Earth Elements
32.	SKD	Semi-Knocked Down
33.	SW	(Automotive) Software
34.	VAMA	Vietnam Automobile Manufacturers Association
35.	WB	World Bank
36.	ZEV	Zero Emission Vehicle

LIST OF EXHIBITS

ABOUT THE AUTHORS AND CONTRIBUTORS

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Vu Minh Tuan is a securities broker and a specialist in commercialization R&D achievements to OEM. Tuan graduated from Skidmore College with a Bachelor of Arts degree focusing on Economics and is currently pursuing his MBA at Western Sydney University – University of Economics Ho Chi Minh City. He has published works on engineering economy and cost-efficiency analysis for private vehicles.

PREFACE

Automotive businesses are defined as groups of automotive manufacturers (ODM), original equipment manufacturers (OEM) and upstream groups such as supporting industries enterprises, raw materials enterprises such as metal, plastic, rubber, glass, power, energy… downstream, including spare parts, fuel, transportation, logistics, insurance… along with adjacent industries including education and training, finance, banking… and influence groups such as Government agencies, policymakers, professional organizations, social organizations...

Economic growth and development depend on the automotive industry's development. The automotive business also contributes to several important aspects of the country, like generating national income, developing the economy, encouraging human development, promoting research and development (R&D), and innovation.

The automotive enterprises in Vietnam are divided into three main types: foreign direct investment enterprises (FDI), joint venture companies, and Vietnamese capital-owned enterprises. A common feature among these firms is that they typically follow similar processes, namely: CKD (Complete Knock Down) means assembling domestically with 100% of imported components; CBU (Complete Built Unit) means importing and distributing vehicles that were manufactured entirely abroad; and SKD (Semi-Knocked Down) means assembling vehicles locally with some localized components.

According to the General Statistics Office (GSO), Vietnam has more than 3,027 supporting industries enterprises in the fields of mechanics and automobiles. According to the Ministry of Industry and Trade (MOIT), more than 350 auto-related manufacturing enterprises have a total designed assembly capacity of about 680,000 vehicles per year, with a domestic production and assembly output that meets up to 70% of the domestic demand for passenger cars with fewer than nine seats.

The following factors can bolster the advanced developments in the Vietnamese automotive industry: the marketplace, parts production, human resources, technology, and policy & regulation. In particular, previous studies have mentioned the localization rate, supporting industries, market share, human resources, and government policy. Nevertheless, there has not been research that mentions the factors affecting Vietnam automotive business,

especially affected by factors beyond the era of industrial revolution 4.0 (IR4) and the trend of future technology.

At a Crossroads, Vietnam Automotive Business should make a Jump to Future Technology including promoting parts and components production such as ZEV (Zero Emission Vehicle), SW (Software), E/E (Electrical and Electric Components) of CASE (Connected vehicles, Autonomous driving, Shared mobility, Electrification of the powertrain) and development of electric vehicles (EV). To support that, human resources development, promoting R&D, and strengthening the application of policy and regulation in relevant fields are necessary.

Nguyen Duc Bao Long

ACKNOWLEDGEMENTS

Welcome to the first edition of Vietnam Automotive Business at a Crossroads: A Jump to Future Technology. I would like to take this opportunity to thank the many people who have contributed to this book. Professors and officers at the Graduate School of Business Administration, University of Economics and Business – VNU, who encouraged me to write this book. I would also like to thank my colleagues, at MKTP Company Limited and Japan Vietnam Hitech R&D Center, for initiating the idea of book writing on a subject that falls within my area of expertise. I am indebted to my coach, Dr. Luu Quoc Dat. Without his help, I would not have found the mental strength and balance to carry out such an immense task. Finally, I would like to thank the Oxford Journal of Technology, Arts, Sciences, and Knowledge as well as OJTASK Academy team for their continuous support.

INTRODUCTION

There are three main parts presented in this book: Part 1 is an overview of the Vietnam automotive industry; Part 2 is about the global automotive technology context; and Part 3 is about the future of automotive technology.

Part 1 presents the current situation of the marketplace, auto parts industry, human resources, and technology, as well as policy & regulations related to the development of the automotive industry. Part 1 is followed by and concluded with an overview of Vietnamese automotive enterprises based on similar experiences from other countries, and thus lessons for Vietnam that can be drawn.

Part 2 presents the landscape of global automotive technology with respect to Low Cost Cars (LCC), Zero Emission Vehicles (ZEV), electric vehicles, 4.0 technology, with the addition of the automotive software and automotive electrical equipment market. Part 2 concludes with a description of the impact of Covid-19 on the world automotive industry and the development of Vietnam automotive industry.

Lastly, Part 3 proposes a glimpse into the future of automotive technology with five solutions to promote the development of Vietnam automotive industry including boosting parts production, developing human resources, promoting R&D, strengthening policy & regulation application, and encouraging electric vehicle production. The current situation of Vietnam automotive business is evaluated within the context of international and domestic markets, with regards to their common characteristics, strengths, and weaknesses. With these concerns, the book aims to provide a vision and in Vietnam propose solutions for the development of Vietnam automotive business towards 2030.

OVERVIEW OF VIETNAM AUTOMOTIVE BUSINESS

Compared to the history of Vietnam industries, the automotive industry is relatively young. In 2004, two enterprises, Truong Hai Auto Corporation (Thaco) and Vinaxuki Motor Corp. (Vinaxuki), were allowed to manufacture and assemble vehicles. In 2012, Vinaxuki encountered difficulties and had to close.

1. PERIOD 2015 - 2019

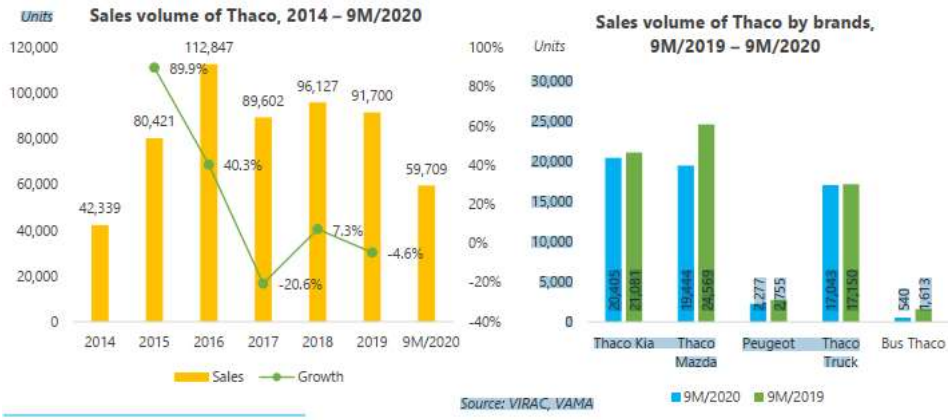
In the automotive industry, there are three major categories of vehicles: passenger vehicles, commercial vehicles (buses and trucks), and specialized vehicles; Enterprises are classified into three main groups by ownership type: (1) Mercedes-Benz, Ford, Chevrolet, Suzuki, and SYM are part of the FDI group; (2) Toyota, Mazda, Honda, Mitsubishi, Nissan, Hino, Isuzu, Kia, and Daewoo Bus are part of the joint venture group; and (3) VinFast, Do Thanh Auto, Samco, Thaco, Veam, Mekong, and Vinamotor are part of the domestic group.

Truong Hai Auto Corporation (THACO) has about 20,000 employees. As one of Vietnam leading automakers, THACO has an A-to-Z value chain ranging from product R&D, auto parts manufacturing, to auto assembly, logistics, distribution, and retail. The company offers a wide range of products: trucks, buses, passenger cars, and special-purpose vehicles from mid-range to luxury segments, which have consistently earned high sales and market share in the domestic market over the years.

EXHIBIT 1: 5 TYPICAL MODELS OF THACO

In terms of revenue, THACO has maintained its position as the top market performer in Vietnam with five vehicle brands: Mazda, Kia, Peugeot, Thaco truck, and Thaco bus.

EXHIBIT 2: SALES VOLUME OF THACO, 2014 - 2020



THACO Chu Lai Mechanical and Automotive Industrial Park in Quang Nam Province is considered the most prominent hub of automotive manufacturing and supporting industries in Vietnam. There is a total of 32 companies and units, including automotive assembly plants, automotive parts factories and mechanical complexes, Chu Lai port and logistics units, road transport and shipping companies, construction, and investment companies, Thaco College, and other support units.

EXHIBIT 3: CAR MODEL OF VINFAST


Sedan

Hatchback


SUV

VinFast, a member of Vingroup, the largest private corporation in Vietnam established in 2017, aims to become the leading automobile and motorcycle manufacturer in Southeast Asia. It plays a crucial role in Vingroup's vision to become an international standard

technology-industry-service conglomerate by 2028, focusing on technology development and application. VinFast established manufacturing, R&D, supplier parks, and a development complex in Hai Phong City. The complex comprises 335 hectares and includes a centre for product R&D, an automotive manufacturing plant, and a training centre, Most R&D is expected to be channeled towards electric vehicles from 2025 – 2030. VinFast diversified its product offering to compete with Mercedes-Benz, BMW, Audi, Lexus…

In October 2018, two car models, Sedan Lux A 2.0 and SUV Lux SA 2.0, were revealed at the Paris Motor Show, one of the most significant global automotive events, and received an enthusiastic reception from the international public. Other car models VF6, VF7, VF8, and VF9 were named among the top ten most beautiful electric cars at the CES 2022 exhibition in Las Vegas, while VF6 and VF7 were named among the top ten most beautiful electric cars at the CES 2022 exhibition in Las Vegas.

In 2016, a tax reduction on car imported from ASEAN to 40%, and a new method of calculating the special consumption tax on imported vehicle from cost to wholesale price, i.e., cost of goods plus shipping costs, advertising, sales, and profitability of the business increased vehicle price of the domestic market.

In 2017, in order to support the domestic automotive manufacturers, the Government issued Decree No.116 on tightening conditions for automotive importers and Decree No.125 on the preferential import duty rate of 0% for imported vehicle part if they satisfy certain conditions, which caused a significant decrease in the number of import vehicle.

In 2018, Decree No. 116 came into effect. The special consumption tax is based on cylinder capacity:

- The passenger car with nine seats or less with a cylinder capacity of 2.0 liters or less will receive a 5% discount on the special consumption tax.
- The models with engines of cylinder capacity of 2.5 – 3.0 liters are subject to a 5% increase in special consumption tax.
- The tax reduction on vehicles imported from ASEAN was reduced down to 0%.

As a result, the number of import vehicle decreased drastically. In 2019, Decree No. 16/2019/QD-TTg on regulating the roadmap for the application of exhaust emission standards for motor vehicle in traffic and import used motor vehicle which manufactured

before 1999: Level 1 manufactured between 1999 and 2008; Level 2 manufactured after 2008; Level 3 for import used motor vehicle; Level 4 has contributed to reducing CO2 emission and sustainable growth in the number of vehicles.

2. PERIOD 2020 - PRESENT

In 2020, the Government issued Decree No. 70/2020/ND-CP on a 50% reduction in the registration fee for domestically manufactured and assembled motor vehicle; Decree No. 109/2020/ND-CP on the extension of time limits for particular consumption tax payments for domestically manufactured or assembled cars to the end of 2020; and Decree No. 57/2020/ND-CP on applying a 0% preferential import duty rate for raw materials, supplies, and components that have not been domestically produced, thus consumption. The imported vehicles had to cut profits to increase promotion to compete, and the domestic automotive industry greatly benefited.

EXHIBIT 4: VINFAST MODEL VF31 – VF32 – VF33




VinFast is a pioneer in the production of electric vehicle in Vietnam. In January 2021, VinFast launched 3 brand-new innovative electric vehicle models using AI technology with many outstanding features, including theVF31 (C-segment SUV, electric version), VF32 (D-segment SUV), VF33 (E-segment SUV). VF32 and VF33 are electric vehicles, and there is a fuel version as well. This event represents an essential milestone for Vinfast in its global expansion to put its name in the world automotive industry. The standard version of VF31

started receiving orders in Vietnam in May 2021 and was delivered to customers in November 2021. VF32 and VF33 is expected to receive order from September 2021 in Vietnam, with delivery from February 2022; In the US and Canadian, European market, VinFast will receive order from November 2021 and deliver from June 2022.

