INCREASING THE PHILIPPINE PARTICIPATION IN THE AUTOMOTIVE VALUE CHAIN THROUGH HUMAN CAPITAL DEVELOPMENT

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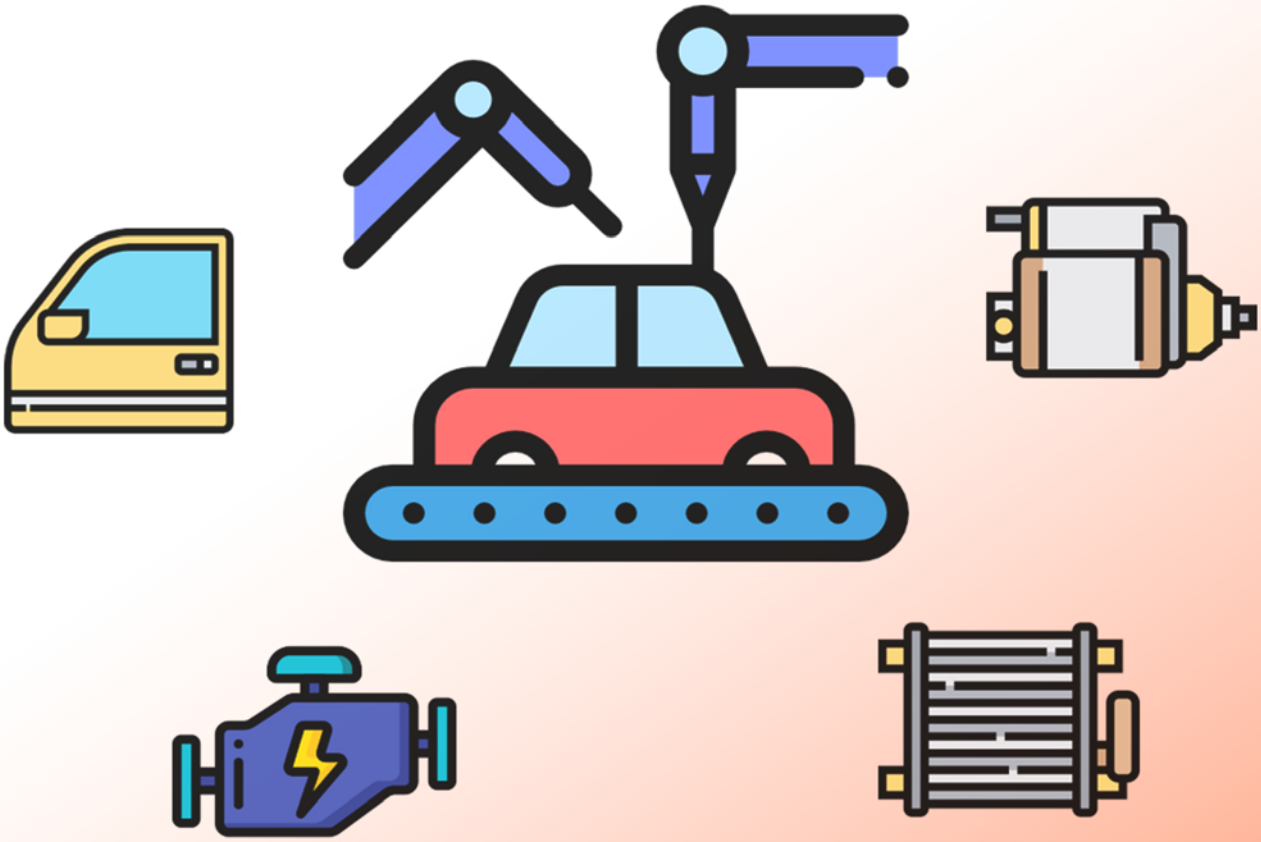
LABOR MARKET INTELLIGENCE REPORT



Technical Education and Skills Development Authority

March 2019

Increasing the Philippine Participation in the Automotive Value Chain through Human Capital Development

I. Executive Summary

- The Philippine government has been making efforts to further promote Foreign Direct Investment and to develop its manufacturing industry for employment generation and small and medium-sized enterprise (SME) development. The automotive industry has been identified as one of government's priority sectors, which has a 4% share in the country's Gross Domestic Product, and considered to have employment generation potential. In addition, there are several opportunities in the industry for international trade with increasing focus on supplying parts and components.

- Among all auto parts sub-segments, the Electrical and Electronics components, drivetrain parts, and engines and engine parts are considered as where the Philippines has comparative advantage in terms of capability. There are also some activities on manufacturing of high-value added, sensitive auto electronic components, as well as R&D support services.

- There is an abundance of diligent, cost-effective human resources is an advantage for the Philippines. However, there are reported skills gaps in terms of both technical and soft skills.

- The growing trend in automotive sales is something that the Philippines can capitalize as an opportunity to increase its manufacturing capability, and thereby increase the country's participation in the automotive global value chain. For this anticipated growth, there will be demand for additional people at all skill levels, starting from workers, technicians, engineers, and managers.

- There are specific recommendations for TVET/TESDA in strengthening the development of human resources for the Philippine automotive industry.