On April 12, 2021, on the portal of the Ministry of Information and Communications (MIC), the article titled "Technology and industrial enterprises would help turn Vietnam into a developed country" by Minister Nguyen Manh Hung had indicated: "Vietnam aims to become an industrialized country by 2045, the country must rely on technology and industry business."

In May 2019, the Government organized a national forum and spread the message about Vietnam technology enterprises and "Made in Vietnam" products to encourage enterprises with the financial, market, management, and human potential to undertake the country's technological and industrial mission. VinGroup, as one of the leading enterprises, declared the strategy to become a technology – industry – service conglomerate.

The Vietnam market is the foundation for Vietnam's technology enterprises on the momentum of globalization. Vietnamese people prefer to use Vietnamese goods because they have good quality and reasonable prices. "Made in Vietnam" is mastering the design, core technology, and integration into commercial products. In terms of technology, invest directly in the electric vehicle and\ invest in factories with the latest technology, high-level automation, and intelligence.

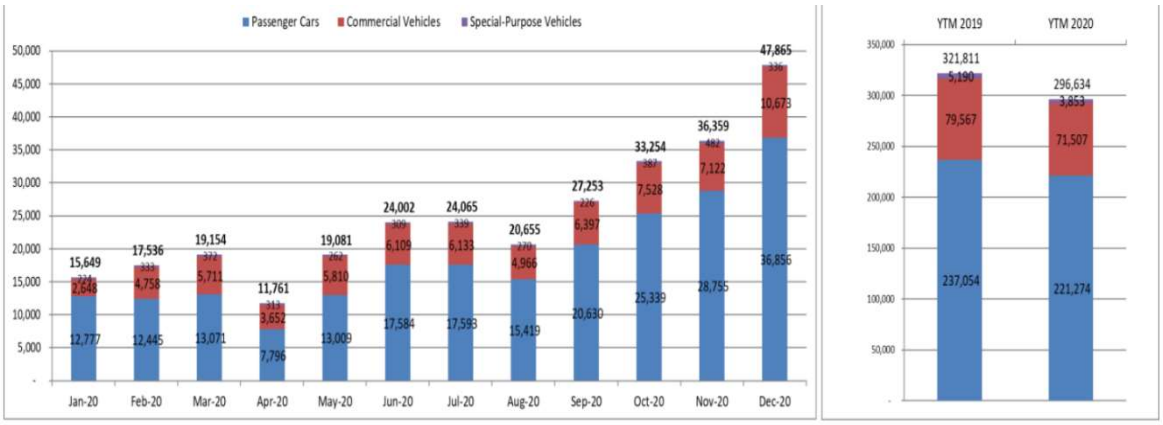
VinFast is building a nationwide electric vehicle charging station ecosystem by calling for 2,000 suitable locations to place 40,000 charging ports. VinFast is a pioneering electric motorcycle and electric vehicle manufacturer in building an electric vehicle ecosystem. Recently, VinFast announced that it is implementing a project to develop electric vehicle charging stations covering 63 provinces and cities nationwide. This is the first project to install battery-charging ecosystem for electric vehicles and the largest scale project in Vietnam. Specifically, VinFast will deploy charging stations in the parking lots of the following locations: apartment buildings, office buildings, commercial centers, supermarkets, bus stations, public parking lots, universities, colleges... The VinFast charging station looks good, meets European standards, and operates automatically through VinFast's application.

3. SITUATION OF VIETNAM AUTOMOTIVE BUSINESS

3.1. MARKET

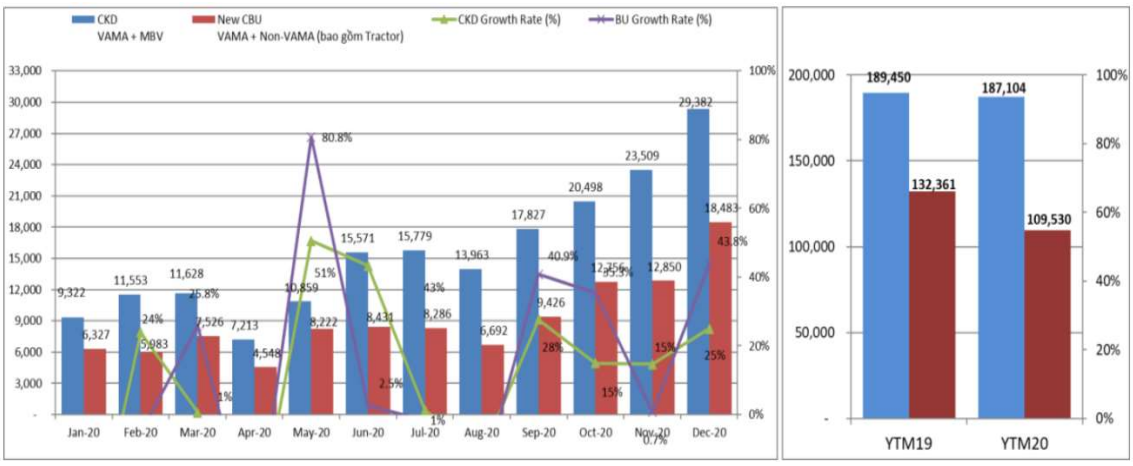
Sales of members of the Vietnam Automobile Manufacturers' Association (VAMA) in 2020 by vehicle types are as follows:

EXHIBIT 5: SALES CHART OF MEMBERS OF THE VIETNAM AUTOMOBILE MANUFACTURER'S ASSOCIATION, 2020 (SOURCE: VAMA)



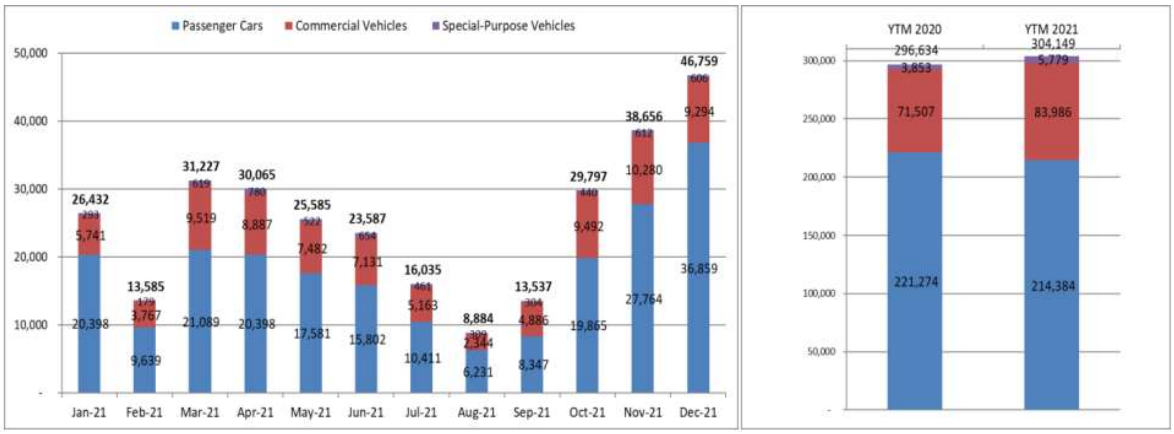
Sales in 2020 classified by domestically assembled vehicles (CKD: Complete Knock Down) with 100% of components imported and completely imported (CBU: Complete Built Up) are as follows:

EXHIBIT 6: SALES CHART OF MEMBERS OF VIETNAM AUTOMOBILE MANUFACTURERS' ASSOCIATION, 2020 CLASSIFIED BY CKD AND CBU (SOURCE: VAMA)



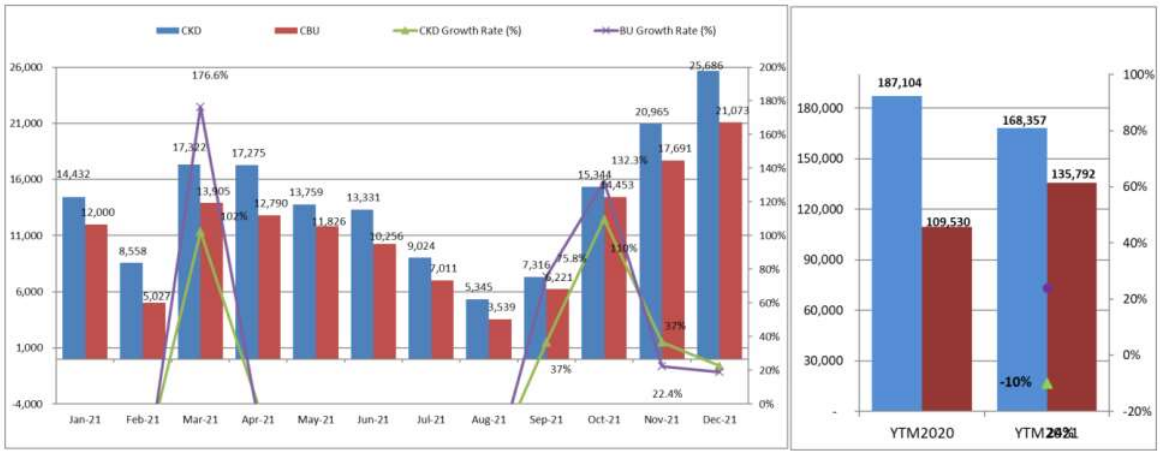
In 2021, the total sales increased by 3% compared to 2020.vIn terms of segments, passenger cars decreased by 4%; commercial vehicles increased by 20% and specialized vehicles by 50% when compared to 2020. Based on vehicle types, sales of VAMA members for 2021 are as follows:

EXHIBIT 7: SALES CHART OF MEMBERS OF THE VIETNAM AUTOMOBILE MANUFACTURERS' ASSOCIATION, 2021 (SOURCE: VAMA)



Total sales in 2021 increased by 3% versus 2020 whereby passenger cars decreased to 3%, commercial vehicle increased to 17% and special-purpose vehicles to 50% versus 2020.

EXHIBIT 8: SALES CHART OF MEMBERS OF VIETNAM AUTOMOBILE MANUFACTURERS' ASSOCIATION, 2021 CLASSIFIED BY CKD AND CBU (SOURCE: VAMA)



Sales in 2021 classified by CKD were down 10% and CBU was up 24% versus last year.

Additionally, in comparison to the sales of vehicles in Southeast Asia, Indonesia's vehicle sales in 2019 was 3.2 times higher than Vietnam, and 1.79 times higher in 2020 than Vietnam. Thailand's vehicle sale in 2019 was 3.13 times higher than Vietnam, and 2.67 times higher in 2020.

EXHIBIT 9: VEHICLE SALES OF SOUTHEAST ASIAN COUNTRIES, 2020 (SOURCE: AAF)

	Passenger vehicles	**Commercial vehicles**	**2020**	**2019**
Brunei	12,239	266	12,505	11,909
Indonesia	388,886	143,141	532,027	1,030,126
Malaysia	474,104	48,469	522,573	604,281
Myanmar	12,867	4,840	17,707	21,916
Philippines	69,638	154,155	223,793	369,941
Singapore	46,986	9,437	56,423	90,429
Thailand	343,494	448,652	792,146	1,007,552
Vietnam	221,274	75,360	296,634	322,322
TOTAL	**1,569,488**	**884,320**	**2,453,808**	**3,458,476**

As for Southeast Asian countries, the production numbers show that in 2019 Indonesia's production is 7.3 times higher, and in 2020 it is 4.17 times higher than Vietnam. Thailand's production in 2019 is 11.43 times higher, and in 2020 it is 8.62 times higher than that of Vietnam.

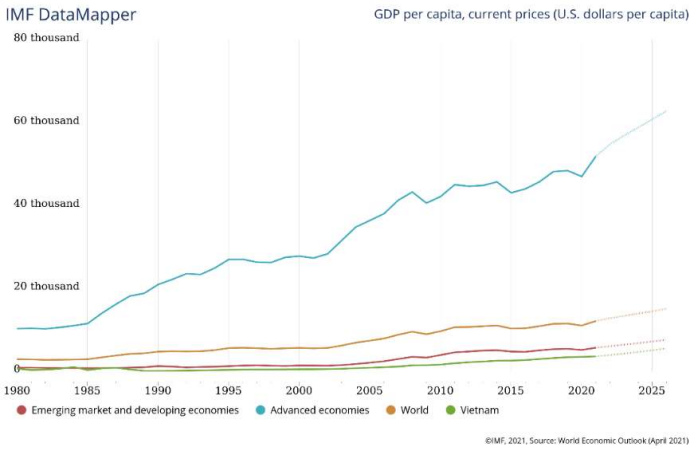
EXHIBIT 10: AUTO PRODUCTION VOLUME OF SOUTHEAST ASIAN COUNTRIES, 2020 (SOURCE: AAF)

	Passenger vehicles	**Commercial vehicles**	**2020**	**2019**
Indonesia	551,400	138,750	690,150	1,286,848
Malaysia	457,755	27,431	485,186	571,632
Myanmar	8,346	2,407	10,753	15,496
Philippines	37,141	30,156	67,297	95,094
Thailand	537,633	889,441	1,427,074	2,013,710
Việt Nam	125,235	40,333	165,568	176,203
TOTAL	1,717,510	1,128,518	2,846,028	4,158,983

More specifically, Indonesia's production/sales ratio is 1.25-1.3, Thailand's ratio is 1.8-2.0 while Vietnam's ratio is only 0.55-0.56. This means that Indonesia has overproduced 25-30% for export, Thailand produces twice the domestic demand for export while *Vietnam produces only about 55% of domestic demand*.

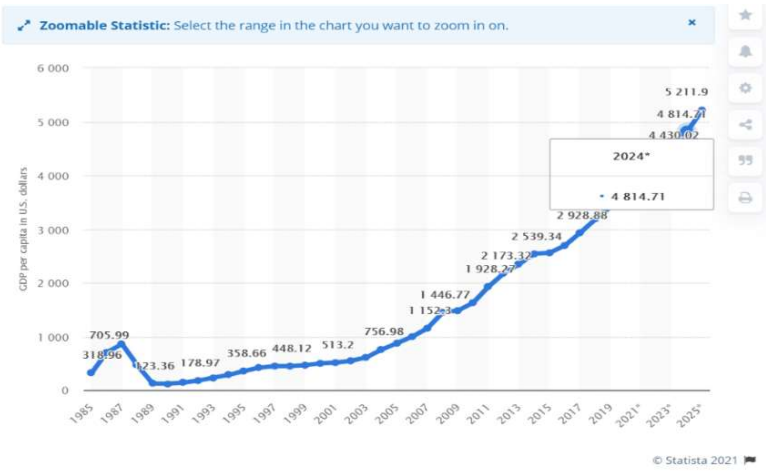
According to the International Monetary Fund (IMF) in April 2021, Vietnam's GDP per capita is 3,610 USD, while those of developing economies and emerging markets are 5,700 USD and other economies average economic development is 12,160 USD.

EXHIBIT 11: VIETNAM GDP PER CAPITA, DEVELOPING AND EMERGING MARKETS, DEVELOPED ECONOMIES, 2025 (SOURCE: IMF)



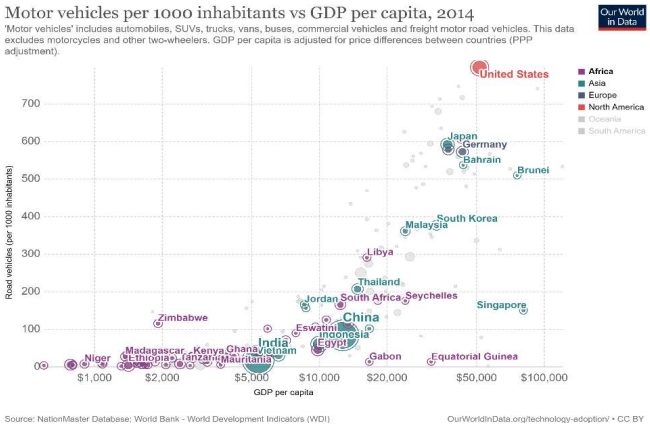
According to Statista, report (2021) Vietnam's GDP per capita for 2024 will reach USD $4, 817 and continues to increase. Based on the experience of Japanese car manufacturers, if a country's GDP per capita reaches USD $3,200 - 3,400, its people can afford to purchase a personal car. In terms of income, this is the time where the majority of Vietnamese people to be able to buy a personal car.

EXHIBIT 12: FORECAST OF VIETNAM GDP PER CAPITA, 2025 (SOURCE: STATISTA)



The graph below shows the relationship between per capita income and the car index per 1,000 inhabitants, whereby colours in red represents America, grey represents Germany, and blue represents Germany and Japan, purple indicates Asian and most African countries.

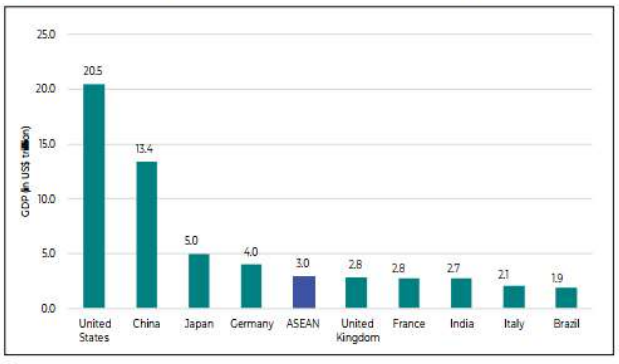
EXHIBIT 13: MOTOR VEHICLES PER 1,000 INHABITANTS VS GDP PER CAPITA, 2014 (SOURCE: WORLD BANK)



According to the World Bank 2019 figures, the entire Southeast Asia region has a population of over 661 million people and a nominal GDP of approximately 3,317 billion USD. Among them, Thailand has a population of around t 69.6 million people, a GDP of approximately 543.5 million USD, a GDP per capita is 7,806 USD, and the index of motor vehicles per 1,000 inhabitants is 266. Indonesia has a population of around 270 million people, GDP of about 1.119 billion USD, a GDP per capita of 4,136 USD, a motor vehicles index of 87 per 1,000 inhabitants. Vietnam has a population of about 96.5 million people; GDP is about 261.9 billion USD, a GDP per capita of 2,715 USD, a motor vehicles index of 23 per 1,000 inhabitants. This shows that the domestic market of Vietnam still has potential.

EXHIBIT 14: TOP TEN LARGEST ECONOMIES IN THE WORLD, 2018 (SOURCE: ASEAN SECRETARIAT)

Figure 6.1. Top ten largest economies in the world (US$ trillion), 2018



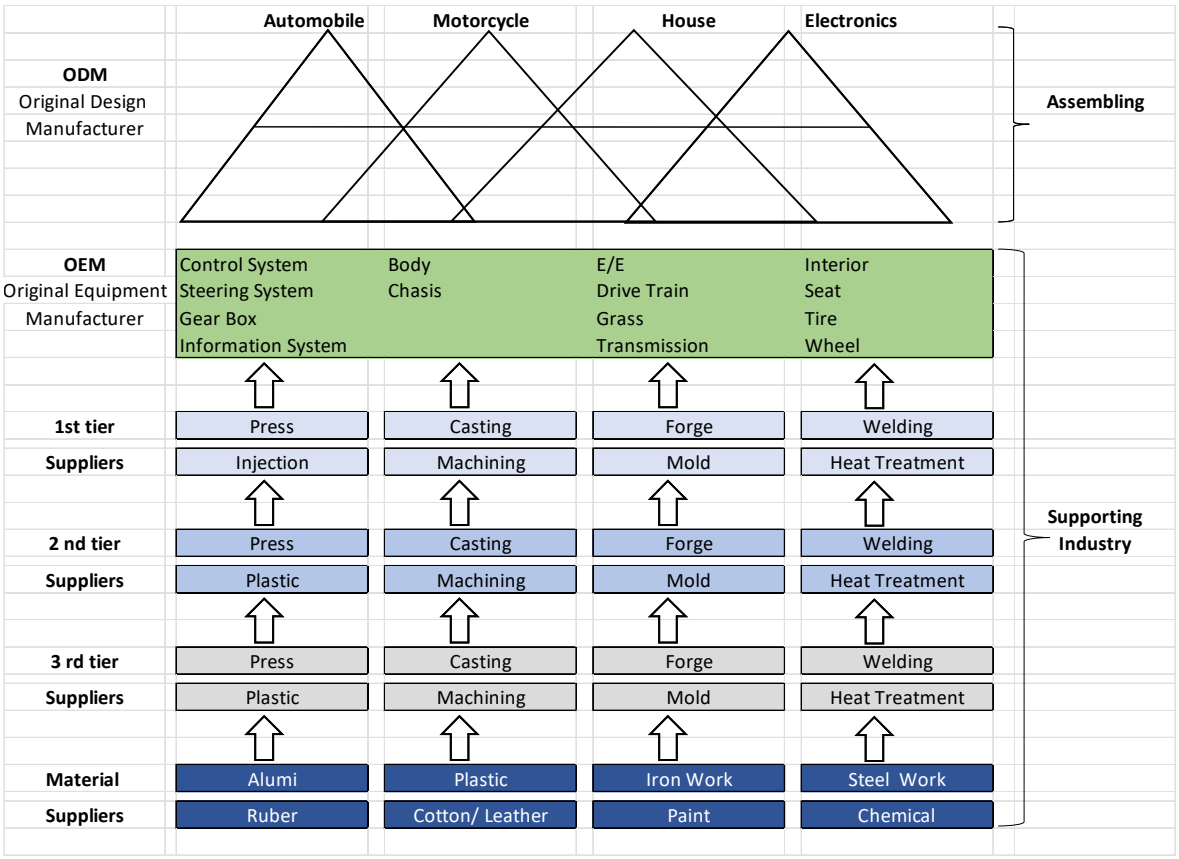
Source: ASEAN Secretariat, ASEANstats database

The above chart shows that in 2018 ASEAN is among the largest ten economic groups in the world with a GDP of approximately 3 billion USD.

3.2. AUTO PARTS PRODUCTION

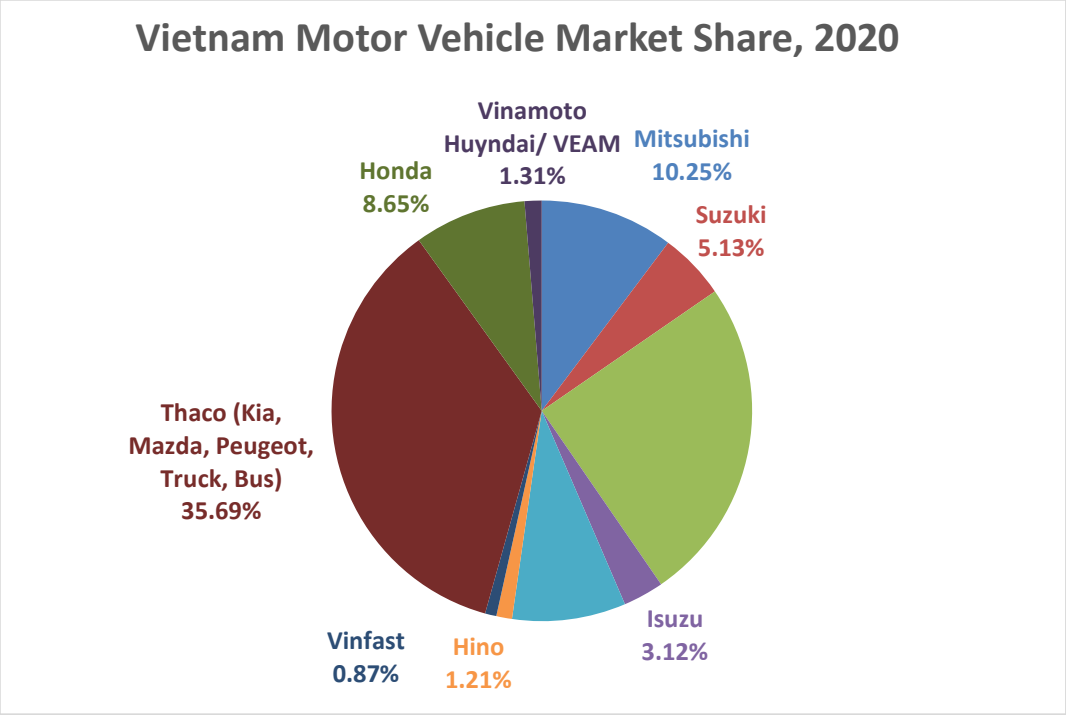
Currently, Vietnam has 19 automotive manufacturers (Appendix), more than 50 world OEM, 350 supporting industries enterprises, 1,200 enterprises manufacturing motorcycle parts, 126 enterprises providing raw materials for the automotive industry with a total design assembly capacity of about 680,000 vehicles/year. It mainly manufactures and assembles cars, produces chassis, bodywork, manufactures components and auto parts such as interior, seat, tire, plastic... Engine parts, control systems, information systems, fuel-saving systems, environmentally friendly parts... are mostly produced by some World OEMs who are present in Vietnam, but it is not taking advantage of them to develop the National automotive industry.