II. Background

The Philippine government has been making efforts to further promote Foreign Direct Investment and to develop its manufacturing industry for employment generation and small and medium-sized enterprise (SME) development. The automotive industry has been identified as one of government's priority sectors, which has a 4% share in the country's Gross Domestic Product, and considered to have employment generation potential. In addition, there are several opportunities in the industry for international trade with increasing focus on supplying parts and components. Several studies that will be mentioned in this report, such as Duke University's "The Philippines in the Automotive Global Value Chain (GVC)" in 2016, and the "Project for Elaboration of Industrial Promotional Plans using Value Chain Analysis"[1] of the Philippines' Department of Trade and Industry-Board of Investments (DTI-BOI) and the Japan International Cooperation Agency (JICA), provide analysis of the Philippines' current position and potential strategies to increase the country's participation in the automotive GVC.

III. GVC Analysis

GVC Analysis for the Philippine automotive industry investigated "the full range of activities that firms and workers do in order to manufacture a product from conception to production and end-use" (Sturgeon et al., 2016). The study by Duke University provides a simple visual representation of the automotive GVC:

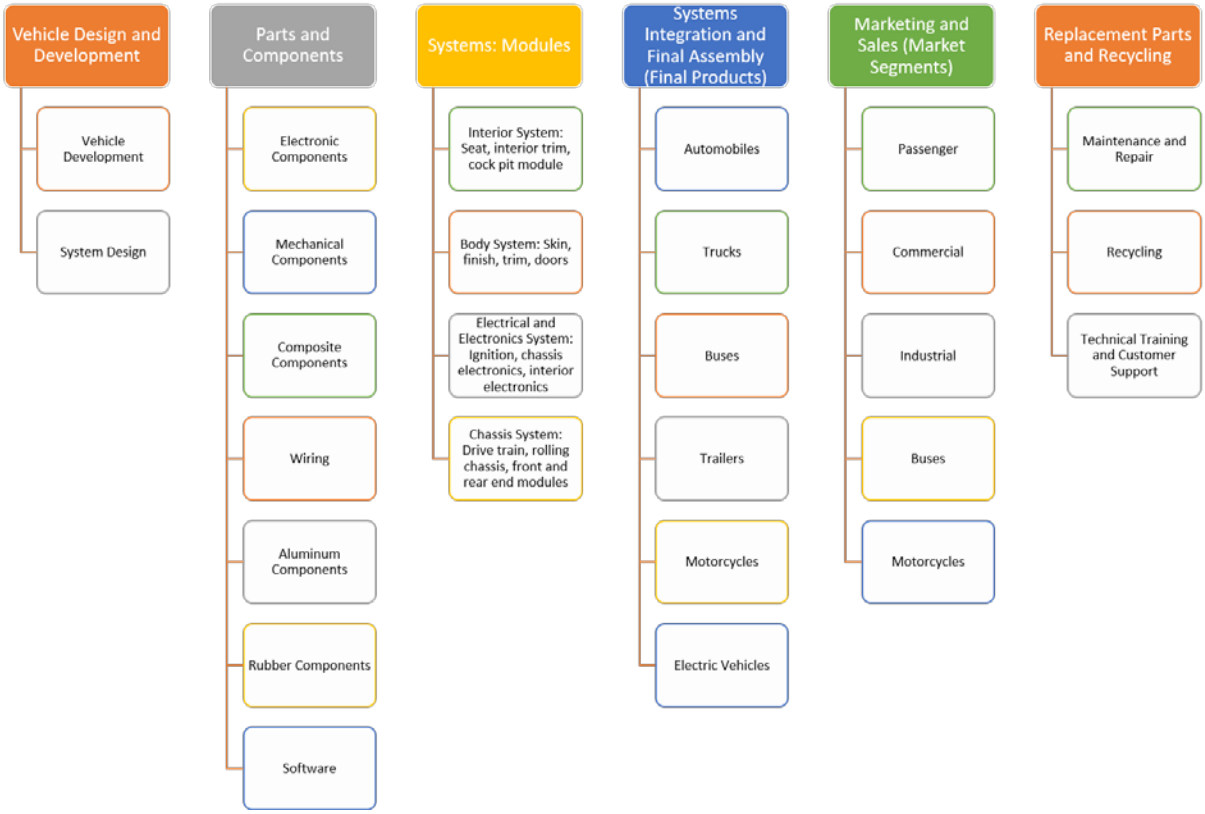


Figure 1. The Automotive Global Value Chain (Sturgeon et al., 2016)

[1] Project implementation began in September 2016 and will conclude on June 2019

The study also reports the Philippine participation in the automotive GVC, as illustrated below:

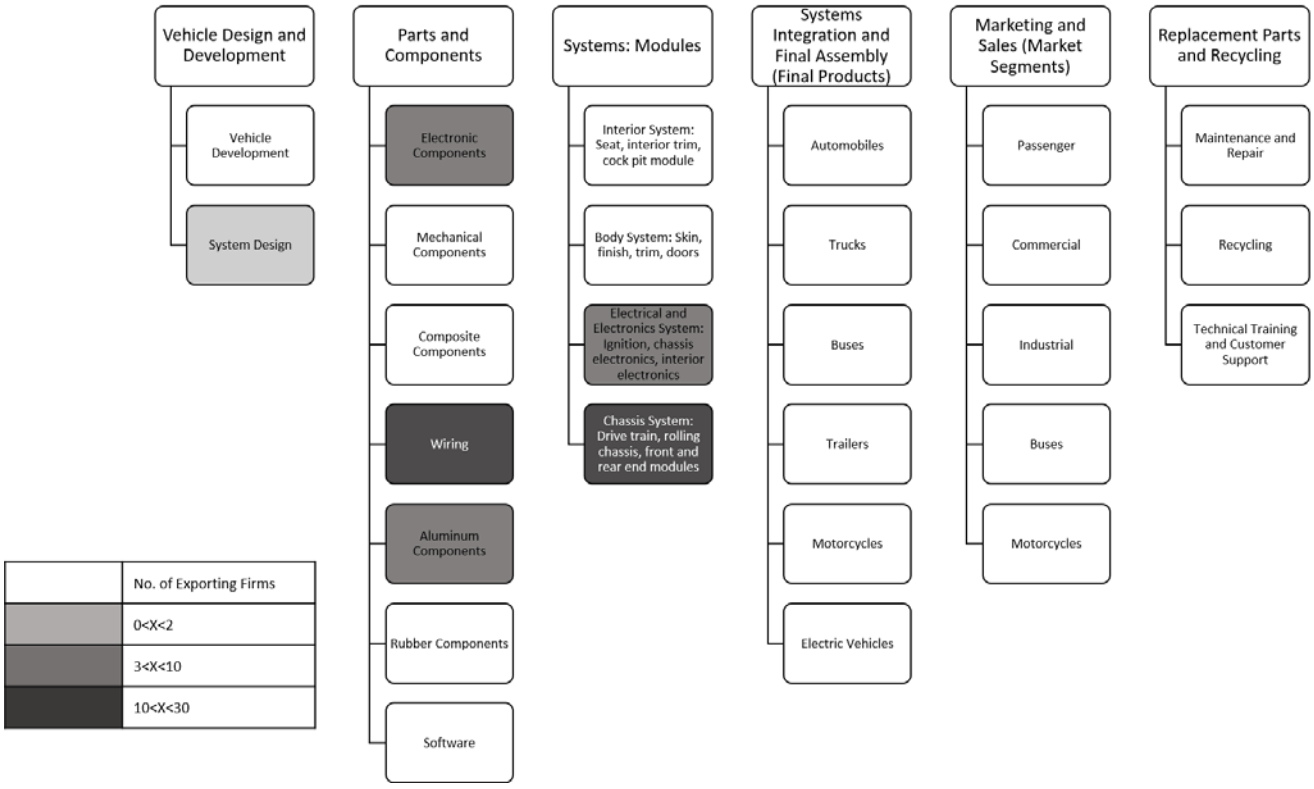


Figure 2 Philippine Automotive Global Value Chain (Sturgeon et al., 2016)

The DTI-BOI and JICA study delved into a deeper analysis of initial findings of the Duke University.

One way was through the analysis of trade statistics where HS code data analysis of 103 six-digit level HS codes in passenger car, commercial vehicle and auto parts segments from 2001-2015. It also mentions the Philippines' important trading partners, and a comparison with the automotive industry of Thailand. Below is the summary of the findings on trade statistics:

i. The Philippines' trade in the automotive industry had a moderate growth in the last 15 years, compared to those of other ASEAN countries. From 2001 to 2015, the Philippines' total exports in the automotive industry increased from US$1.4 billion to US$4.3 billion with a Compound Average Growth Rate (CAGR) of 9%, while its total imports increased from US$0.8 billion to US$3.9 billion with a CAGR of 12%.

ii. The passenger car segment (HS code 8703) imports increased dramatically from US$0.04 billion in 2001 to US$2.1 billion with a CAGR of 33%. The recent imports are made mainly from Thailand (40% share in 2015) and Indonesia (30% share). Net export deficit in the segment widened from US$0.03 billion in 2001 to US$2.1 billion in 2015.

iii. In the commercial vehicle segment (HS code 8704), the Philippines' imports increased with a CAGR of 11%. The country's net export deficit expanded from US$0.1 billion in 2001 to US$0.5 billion in 2015. The sales expansion of pick-up trucks and other commercial vehicles in the Philippine market, mainly supplied by CBU imports, has accelerated this trend.

iv. In the auto parts segments, while the Philippines' imports doubled from US$0.6 billion to US$1.3 billion with a CAGR of 6%, its exports tripled during the same period from US$1.4 billion to US$4.3 billion with a CAGR of 8%. As a result, the net export surplus expanded from US$0.7 billion to US$2.9 billion in 2015.

v. Among all auto parts sub-segments, 1) Electrical and Electronics (E&E) components, 2) drivetrain parts, and 3) engines and engine parts are the biggest money makers for the Philippine auto parts exports with CAGRs of 10%, 9% and 14%, respectively. In particular, the E&E component segment occupied 56% of the total auto parts export value in 2015. This was brought about by a steady increase in production and exports of wire harness and other E&E components by global (mainly Japanese) Tier 1s.