EXHIBIT 15: VIETNAM AUTOMOTIVE MANUFACTURING INDUSTRY



According to VAMA statistics, in 2020, the market share of automotive manufacturers in Vietnam is as follows:

EXHIBIT 16: VIETNAM MOTOR VEHICLE MARKET SHARE, 2020



Toyota accounts for 24.90% of sales, Thaco (Kia, Mazda, Peugeot, Truck, Bus) for 35.50%, Mitsubishi for 10.20%, Suzuki for 5.10%, Toyota for 24.90%, Isuzu for 3.10%, Ford for 8.70%, Hino for 1.20%, Vinfast for 0.87%, Honda for 8.60%, Vinamoto Hyundai/VEAM for 1.30%. Toyota and Thaco have dominant positions. There is less concentration of the market share. There is no type of vehicle that explains for the unprecedented number.

Geographically, 11 OEM are located in the North, 2 ODM are located in the Central Region, and 8 ODM in the South, and thus it is difficult to save on logistics cost as well as parts manufacturing cost.

Vietnam's automotive sector is growing at a slower rate than that of its ASEAN neighbours, although it has witnessed exponential growth in recent years. The industry started to progress in the early 2000s and will be one of the fastest-growing automotive industries in ASEAN over the next 20 years. According to the Vietnam Automobile Manufacturers Association, more than 296,634 cars were sold in Vietnam in 2020, down 8% decrease from the previous year. Vietnam auto industry currently relies primarily on the export of components and parts

to neighbouring countries; Vietnam has a trade surplus of 900 million USD in 2020 from exports worth 4.4 billion USD and imports worth 3.5 billion USD, with 42% going to Japan, 16% going to United States and 9% going to China. While manufacturing auto components is profitable, Vietnam is also looking to expand its auto industry. In June 2019, Vietnam signed the EU-Vietnam Free Trade Agreement with the European Union (EU-FTA); 71% of duties will be eliminated on Vietnam exports, accordingly, including motor vehicle and auto components. When combined with Vietnam low production costs, the EU-FTA could attract some auto and parts manufacturers to move out of Thailand, where FTA negotiations with the EU are ongoing.

Vietnam has remained a popular destination for international investors since it has far less limitations on foreign direct investment than most neighbouring countries. Automotive joint ventures can be held entirely by foreign capital and do not require a Vietnamese legal representation. In order to enhance the domestic supporting industries, certain import measures have been recommended in Vietnam

3.3. HUMAN RESOURCES

According to the research by (Nguyen Duc Bao Long, Ho Lu Lam Tran, Khong Sin Tan, 2015), (Nguyen Duc Bao Long, Ho Lu Lam Tran, 2017), (Nguyen Duc Bao Long, Nguyen Thi Le Van, Nguyen Duc Quynh Lan, 2018), Vietnam has the advantage of the workforce: low labour cost and availability. The automotive industry requires high technical skill; however, one of the most significant workforce issues faced is the quality of technical competence. Its technical skills are not qualified for a particular high technology-related role, but they can be improved through education and training.

3.4. TECHNOLOGY

According to a study by the General Statistics Office (Statistical analysis and forecast reports in 2019 - Research on factors promoting Vietnam supporting industries, 2020), supporting industries, by definition, according to Decree No. 111/2015/ND-CP dated November 3, 2015, of the Government, are “industries producing raw materials, materials, components, and parts to provide for the production of finished products.” With this definition, in the overall image from upstream to downstream, supporting industries are upstream and midstream industries, that provide inputs to produce final products in the downstream region. However,

when considering only the supporting industries' products prioritized for development as prescribed in Decree No. 111, the supporting industries include several raw materials, parts, and components for downstream products of the textile, garment, and leather industries, footwear, electronics, automotive, mechanical, and high-tech industries.

In the field of mechanics and automobiles, there are 3,027 supporting industrial enterprises, including 286 enterprises producing metal parts and components and 182 enterprises manufacturing parts and components for all kinds of metal structures, tanks, etc. 1,840 enterprises providing metal processing (forging, stamping, pressing, metal coating...), 155 enterprises manufacturing parts, and electrical equipment components, 139 enterprises manufacturing parts for other machinery and equipment products, and 422 enterprises manufacturing parts and components for motorcycles.

Regarding processing methods in the mechanical industry, 348 enterprises engaged in casting, 257 enterprises in forging, 1,181 enterprises in welding, 722 enterprises in stamping processing, 1,017 enterprises in precision processing, 15,889 enterprises in heat treatment, 901 enterprises for surface treatment/ painting/ plating, 306 enterprises assembling components, and 159 enterprises with other processing methods. In the automotive and motorcycle industry, there are 124 casting enterprises, 47 forging, 163 welding, 197 pressing/ stamping, 26 enterprises manufacturing plastic molds, 8 rubber molding, 205 mechanical processing, 37 heat treatment, 113 surface treatment, 4 glass processing, 179 parts assembly, 25 parts manufacturing. In terms of efficiency capability ratio, 12% enterprises achieved 100% utilization efficiency, 24.1% of enterprises achieved utilization efficiency between 80-100%, 54.4% of enterprises achieved utilization efficiency from 50-80%, and 9.5% achieved utilization efficiency below 50%.

Regarding the degree of automation, 43% of enterprises are still using manual equipment, 49% use semi-automatic equipment, 8% use automated equipment, and 5 enterprises (less than) 1%) use robots.

Regarding quality management system application, 2,375 enterprises said that no management system has been applied, 492 enterprises have been granted ISO 9000, 187 with ISO 14000, 2 with ISO 13485, 6 with ISO 50001, 72 with ISO/IATS 16949, 16 with OHSAS 18000 and 2 with SA 8000.

Regarding applying management tools, 2,423 enterprises said that they had not applied any tools, 529 applied 5S, 156 applied Kaizens, 27 applied six sigma, 27 applied lean production, 50 applied TQM, 32 applied TPM, and 33 enterprises applied Kanban tools.

Research by (Nguyen Duc Bao Long, Ho Lu Lam Tran, Khong Sin Tan, 2015) suggests that the supporting industries of the Vietnam auto industry is capable of providing inputs for motor vehicle production and helps increase the localization rate, which would result in generating more profits for the industry. The study points out that the concept of parts supply base is an entirely new concept in the Vietnam automotive industry and the region. It shows that most of the respondents consider the concept of parts supply base similar to supporting industries. However, most people think that Vietnam has the conditions to become a supply base with a good location, a growing domestic market, and an attractive ASEAN market.

According to research done by (Nguyen Duc Bao Long, Ho Lu Lam Tran, Khong Sin Tan, 2015), R&D activities of Vietnam auto industry itself are still weak. Vietnam automakers can only do simple tasks in the production value chain, and they are slow to adopt new technology and easily satisfied with products, markets, or customers. This leads to almost no motor vehicle parts being R&D domestically.

On July 01, 2013, the Prime Minister issued Decision No. 1043/QD-TTg approving Vietnam's industrialization policy within the framework of Vietnam-Japan cooperation toward 2020, with a long-term vision to 2030. Automotive and auto parts manufacturing will be one of six priority industries, according to this decision. It is worth emphasizing that the automobile and auto parts manufacturing industry will dramatically rapidly grow into vital industries for the economy, with high added value and international competitiveness by 2020 – vision to 2030. Japan's automakers have requested that Vietnam to adopt an action plan that includes developing preferential policies to attract significant investment businesses in this sector. Japan is one of the world's leaders in this sector. However, the question is whether Vietnam will have enough time to compete with Thailand and Indonesia, both of which have strong auto industries and major commitments to Japanese manufacturers.

Currently, there are production facilities with modern equipment, machinery, and technology, such as the Bus Thaco factory, the largest bus assembly, and manufacturing plant in Vietnam and South East Asia are outfitted with cutting-edge bus systems.Automatic assembly and production with a localization rate of more than 40%; The most modern Mazda

car factory in Southeast Asia with a capacity of 50,000 vehicles/year; The VinFast assembling plant in Dinh Vu Industrial Park, Cat Hai, Hai Phong has a complete product production cycle, which is continuously connected and automated with thousands of ABB robots, operating systems. Manufacturing practices from Siemens and SAP.

3.5. POLICY & REGULATION APPLICATION LANDSCAPE

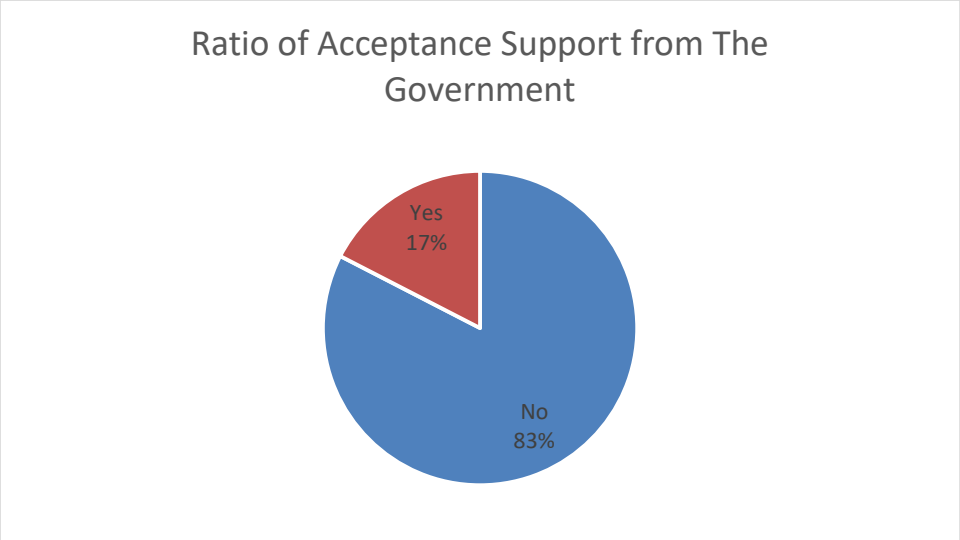
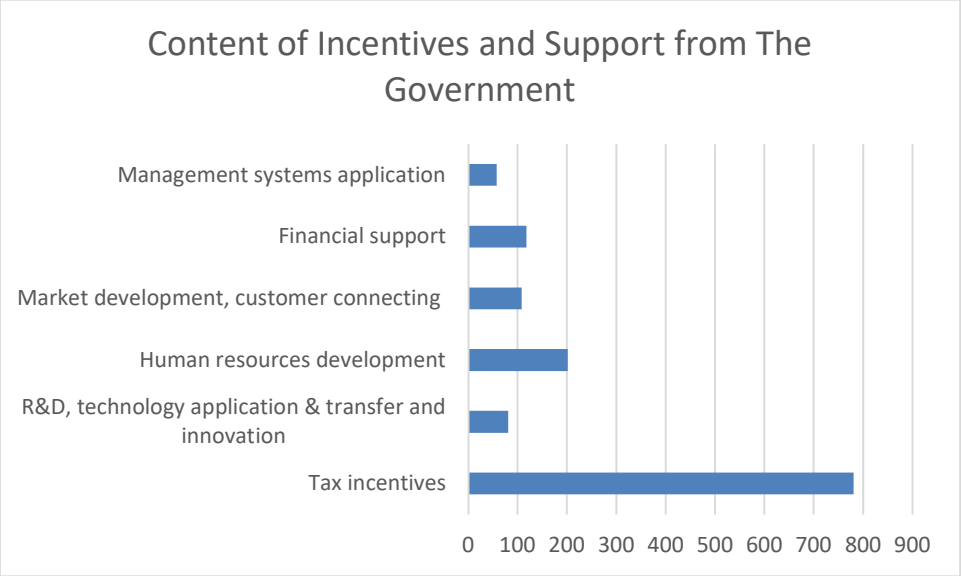


EXHIBIT 17: RATIO OF ACCEPTANCE INCENTIVES AND SUPPORT RELATED TO SUPPORTING INDUSTRIES FROM THE GOVERNMENT

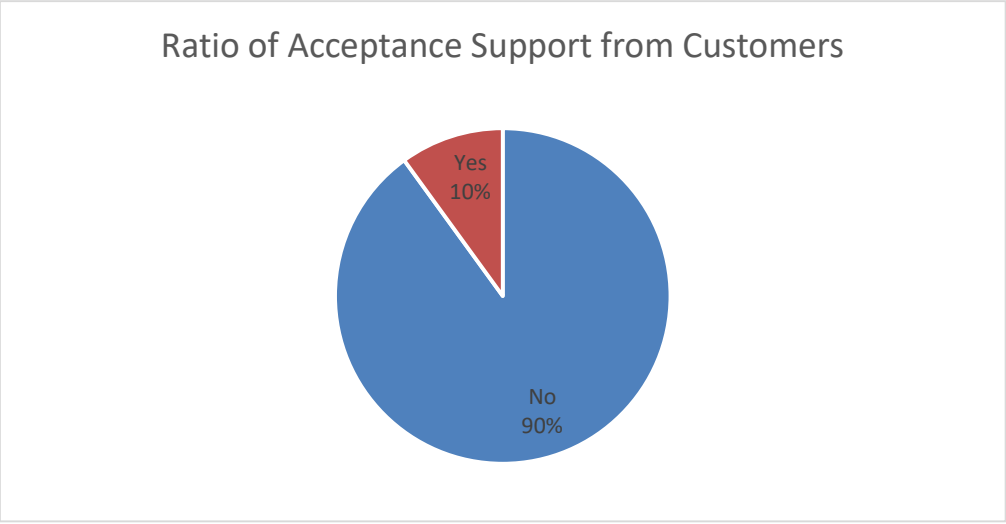
In a study done by the General Statistics Office (Statistical analysis and forecast reports in 2019 - Research on factors promoting Vietnam supporting industries, 2020) on related incentives and support from the Government that enterprises received, a total of 839 enterprises (17%), and 3,976 (83%). enterprises said that they have not received any support incentives.

EXHIBIT 18: CONTENT OF ACCEPTANCE INCENTIVES AND SUPPORT RELATED TO SUPPORTING INDUSTRIES FROM THE GOVERNMENT



Among the enterprises that have received support incentives, a total of 781 enterprises have received tax incentives, 91 enterprises have received R&D, technology transfer and innovation support, and 202 enterprises have received support from training to human resources, development. While another 108 enterprises have received support for market development, connecting its domestic and foreign customers, 118 enterprises have received financial support, and 58 enterprises have received support in applying management systems to meet the world supply chain requirements.

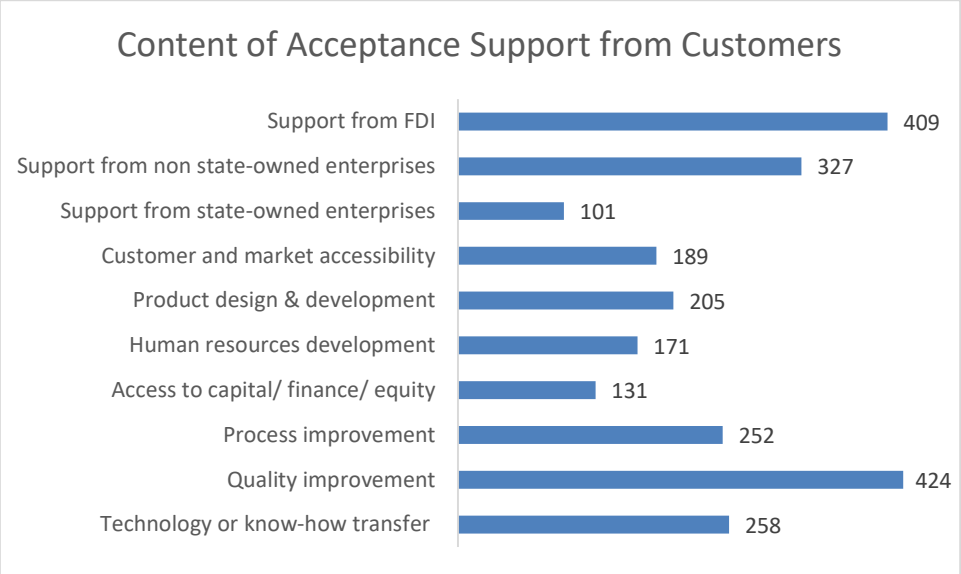
EXHIBIT 19: PATIO OF ACCEPTANCE SUPPORT FROM CUSTOMERS



The survey results suggest that that supporting industries firms score all incentives and support measures at an average level in the range of 5-7 points when evaluating the efficacy of incentive and support from state agencies on a scale of 10 points.

Regarding the support from customers to help businesses improve their production and business activities, 480 enterprises said that they received support from customers (10%), of which, 258 enterprises received support for technology or know-how transfer, 424 enterprises were supported to improve product quality, 252 enterprises were supported to improve production processes, 131 enterprises were supported to access capital/ finance/ equity, 171 enterprises were supported with training human resources, 205 businesses were supported with product design and/or development, and 189 businesses were supported to access customers and markets. In terms of customers, 101 enterprises said they received support from state-owned enterprises, 327 enterprises said they received support from non-state enterprises, 409 enterprises received support from FDI customers, and 748 enterprises received support from foreign customers. Support content is mainly focused on product quality improvement, technology transfer, and production process improvement.

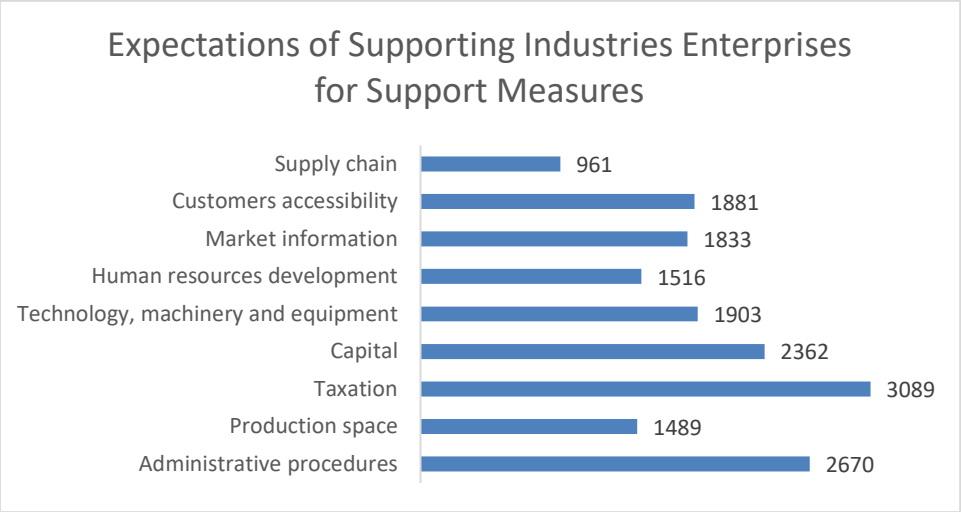
EXHIBIT 20: CONTENT OF ACCEPTANCE SUPPORT FROM CUSTOMERS



Regarding the desire of supporting industry enterprises for support measures, 2,670 enterprises said they wanted to receive support for administrative procedures, 1,489 enterprises said they wanted to be supported in terms of production space, 3,089 enterprises

said they wanted taxation support, 2,362 enterprises wanted capital support, 1,903 enterprises wanted to be supported in technology, machinery, and equipment, 1,516 enterprises wanted support in human resources development, 1,833 enterprises wanted to be supported with market information, 1,881 enterprises wanted support in customer accessibility, and 961 enterprises wanted support in the production chain.

EXHIBIT 21: EXPECTATIONS OF SUPPORTING INDUSTRIES ENTERPRISES FOR SUPPORT MEASURES



According to the General Statistics Office, 88% of supporting industries enterprises are small and medium-sized enterprises that lack market intelligence and customer access; thus, they mostly provide the domestic market (75% of enterprises have 100% revenue from the domestic market and only 8% of enterprises have full revenue from export). Only 17% receive incentives and assistance from Government programmes. The coverage of domestic supporting industries development policy and programme are limited due to various reasons such as programmes or preferential policy, and support for supporting industries enterprises have only been implemented in the past few years, the propaganda activities about these policies and programs are still limited, making many enterprises not yet known. The budget allocated for supporting activities is insufficient to meet the needs of the supporting industries enterprises; the support solution is not suitable to the needs of the business... As a result, detailed assessments must be conducted as the basis for appropriate adjustments to ensure that the solution and support policy are spread to reach the customers. More business that profits from supporting sectors in terms of value chain, the proportion of enterprises operating in segments that provide high added value in the value chain is relatively low, 19%

of textile and garment enterprises and 33% of electronic enterprises doing design during manufacturing.

Although all supporting industries enterprises admit they do not have strengths in responding to environmental changes, the ability of products R&D, strategic vision for production, and business management systems. Enterprises also identify barriers to development as customers' accessibility, market information and human resources... but when being asked about their desire for assistance with, taxation, administrative procedures, capital, but not solutions to overcome difficulty and weakness that enterprises have previously identified. In addition, the results of the evaluation of the effectiveness of support programme and solution show that, although there is not a big difference, the supporting industries enterprises seem to appreciate the support measures in terms of taxation and financial support rather than market support, training, innovation, R&D... This presents a big challenge for Government support programme that wish to focus on supporting problem-solving, but not many businesses respond because it is not as expected.

In addition to the programme, preferential policy, and support from the Government, supporting industries enterprises also have the opportunity to receive support from customers. However, the customer will only support by increasing the capacity when the supplier reaches a certain threshold and is assessed as having the potential to become a supplier. Participation in the global supply chain, enterprises are required to reach a certain level, meeting the minimum standards for Quality – Cost – Delivery (QCD) and other industry – field specific requirements.

4. VIETNAM AUTOMOTIVE INDUSTRY

The automotive industry plays an important role in global economic development, contributing for around 3.65% of the global GDP. The automobile industry is comprised of two primary industries original design manufacturer (ODM) and original equipment manufacturer (OEM) both of which contribute significantly to both upstream and downstream economic sectors along with adjacent sectors. In industrial nations, a 1% growth in the automotive sector results in a 1.5% increase in GDP In Vietnam, the automotive sector accounts for 3% of the GDP and continuing to expand with the goal of achieving 1 million vehicles by 2030.

Currently, automotive enterprises in Vietnam are divided into three groups: foreign direct investment (FDI), joint ventures and Vietnamese enterprises. Their common attribute is that they all manufacture and assemble CKD vehicles, as well as import and distribute CBU, or SKD vehicles.

According to the General Statistics Office, Vietnam has over 3,027 supporting industries enterprises in the fields of mechanics and automobiles, as well as more than 350 manufacturing enterprises related to automobiles, with a total designed assembly capacity of about approximately 680,000 vehicles/year. However, its average localization rate is only 10-15%, one of the lowest in the region.