vi. The trade surplus of the automotive industry has been shrinking since the imports of passenger cars is growing at a much faster speed (CAGR 33%), compared to the exports of auto parts (CAGR 8%). If the country's CBU imports continue to increase, the Philippines is bound to face a huge trade deficit in the automotive industry in the near future.

vii. While the Philippines' automotive trade largely increased in the recent 15 years from 2001 to 2015, the figures for similar segments in Thailand increased more sharply. It is presumed that the drastic growth of these segments in Thailand was due to rapid expansion of OEM assembly and Tier 1 capacities. The integration of Thailand's automotive industry into the automotive GVC has been progressing more intensively. From this observation, it can be said that the scale of OEM production capacity matters greatly for the development of a country's auto industry.

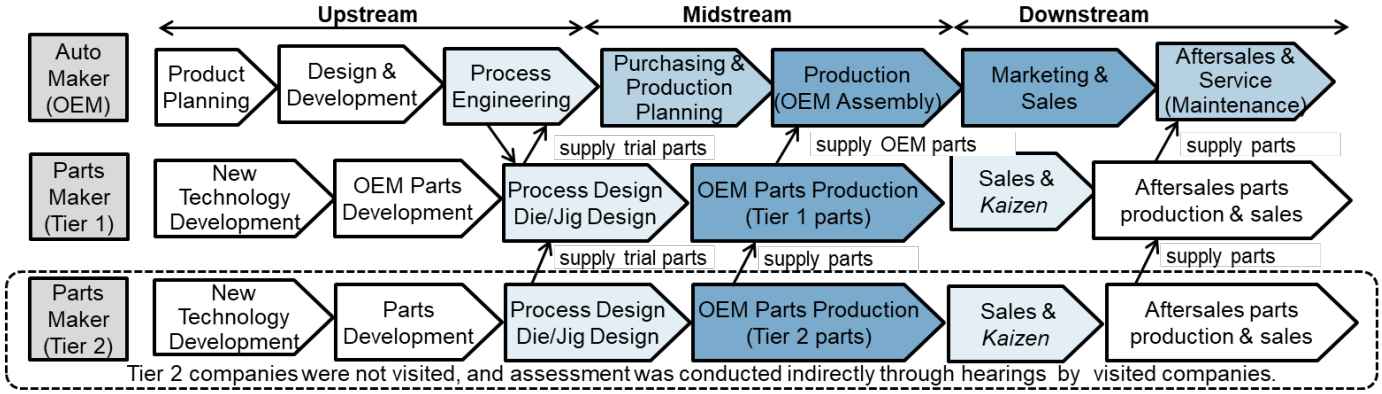
viii. The Philippines' trade with other ASEAN countries, especially Thailand, has expanded drastically. The growth of inter-regional trade indicates that the regionalization and interdependence of the automotive supply chain within Asia have been accelerating.

ix. Japan and the USA maintained their positions as major export destinations for the Philippines, which implies that the Philippines functions as an important production base (gateway) of the automotive global supply chain in the Pacific Rim.

x. The increase in wire harness exports from the Philippines to Japan shows a changing global division of labor. Japanese global tier 1s have shifted their production bases of labor-intensive auto parts manufacturing to newly emerging economies such as the Philippines.

Another way was through the interviews of company representatives in order to better understand the Monozukuri (manufacturing) situation in the Philippines by seeing the Genba (actual production site), Genbutsu (actual products) and Genjitsu (actual production situation, processes).

Current Value Chain of the Philippine Automotive Industry



Note: Dark-blue colored functions are VC functions conducted, in the Philippines. Pale-blue colored ones are also conducted but with a limited scale and weak linkage inside the country. Other white parts are not conducted in the Philippines

Source: Assessment by JICA Experts, based on interview (company visit survey)

Figure 3 Current Value Chain of the Philippine Automotive Industry

a. Supply Chain and Local Contents –Local

i. The drivetrain segment has the strongest and most integrated supply chain linkage with OEMs. In the E&E component, there are (Japanese) global Tier 1 companies putting more focus on producing specific parts and sub-components for export to mother/sister factories/companies in advanced markets such as Japan.

ii. Local content rates on average is roughly estimated around 50-60%. For Japanese OEMs and Tier 1 companies, one of the main challenges in their operations in the Philippines is a limited availability and variety of parts and component suppliers. The difficulty in sourcing raw materials, such as steel and resin, is another major weakness of Philippine manufacturing. Logistical infrastructure is also another challenge, i.e. port congestion.