The marketplace, components, manufacturing, human resources, technology, and the implementation off policy and regulations are all critical variables in the development of Vietnamese automobile industry. In particular, previous research has focused on the pace of localization, supporting industries, market capacity, human resources, and government policy. There has been minimal study little of research on the factors affecting Vietnamese automotive enterprises, especially those prior to the age of industrial revolution 4.0 and the trend of automotive technology towards Zero Emissions vehicles (ZEV) and future technology.

The automotive industry is considered as one of the most important industries by the Vietnamese government It's a country with a population of over 96 million, a GDP per capita of 3,610 USD (IMF, April 2021) and expected to achieve 4,817 USD (Statista) in 2024 and continue to increase in the future. However, its personal car ownership index is rather low. only 23/1000, thereby indicating that is still a market potential. Unfortunately, it does seem to show that the domestic market capacity has not yet developed.

5. CASE STUDY AND LESSONS

5.1. CASE STUDY FROM OTHER COUNTRIES

Thailand produced over 2 million motor vehicles in 2019, 1.4 million motor vehicles in 2020, and exported more than half to more than 100 countries. Thailand initiated the green car plan in 2007, which brought many opportunities for foreign investors, such as corporate income tax exemption and the issuance of a stimulus package. Indonesia focuses on the domestic

market, such as Low Cost Green Car (LCGC), issuing many incentives, including tax, R&D, and vocational training. Malaysia is an important contributor to ASEAN automobile production. In Malaysia, its motor industry is divided between domestically produced vehicles (Proton and Perodua) and international competitors (Honda and Toyota). In 2018, Malaysia replaced the goods and services tax with a sales and service tax, resulting in a 10% vehicle tax and an increase in vehicle pricing.

5.2. LESSONS

It is possible to learn the quality and efficient business model through the lean production system, R&D, and innovation of Japanese and German manufacturers. Japan is vital in promoting technology innovation, improving vehicle safety, and expanding accessibility. At the same time, Germany manufacturers invests a lot in improving engines efficiency, enhance performance, improve advanced electric, hybrid, and fuel cell engine upgrades while incorporating lightweight materials and electronics. Japanese manufacturer significant contribution to safety and connectivity that enables the rapid transition from conventional vehicle technology to future technology and symbolizes global integration. Japanese manufacturers also support non-profit organizations, charities, educational, cultural, and community events.

THE WORLD AUTOMOTIVE TECHNOLOGY LANDSCAPE

1. LOW COST CAR TREND

With flat growth in the United States, Europe, and Japan, automakers are focusing emerging markets by offering Low Cost Car (LCC) (priced at 6,000 USD or less) for a more significant population segment. Although the returns are small (2-3% in the case of Tata Nano), the yield potential is enormous. According to a study by AT Kearney, LCC less than 5,000 USD have huge sales potential in emerging markets like India.

Historically, the sector has enjoyed an incredible growth and by 2022 is expected to reach 17.5 million vehicles globally. Asia, particularly India and China, is driving this expansion. And as result firms such as GM, Bajaj, Nissan, and Renault are investing significantly in this category.

However, this segment also has drawbacks: meager margins, the need for alternative distribution channels compared to conventional means, and the development of tailored marketing strategies by country and export to other potential regions such as the Middle East, Africa, and other emerging markets. Therefore, the possibility of profit margins being completely eroded is high if the marketing strategy is not effective enough.

In the auto parts sector, the hybrid segment favours the entry of new company with more efficient manufacturing technique that differentiate themselves from established component manufacturers. At the same time, established auto parts manufacturers must redesign their existing product portfolios to avoid falling into the low-cost trap. This strategy requires designing the widget from scratch.

Many remodels will become popular within the next 5 or 7 years due to their price competitiveness advantage. The lower cost of R&D leads to better warranties. The product is more environmentally friendly. With a focus on a higher economic contribution per unit of product produced, regulations on remanufacturing are expected to be tightened in the future to promote sustainable production, i.e., improving productivity with lower resource and energy consumption. Furthermore, among the various reproduction methods, independent remanufacturing (companies working without cooperation with the automakers

or original product suppliers) is expected to be the most cost-effective and has more potential in the future.

Automotive product recycling is believed to account for two-thirds of all recycling and is a 53 billion USD industry in the U.S. and more than 100 billion USD worldwide. About 50% of the original products are recovered through recycling methods. Even in the US, recycling can save 8.2 million gallons of crude oil annually from steel production, 51,500 tonnes of iron ore, 6,000 tonnes of copper and other metals. Recycled engines require only 50% energy and 67% labour instead of producing new ones.

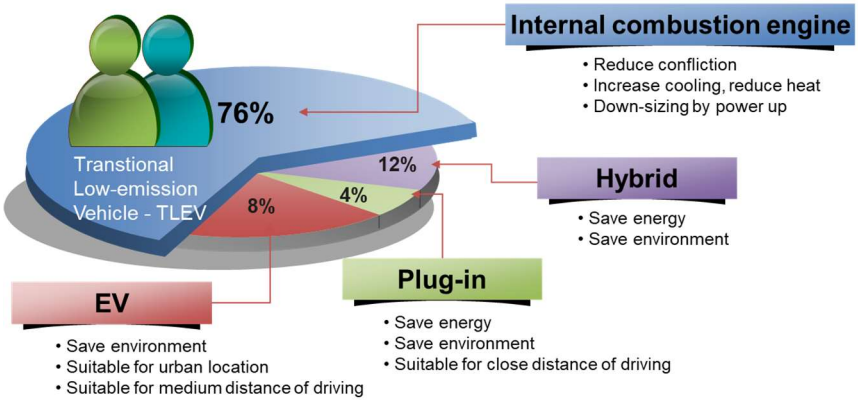
2. ZERO EMISSION VEHICLE

About 76% of motor vehicles currently use an internal combustion engine (ICE). The change to an electric vehicle takes time and encounters the following obstacles:

- The infrastructure for electric vehicles, such as charging stations, maintenance, and repair, is most unsatisfactory.
- Nowadays, electric vehicles can only run 480 km on a single charge.
- Some recent studies suggest that the magnetic fields emitted by electric vehicle batteries cause negative harm to the psychology and health of users.
- The dangers of lithium batteries in electric vehicles exploding.
- The exploitation and purification of rare earth elements (REE) to produce Lithium batteries presents many risks of radioactive environmental pollution, with a high cost.

The transitional low-emission vehicle diagram (TLEV) is as follows:

EXHIBIT 22: TRANSITIONAL LOW-EMISSION VEHICLE (TLEV)



Internal Combustion Engine combining Idling Stop System (ISS) technology, downsizing, and reducing friction can reduce emissions to 110g CO2/km. Similarly, combined with Mild Hybrid or Strong Hybrid technology. It can reduce emissions to 98-65g CO2/km; a Hybrid engine improved to Plug-in can reduce emissions down to 35g CO2/km.

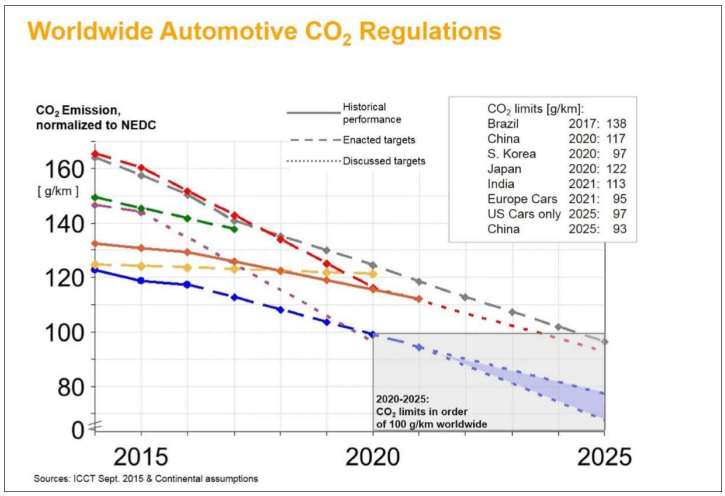
The Electric Vehicle is ideal due to environmental friendliness. However, it is hampered by the limited travel distance on a single charge, so the market for other technologies for internal combustion engines to reduce emissions is in great demand. This additional technology requires impact resistance, abrasion resistance, weather resistance, long life in oil environments...

A Zero Emission Vehicle, or ZEV is a vehicle that emits pollutants from the vehicle fuel source of less than 118g of CO2/km. Included in the contaminants that are harmful to health and the environment are particulates, hydrocarbons, carbon monoxide, ozone, lead, and lots of nitrogen. ZEV technologies include the combination of ISS with ICE, Light Combination (ICE/Battery), Strong Hybrid, Plug-in Hybrid Vehicle (PHV), and Electric Vehicle (EV).

The ICE will continue to play an essential role in the global automotive industry in the future. A Zero Emission Vehicle, or ZEV is a vehicle that emit pollutants from the vehicle fuel source under 118g of CO2/km. Contaminants that are harmful to health and the environment include particulates, hydrocarbons, carbon monoxide, ozone, lead, and lots of nitrogen. ZEV technologies include the combination of ISS with ICE, Light Combination (ICE/Battery), Strong Hybrid, Plug-in Hybrid Vehicle (PHV), Electric Vehicle (EV).

The ICE will continue to play an essential role in the global automotive industry in the future. Bosch forecast (Leonhard, 2011) states that by 2020, annual demand for cars and light trucks will reach 103 million units, of which 3 million will be EVs or PHVs, another 6 million will be HV (external ICE battery). In other words, 100 million new ICE-powered motor vehicles be sold by 2020.

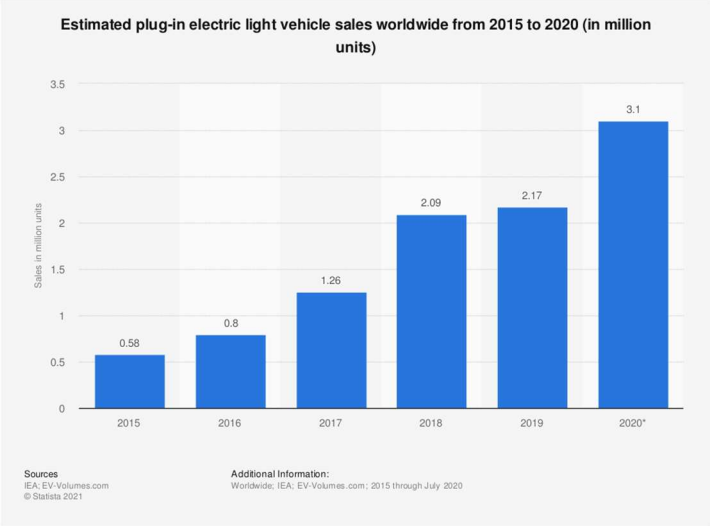
EXHIBIT 23: WORLDWIDE AUTOMOTIVE CO2 REGULATIONS, 2025 (SOURCE: (GMBH, 2019))



The CO2 reduction can only be achieved through an optimized combustion engine. EVs and PHVs help reduce CO2 emissions by about 4 grams per kilometer which preserves fossil fuel. The remaining new motor vehicles with ICE can reduce CO2 emissions simply by reducing size, reducing emissions, coolant, and other heat loss, reducing pumping, or reducing friction.

In other words, Bosch and Aisin Seiki, are the only 2 OEMs in the world to offer automotive technology packages to achieve the required savings on both diesel and cylinder engines.

EXHIBIT 24: ESTIMATED PLUG-IN ELECTRIC VEHICLE SALES, 2015-2020



Driven by global initiatives under the Paris agreement, several countries across the globe have begun enacting stricter emissions control measures for new car models. As a result, automakers are starting to expand their business into electric vehicles. Every third new vehicle sold is expected to be battery-powered or driven by 2025. Over the next decade, transportation services and autonomous vehicles are set to launch another revolution in the automotive sector. China is predicted to lead the market by 2040, with sales of autonomous vehicles, expected to be 14.5 million units.

3. ELECTRIC VEHICLE

Electric Vehicle (EV), including battery electric vehicle (BEV) and plug-in hybrid (PHEV), have been superior by providing a wide range of environmental, social, and health benefits, such as (1) Energy saving: Electric vehicles save 3 - 5 times more energy than conventional internal combustion engine vehicles. This results in unprecedented energy efficiency improvements for road vehicles; (2) Electrifying trucks makes them less reliant on oil, which makes them less reliant on the oil companies. Furthermore, electricity can be produced domestically, using various resources and fuels; (3) Air pollution: Because of their zero emissions, EVs are well suited to solving air pollution problems, particularly in urban areas and along road systems where large numbers of people are exposed to toxic pollutants from vehicles.(4) Greenhouse Gas Emissions (GHG): The increase in electric mobility coupled with the progressive increase in low-carbon electricity production results in a significant reduction in GHG from road transport compared to other ICE vehicles. Furthermore, EVs play a larger role in providing flexible services for power systems that incorporate renewable energy sources. (5) Noise reduction: Electric vehicles are engineered to be quiet. As a result, when compared to an ICE vehicle, it contributes to noise reduction.: (6) Industrial development: EV are positioned very important as a potential driver of significant cost reduction in battery technology, one of the key value chains of strategic importance for competitiveness.

These benefits of EVs have resulted in increased global deployment over the last decade. While in some countries, the transition to electric transportation is still in its early stages, EVs are proliferating in some of the world's largest motor vehicle markets. Battery and EV costs are falling, and EV infrastructure is being installed in many places. The range of models that consumers can choose from is also continuing to expand as manufacturers have launched

new vehicles and announced the launch of several new models soon. However, effective policy is essential to reduce costs, promote charging infrastructure, and ensure the smooth integration of EV charging needs into the electrical system. The transition to electric mobility in several significant economies has strong prospects in 2030.

4. TECHNOLOGY 4.0 AND AUTOMOTIVE SOFTWARE & ELECTRICAL/ ELECTRIC COMPONENTS MARKET

According to (Ondrej Burkacky, Johannes Deichmann, Jan Paul Stein, 2019) and (Nguyen Duc Bao Long, 2019), Connected vehicles, Autonomous driving, Shared mobility, Electrification of the powertrain (CASE) are new developments in the automotive industry. These novelties impact all stakeholders and results in compounding the expected CAGR (Compound Annual Growth) of 7% in automotive software (SW) and electrical and electric components (Electrical and Electric - E/E), from 238 billion USD to 469 billion USD, from 2020 to 2030. The SW and E/E markets are expected to outpace the overall auto market growth at this rate. It is estimated to grow at a CAGR of 3% over the same period. Accordingly, SW and E/E components have become the concern of most auto companies globally. The following groups of parts will be needed in the upcoming period: (1) Software development, integration software, verification software, and authentication software; (2) Electronic control units (ECUs)/domain control units (DCUs); (3) Sensors; (4) Electrical actuators; (5) Other electrical accessories (wiring, controls, switches, monitors...).

The SW and E/E components markets will grow significantly at a segment level, driven by the CASE trend. The move towards SW and E/E is the trend and driver of the market's expected growth at a CAGR of 7% by 2030. Substantial shifts are expected across different market segments. E/E components are expected to grow at a CAGR of 15%. Autonomous Driving (AD) will drive growth in the SW and sensor segments, projected at 9% and 8%, respectively. ECU/DCU will continue to hold the largest share of the market, but growth is likely to be relatively low, at 5%. While ECU/DCU will be used more and more in AD applications, the price drop due to increased efficiency will counterbalance the balanced growth in the segment.

EV will be a new market for high-voltage wiring, while demand for low-voltage wiring is expected to decline. The separation between hardware (HW) and software (SW) will fundamentally change the dynamics of the auto industry. The era where OEMs mastered

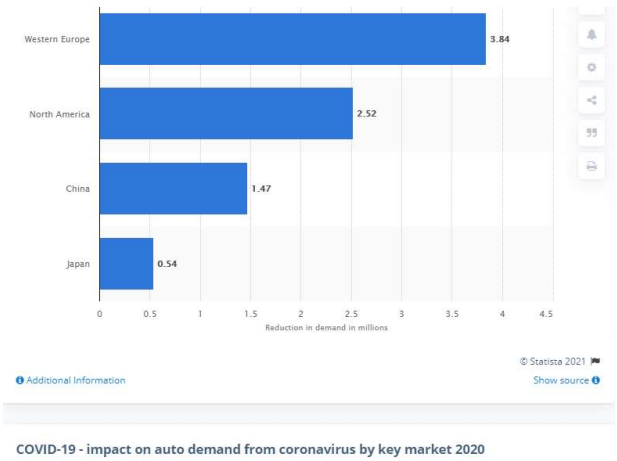
every design may be coming to an end. Neither the OEM nor the traditional supplier thoroughly defined the technological requirements of the new systems. R&D cooperation between OEM and supplier will be required. In addition, technology companies will have space to apply. The company specializing in developing HW will be separate from SW. It will also make it easier for OEMs, to source and grow, making it easier for them to keep up competition on the hardware side while keeping the competition for them while keeping the software side.

An intensive production strategy and a cross-manufacturing strategy can position a company for success in the future. The set of procedures for OEMs includes a plan to keep HW costs growing and SW development under control and establish cross-functional development. Cross-manufacturing will also benefit tier 1 suppliers and actively work with OEMs to define new E/E designs. Tier 2 suppliers will continue to specialize and scale in an attractive market to thrive. Opportunities for manufacturers from the successful innovation of SW and E/E due to the application of technology.

5. IMPACT OF COVID-19 ON THE WORLD AUTOMOTIVE INDUSTRY

Global auto sales are forecast to fall to just under 70 million units in 2021, down from a peak of nearly 80 million units in 2017. The most important industry segments of the auto industry include those for commercial vehicles and passenger vehicles. China is considered one of the largest auto markets worldwide, both in sales and production. Auto sales in China fell for the first time in 2018; the market collapsed in February 2020 but rallied shortly after.

EXHIBIT 25: IMPACT OF COVID-19 ON MOTOR VEHICLE DEMAND IN KEY MARKETS, 2020 (SOURCE: © STATISTA 2021)



COVID-19 - impact on auto demand from coronavirus by key market 2020

According to the chart above, the auto industry relies on how production recovers from the impact of the Covid-19 pandemic. Amid the pandemic outbreak in China, many factories closed, and the assembly lines barely rolled. Epidemics continue to affect the industry globally, although factories have reopened in many markets. More recently, the coronavirus pandemic has also caused chip shortages in many sectors, including the automotive industry. It is predicted that electric systems will account for half of the total price of a new car by 2030. According to (V.J. Thomas, Elicia Maine, 2019), global car sales declined during the crisis, but electric vehicle consumption still recovered significantly in some countries. This growth in sales is a positive signal for the automotive industry. It could be explained due to the following policies: (1) Macroeconomic environment: The Covid-19 pandemic has reduced purchasing power and contributed to a significant drop in petrol prices. Therefore, the strength in fuel cost reduction is not an important factor. However, the impact of falling oil prices will vary with tax policy differences; (2) Government policy and regulation: The CO2 emissions have a strong market impact because it incentivizes OEMs to produce more fuel-efficient vehicles. Similarly, government incentives, such as purchase subsidies and tax reduction, significantly impact consumer demand. Several changes in emissions regulations and incentives have resulted from Covid19 crisis; (3) Technology and infrastructure: In addition to implementing cash subsidies for electric vehicle acquisitions, some governments invest in toll infrastructure as part of economic stimulus, including by investing directly in public charging stations. Plus, subsidies for installing separate charging stations at home and work.

JUMP INTO THE FUTURE TECHNOLOGY

1. BOOSTING AUTO PARTS PRODUCTION

The future of Vietnam's automotive industry is to develop supply with a focus on reducing costs and economies of scale, developing technical and human capacity, overcoming infrastructure weaknesses, stimulating domestic demand, and exploiting international business opportunities. The key to success is to help Vietnam's businesses compete and generate sustainable profits. Monitor challenges and take measures to compete in manufacturing and technology, build brands, promote exports and international trade, update environmental and safety standards, and develop human resources. One weakness that needs to be fixed is not being able to reach the goal of becoming more competitiveness in production and research and development capacity.

Parts groups should focus on producing and exporting:

- Zero Emission Vehicle (ZEV) parts include (1) Engine cooling oil pump (2) Engine cooling water pump (3) Auto tensioner (4) Friction reduction accessories group (5) Advanced parts group engine performance (6) Group of parts to reduce engine heat.
- Software (SW) includes (1) Software development (2) Integrated software (3) Verification software (4) Authentication software.
- Electrical and Electronic (E/E) components include (1) Electronic control units (ECUs)/domain control units (DCUs) (2) Sensors (3) Electric drives (4) Other electrical accessories (wiring, controls, switches, monitors...).
- Battery for electric vehicle.

2. HUMAN RESOURCES DEVELOPMENT

Human resources have always been a key factor when measuring the importance of any economic sector. Based on backward and forward linkages, the auto industry is a significant source of job creation – both direct and indirect. While direct jobs are for workers involved in producing cars and auto parts, indirect jobs also supply the industry, such as the financial sector, insurance, auto repair, maintenance & service, auto dealers, auto parts retailers, tire industry... Therefore, there should be no supply-demand gap in qualitative and quantitative regarding human resources.

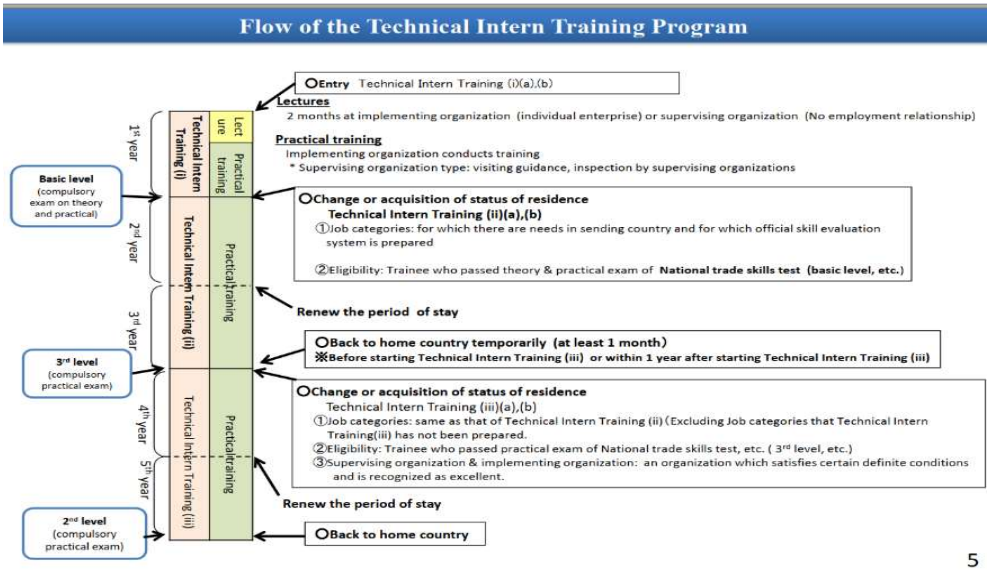
The availability of a trained workforce will support the growth of the industry and facilitate the achievement of employment targets.

Training programs for vocational school/ college/ university should be linked with enterprises to ensure that the practice rate on live equipment accounts for more than 80% of the learning time to ensuring skills practice.

For engineer training programs, the training program should be linked with enterprises to ensure that the practice rate on live equipment accounts for at least 65% of the learning time to providing practical skills. In addition, curriculum must have up-to-date knowledge close to the industries and a passion for manufacturing.

In addition to the usual training contents, it is necessary to supplement the topics of production management, quality management, engineering economy, innovation, lean manufacturing, 5S, TPS, TQM, Six sigma, IoT, big data, AI, digital transformation... with a program in consultation with industry experts. In addition, schools should also have training programs at the request of enterprises in other specific fields.

EXHIBIT 26: TECHNICAL INTERN TRAINING PROGRAM (SOURCE: ORGANIZATION FOR TECHNICAL INTERN TRAINING – OTIT)



Global auto sales are forecast to fall to just under 70 million units in 2021, down from a peak of nearly 80 million units in 2017. The most important industry segments of the auto industry include including commercial vehicle and passenger vehicle. China is considered one of the

largest auto markets worldwide, both in sales and production. Auto sales in China fell for the first time in 2018; The market collapsed in February 2020 but rallied shortly after.