Parts Segment	Parts and Sub-Components Produced by Tier 1
Engine	Cylinder Block, Cylinder Head, Crank Shaft, Cam Shaft, Connecting Rod, Piston, Piston Ring, Int-Manifold, Exhaust Manifold, Water Pump, Oil Pump, Catalyzer, **Radiator**, Fuel Injector, **Air Filter**, Oil Filter, EGR Valve, **Battery**, **Starter Motor**, **Alternator**
Drivetrain	**FR Layout Transmission** (**M/T**, A/T), FF layout Transmission (M/T, A/T), Torque Converter, Clutch, CVT, Differential Gear, **CVJ (Constant Velocity Joint) Drive Shaft**, Propeller Shaft, Tire, Wheel, Rear Axle, **Universal Joint**
Chassis	Coil Spring, Shock Absorber, Stabilizer, Rack & Pinion Steering, Steering Column, Steering Lock, Brake Caliper, Brake Rotor, **Exhaust Muffler**, Fuel Tank
Body	**Engine Hood**, **Fender**, **Roof**, **Door**, **Trunk Lid**, Sill, Front Pillar, Center Pillar, Front Roof Rail, Side Roof Rail, Side Member, Floor, **Small Body Parts**
Body Parts	Window Regulator, Outside Handle, Door Weather Strip, Door Lock, Windshield Glass, Door Glass, Glass Run, Check Link, T/Lid W/Strip
Control Parts	Transmission Control, Parking Brake Control, **Brake Pedal**, **Accelerate Pedal**, **Clutch Pedal**, **Steering Wheel**, Hood Control Cable, Trunk Lid Control Cable
Exterior	**Bumper**, **Head Lamp**, **Rear Combination Lamp**, **Radiator Grill**, Door Mirror, Air Spoiler, Side Marker Lamp, **License Plate Finisher**
Interior	HVAC, **Instrument Panel**, **Center Console**, **Seats**, **Head Lining**, **Pillar Garnish**, **Door Trim**, **Sun Visor**, **Carpets**, Air Bag, Three-Pointed Seat Belt
E&E Component	**Wire Harness**, **Wiper**, **Printed Circuit Board**, **Combination Switch**, Horn, **Car Navigation System**, Ignition Coil, **Meter/Clock**, **Audio**, **Radio Antenna**, **Fuel Sender**, **ECUs**, **Sensors**, Actuators

*The blue shade indicates the presence level of companies in the Philippines. The darker the color, the greater the number of companies existing in the Philippines (or confirmed by the JICA Expert Team).
* **Red Colored Parts with underline**: Produced in the Philippines, which GVC WG visited/confirmed in GVC Analysis.
Source: JICA Expert Team. The presence level is estimated based on experts' observations from company visits.

Figure 4 Parts and Sub-Components Produced by Tier 1 Companies in the Philippines

b. Technology

i. In elemental technological areas such as assembly, metal processing and machining, effective production systems utilizing both equipment and workers have been put in place.

ii. However, a wide range of production technologies and process areas are still needed for further development of the Philippines' auto/auto-parts industry as the existing productions technologies are practiced on a limited scale.

iii. Production management technologies such as Kaizen (Japanese work ethics and management tool for continuous improvements), QCD (quality, cost, and deliver; QCD are key performance indicators for continuous improvements), Monozukuri (philosophy/attitude toward manufacturing, including managing safety at workplace), are being taught to workers through in-house training among Japanese-

affiliated companies. Some spillover effects through OEMs' supplier networks are observed; however, the permeation level of such production technology among local suppliers is not enough. More capacity building in QCD for local suppliers is recommended.

iv. The E&E component segment, the utilization /application of know-how and technology of the E&E cluster in the Philippines is beginning to be seen in the manufacturing of high-value added, sensitive auto components such as sensors, cameras, electronic control unit (ECU) and print circuit boards (PCBs).

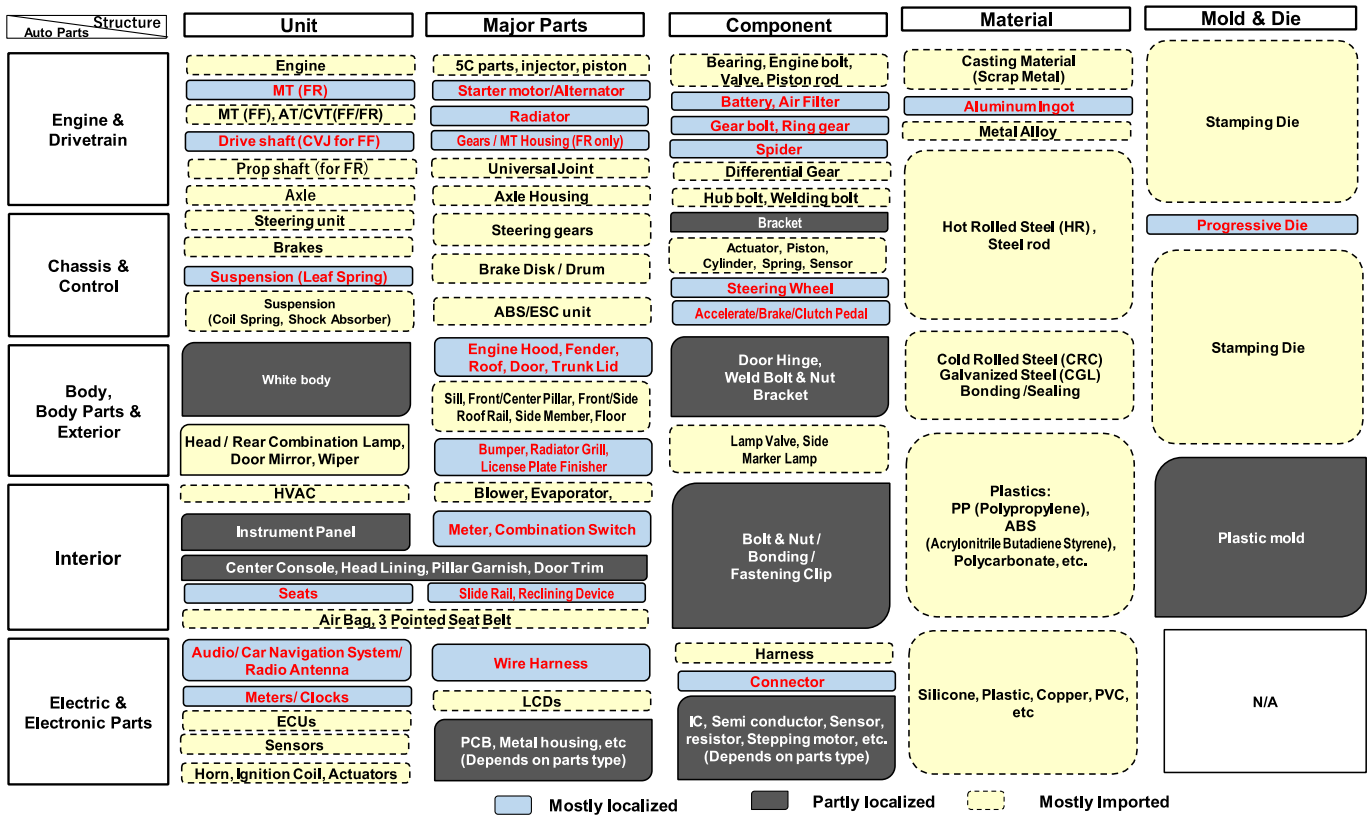


Figure 5 Automotive Parts Produced in the Philippines (JICA Expert Team, 2017)

v. R&D Support – Although still few in number, R&D support centers for automotive industry have steadily been growing among global Tier 1 companies in the Philippines. They conduct R&D support services such as engineering analysis (calculation, simulation, and modeling) and drawings (3D/2D), a downstream portion of R&D function in Tier 1 companies' global value chains.

c. Industrial Human Resource Development (IHRD)

i. General Characteristics

1. Many of the workers at production lines are young (average age of 23 years old) doing labor-intensive work

2. There is a need for continuous training for direct workers, and most companies provide opportunities for in-house training

3. High English proficiency of workers is an advantage

4. There are difficulties in recruiting production engineers

ii. Issues

A survey of Japanese companies in the Philippines enumerated the following issues, and these were also validated during the company visits for the DTI-BOI and JICA study.

Labor Pool (Difficulty in hiring)	* Management /engineer / technician level: somewhat difficult (in terms of finding qualified candidates) * Worker Level: not so much
Technical Skills	* Management (and engineer) level: ➡ Their PDCA capacity, analytical skills (including data analysis), and critical thinking skills need improvement. * Engineer level: ➡ Employees tend to have received in-class oriented courses at higher education institutes; however, they have not had sufficient work experience and knowledge of the industry. It takes a while for them to be fully ready for their assigned tasks. * Engineer level / Technician Level: ➡ Weak math skills (trigonometric functions, metric systems, etc.) ➡ Their education background does not fully equip them with the related knowledge and competencies needed for the job. For example, applied mechanics, such as mechanics of materials, metal corrosions, thermal-designing, need to be covered. * Technician level: ➡ Most of them are hired after the completion of OJT programs; however, some still have insufficient understanding of their jobs (e.g. machine operation).
Soft skills	* Communication skills (consultation, reporting, and advice-seeking) need to be improved at all levels. * Weak teamwork (or little friendly rivalry) among colleges to improve their work (production process or quality of products) ➡ These issues make it difficult to have, for example, the designing work done, which requires continuous problem solving, and fine-tuning of products.
Turnover / retention rate	* Some companies experience a high turn-over rate (e.g. 15%). * Due to their proficiency in English, engineers tend to move to the next job abroad once they gain some work experience. One company reports that engineers only stay for two years before changing jobs.
Other	* The recent Philippine government's efforts to enforce stricter regulations on hiring contract workers increase in the production costs and increase in the time required for the hiring process (more rigid and long selection process).