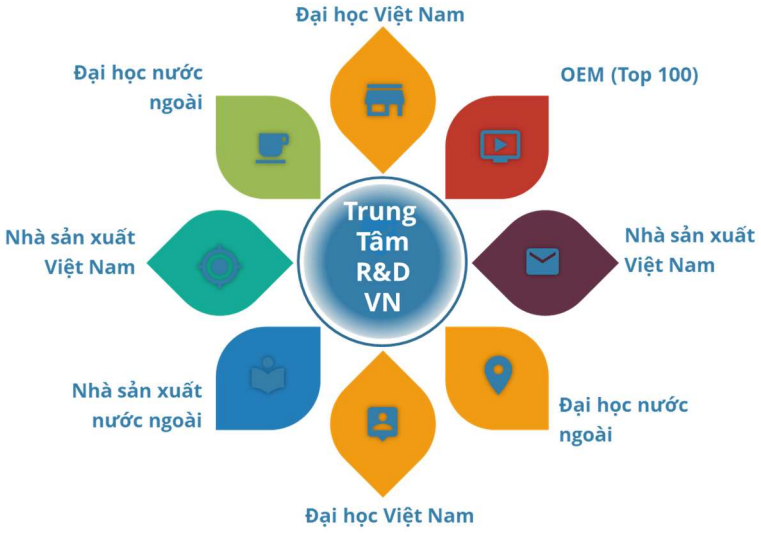
3. PROMOTING R&D ACTIVITIES

The automotive industry knows that this market has a lot of potential, and financial incentives have been given from time to time to help the industry grow.

The automotive industry should collaborate between the industry and universities as well as R&D centres to invest in the following areas:

- R&D projects for ZEV, SW, E/E, or similar.
- R&D projects for HV, PHV, EV, CASE vehicles.
- Develop and acquire appropriate technology for alternative fuels using advanced materials.
- Projects for refining rare earth elements, producing batteries for hybrid and electric vehicles with the ability to operate over 500 km/charge.
- Research and application projects of 4.0 technology such as IoT, AI, BlockChain, IT... in the fields of automotive software and automotive manufacturing. Encourage of digital transformation projects and automation of production systems.
- Establish an automotive design and engineering centre to localize regulations.
- Fuel-efficient vehicles are suitable for the Vietnam market – the conversion/ use of alternative fuel vehicles.
- R&D projects that are both innovative and promising.
- Proposing models of technology research and development cooperation.

EXHIBIT 27: TECHNOLOGY R&D COOPERATION AND TRANSFER MODEL (SOURCE: JAPAN VIETNAM HITECH R&D CENTER – JAVIHI)



2

- Model 1: R&D cooperation between domestic universities and R&D centers, output to be transferred to domestic and foreign enterprises or domestic and foreign universities.
- Model 2: R&D cooperation between international universities and R&D centers, output to be transferred to domestic and foreign enterprises or domestic and foreign universities.
- Model 3: R&D cooperation between domestic technology enterprises and R&D centers, output to be transferred to domestic and foreign enterprises or domestic and foreign universities.
- Model 4: R&D cooperation between international technology enterprises and R&D centers, output to be transferred to domestic and foreign enterprises or domestic and foreign universities.

4. STRENGTHENING POLICY & REGULATION APPLICATION

There are three main channels that business should take advantage including (1) Government policies, (2) Non-governmental support programmes, (3) Customer training programmes, (4) International applied science research fund.

Although the policy on the development of supporting industries for the automotive industry is Decree No. 111/2015/ND-CP dated November 3, 2015, by the Government on the

development of supporting industries (in which priority is given to product development). Supporting industrial products for the automotive industry and projects producing these products enjoy the highest investment incentives and support); Decision No. 68/QD-TTg dated January 17, 2017, of the Prime Minister on the approval of the Supporting Industries Development Program from 2016 to 2025. However, in a study by the General Statistics Office (Statistical analysis and forecast reports in 2019 - Research on factors promoting Vietnam supporting industries, 2020) about the incentives and support related to supporting industries that enterprises received from the Government, only 17% of them apply. Enterprises should apply preferential policies to projects producing supporting industries products on the list of supporting industrial products prioritized for development in terms of corporate income tax, import tax, value-added tax, environmental protection, incentives for small and medium-sized enterprises, investment, financial, land rent, water surface and investment projects to produce supporting industrial products. Priority assistance is given to development areas with difficult and challenging socio-economic conditions on the list of supporting industrial products prioritized for development. With the following preferential content: (1) Assistance in improving business capacity: corporate governance; production management; creating links and connecting supporting industry product manufacturing enterprises with customers; becoming product suppliers for multinational corporations and other domestic and international supporting industry manufacturers; promoting and supporting the consumption of supporting industry products; (2) Assistance in training human resources to meet product manufacturing requirements; (3) Supporting R&D, application of technology transfer and innovation in trial production of components, parts and materials; (4) Disseminating awareness, providing information on policies, markets and capacities of supporting industries in Vietnam, through such forms as organizing seminars, publishing newsletters, publishing products and promotion in other mass media; (5) International cooperation in the development of supporting industries; promoting foreign investment in the field of supporting industries; (6) Assisting in the development of standards and technical regulations for supporting industry products on the priority list that are suitable and in accordance with international and regional standards; and (7) Building and updating the database on domestic and foreign supporting industries on the supporting industries on the supporting industry website.

In addition, Decision No. 1322/QD-TTg approved by the Prime Minister about National program to support enterprises to improve productivity and quality of products and goods in

2021 - 2030 has the common goal of supporting business. Improve productivity and quality of products and goods based on applying solutions on standards, technical regulations, management systems, tools to improve productivity and quality, contributing to increasing contributions of total factor productivity (TFP) on economic growth, improving productivity, quality, efficiency, and competitiveness.

Typical international funds such as the capacity building support fund, helping SMEs participate in global value chains, are jointly organized by the United States Agency for International Development (USAID) with the Ministry of Planning and Investment (MPI) and the Ministry of Science and Technology (MOST) to create linkages of Vietnamese enterprises with FDI and international enterprises.

Japanese companies with know-how about lean production, advanced technology, high quality, and low cost are constantly training suppliers and subcontractors to improve production capability, market accessibility, finance accessibility, machinery, and equipment accessibility, and improve opportunities for human resources training. On a large scale, through organizations such as the Japan External Trade Organization (JETRO), the Japan Organization for Technical Intern Training (OTIT) is a small-scale organization that organizes training by companies with particular and effective programs. By doing this, Japanese business have spread lean manufacturing and Toyota production methods worldwide. Many Vietnamese enterprises have also grown up from the above methods.

Finally, many scientific research funds belong to foreign scientific and technical organizations and enterprises that demand R&D outsourcing, equipment testing, and trial production of technology. This is the focal point for Vietnam automotive enterprises to approach and seek opportunities to reach out internationally.

5. ENCOURAGING ELECTRIC VEHICLE PRODUCTION

Reserve intellectual effort of the whole country in the industry that the world will leave in behind 10-20 years but invest in future technology.

The electric vehicle market is enormous. In 2019, EV sales surpassed the 2018 record 7.2 million/ 2.1 million vehicles globally, accounting for 2.6% of sales and around 1% of global motor vehicle sales. In recent years, the change from direct subsidies to Zero Emission

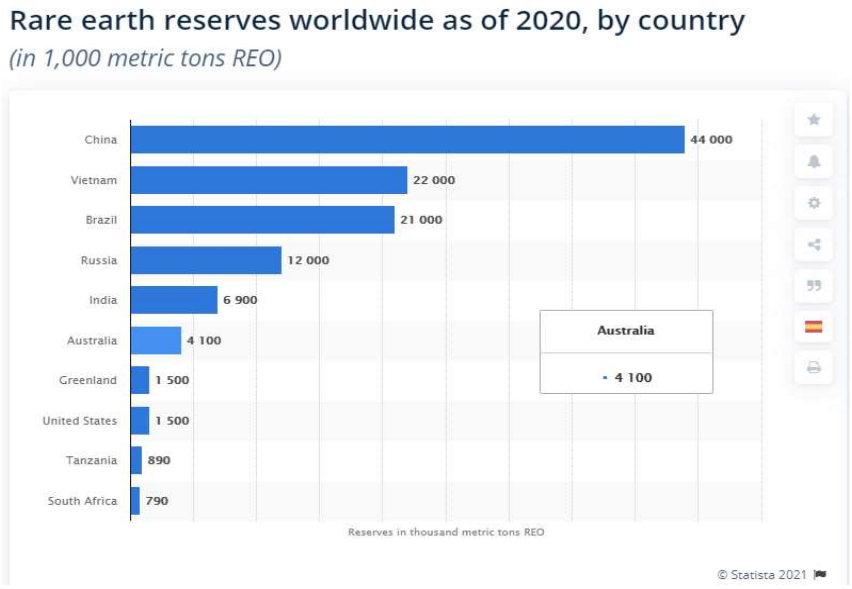
Vehicle regulations and fuel-economy requirements has been critical in driving the development of EV in significant vehicle markets in recent years. This also creates a long-term signal for the automotive industry and consumers.

EVs are entirely powered by electricity, which is supplied by a rechargeable battery that powers an electric motor. This leads to a host of possibilities, including (1) no gasoline, diesel, (2) no exhaust, (3) no clutch and transmission, (4) no spark plugs, (5) no noise. The contents include (1) Battery, (2) Control software, (3) Electrical spare parts, (4) Battery charging station.

Producing an EV is not as difficult as people actually believe. Vehicles with simple internal combustion engines vehicles contain 20,000 to 30,000 spare components. However, electric vehicles are made up of 10,000 or less parts. In which the battery and motor play a critical role.

The cost of an EV battery has decreased considerably, from 1100 USD/kWh in 2010 to 156 USD/kWh now. In 2018, the average size of the battery pack on EV increased from 44 kWh to about 50-70 kWh.

EXHIBIT 28: WORLD RARE EARTH RESERVES IN 2020 (SOURCE: STATISTA)



According to Statista, Vietnam has the second largest deposit of rare earth elements globally with reserves of around 22 million tonnes, behind China which has 44 million tonnes,

followed by Brazil with 21 million tonnes, Russia with 12 million tons of the total 120 million tonnes worldwide. Rare earth elements are found mostly in the Northwest, of Vietnam concentrated in Lai Chau province, Lao Cai province, and Yen Bai province. Vietnam should collaborate with Japanese OEMs in this field such as Japan Oil, Gas and Metals National Corporation (JOGMEC), Panasonic, and Denso… to research and develop mining, preliminary processing, refining to become the technology owner and sell products to the end customers at downstream, maintain the security of rare earth elements, thereby mastering the field of electric vehicle.

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APPENDIX

Vietnam Automobile Manufacturers' Association (VAMA)

No.	Company Name	Brand Name
1	Ford Vietnam Limited	Ford
2	Hino Motors Vietnam Limited	Hino
3	Isuzu Vietnam Limited	Isuzu
4	Do Thanh Motor Joint Stock Company	Do Thanh Auto
5	Mercedes-Benz Vietnam Company Limited (MBV)	Mercedes-Benz
6	Toyota Vietnam Limited	Toyota
7	General Motors Vietnam Limited	GM
8	TCIE Vietnam Limited	Nissan
9	Vietnam Suzuki Corporation (Visuco)	Suzuki
10	Mitsubishi Motors Vietnam Limited	Mitsubishi
11	Saigon Transportation Mechanical Corporation	Samco
12	Truong Hai Group Corporation	Kia, Mazda, Mini, Thaco
13	Veam Corporation	Veam
14	Mekong Auto Limited	Mekong, Fiat, PMC
15	Sanyang Motor Vietnam Limited (SMV)	SYM
16	Vietnam Motors Industry Corporation Joint Stock Company	Vinamotor
17	Honda Vietnam Limited	Honda
18	Daewoo Bus Vietnam Limited	Daewoo Bus
19	Vinfast Trading and Production Joint Stock Company	Vinfast

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