Table 1 Human Resources Issues

iii. Present situation/challenges of IHRD in TVET

Technical Education and Skills Development Authority (TESDA)

TVET programs for the auto industry: 1,160 programs nationwide

(only 6% of all TVET programs) (as of July 2015)

→ **in Region IV-A : 98 (8.4 %)**

- No. of Graduates from TVET program in 2014: 83,706
  - → With Training Regulation (WRT) Courses: 59,996 (72%)
  - → No Training Regulation (NRT) Courses: 23,710 (28%)
- Level of Manpower Developed: Workers and technicians
- Industry linkage (the level of linkage varies by HEIs) : through OJT, DTS programs, curriculum reviews/assessment, NRT courses , apprenticeship program

TVET Program Graduates (2014)

Program Names	Graduates		Share	
Servicing NC I, II, III, IV (incl. Motercycles)	43,498	55,194	73%	92%
Driving NC II, III	11,696		19%	
Wiring Harness Assembly NC II	1,858	4,802	3%	8%
Body Painting/Finishing NC I and II	1,074		2%	
Electrical Assembly NC II, Plastic Maching Operation NC II, Engine Rebuilding NC II, Process Inspection NC II , Tinsmithing (Automotive Manufacturing NC II)	1,870		3%	
Total	59,996		100%	

Challenges

Courses / Curriculum	✓ **The majority of TESDA courses on the auto industry are not focused on manufacturing and production(see table above). ⇒ Under or non-utilization of training regulations (TRs)** ✓ **Companies' needs are not sufficiently reflected in course contents (incl. basic technical skills/knowledge and soft skills).** ✓ Efforts to coordinate/collaborate with the industry are being made by most TVET providers; however, many of them struggle to do it effectively and efficiently. (⇒ not knowing how to conduct linkage effectivity, especially with FDIs, not having enough industry coordinator to facilitate, monitor the linkage) ✓ Requirements for internships and OJT (e.g. insufficient training hours by some TVET providers) are not standardized.
Trainers / Teachers	✓ Work experience of trainers in the relevant industry is often insufficient (=need to upgrade/update the trainers' knowledge and skills) ✓ Insufficient number of trainers and assessors
Equipment	✓ Insufficient number and quality of equipment (some are outdated)

Figure 6 IHRD in TVET (JICA Expert Team, 2017)

IV. Opportunities and Recommendations

Below are some examples of the approaches that were taken by the automotive industries of other countries in upgrading their position in the automotive GVC:

Strategic Approach	Description	Examples
Traditional Path		
Fully vertical export-oriented industry	– National brands and suppliers	– South Korea: Hyundai
Fully vertical for local market	– Attract FDI to serve local market – Institute local content rules to stimulate assembly employment and local supply base – Assemble vehicles for local market	– China – South Africa – Thailand
Specialization within regional production network	– Attract FDI for assembly and/or parts manufacturing – Integrate into low cost portion of regional production systems	– Mexico – Turkey – Poland – Czech Republic
Parts Specialization for regional or global exports	– Specialize in one or a few parts and subsystems for export	– Taiwan – Nicaragua – Macedonia
Emergent Path		
Entry as systems integrator for finished vehicles	– Branded motor vehicles – Rely on design and engineering consultancies and major global module and sub-systems suppliers – Shift to electric vehicles could open up opportunities for new entrants	– China: Chery – Iran: Iran Khodro – Malaysia: Proton (failed) – China: BYD (electric, mass market) – USA: Tesla (electric, high end)
Parts production → exports → outward FDI	– Focus on product and process upgrading to expand capabilities and scope – Move from components to sub-assemblies (functional upgrading) – Gradually increase competencies – Growth through acquisition (FDI) – Locate technical centers in global design clusters	– Argentina: Basso – China: Yanfeng Automotive Trim Services

Table 2 Possible Industrial Policy Strategies for Upgrading in the Automotive GVC (Sturgeon et al., 2016)

Below are the potential activities that the Philippine automotive industry can do to increase its participation in the automotive GVC, particularly those that highlight the need for human capital.

a. Product & Process Upgrading to Increase Wire Harness Exports – both the Duke University and DTI-BOI/JICA studies report the Philippines' strength in wire harness exports. With the increasing electrical and electronic components of vehicles, as well as the push for the use of electric and autonomous driving vehicles, the Duke University study recommends the Philippines to establish its position as the global

automotive E&E hub where the country can leverage its capability and achieve economies of scale. This strategy is also a means to generate employment for semi-skilled workers due to its labor-intensive production.

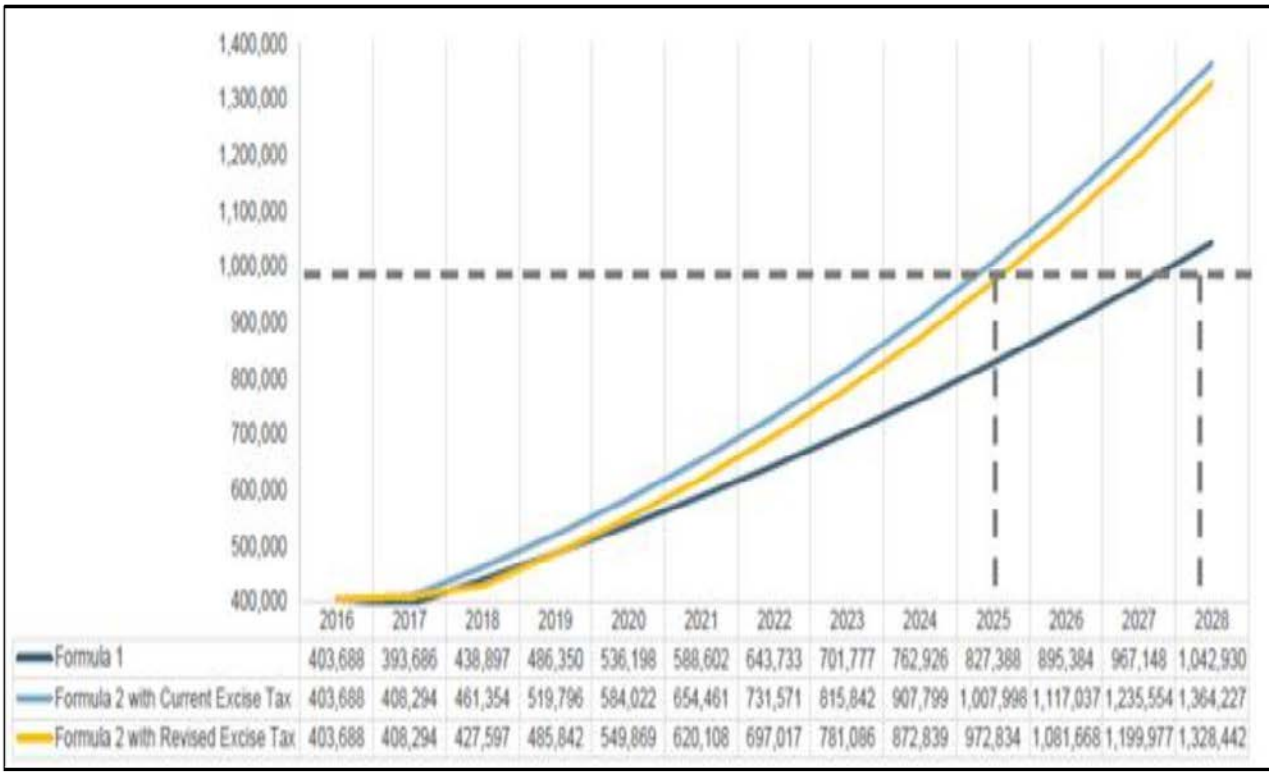
b. Functional Upgrading into R&D for Wire Harnesses – there have been R&D investments among companies in the Philippines that produce wire harnesses. The R&D activities have the potential to higher unit value products, and employ workers with higher-level skills.

c. Product & Functional Upgrading into Automotive Electronics – Collaboration between automotive and electronics industries is emerging, with the outputs of firms from these industries requiring "technical knowledge and cost-competitive labor to assemble" (Sturgeon et al., 2016). Products that are in high demand such as electronic radar, chassis, wheel and braking sensors are already being produced in the Philippines.

V. Industrial Promotion Plans

a. Automotive

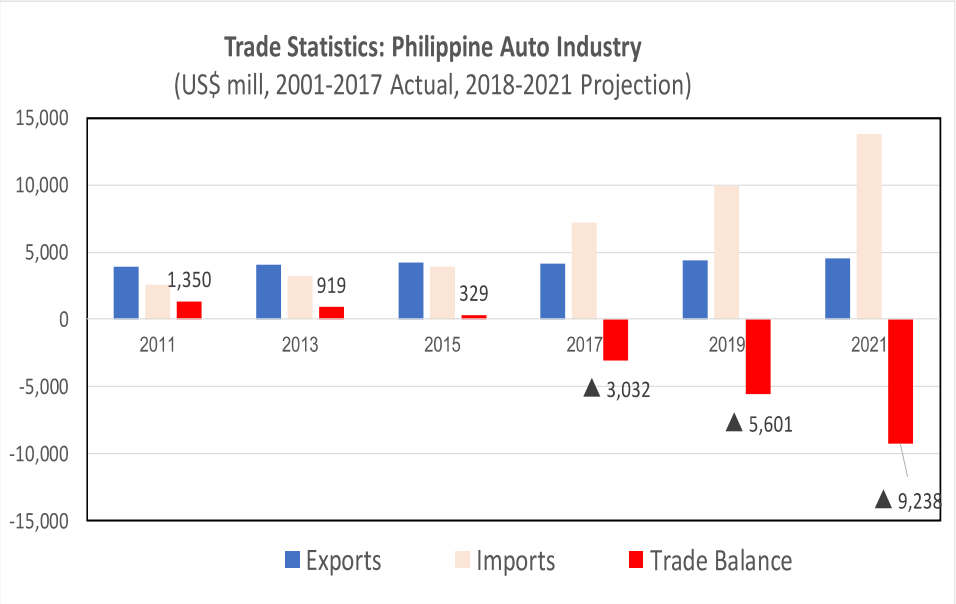
The DTI-BOI/JICA study reports that automotive industry firms will invest in a country if it will produce at least one million cars annually. The same study also forecasts that the "one million car sales" in the Philippines will be achieved between 2025 to 2028.



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Formula 1	403,688	393,686	438,897	486,350	536,198	588,602	643,733	701,777	762,926	827,388	895,384	967,148	1,042,930
Formula 2 with Current Excise Tax	403,688	408,294	461,354	519,796	584,022	654,461	731,571	815,842	907,799	1,007,998	1,117,037	1,235,554	1,364,227
Formula 2 with Revised Excise Tax	403,688	408,294	427,597	485,842	549,869	620,108	697,017	781,086	872,839	972,834	1,081,668	1,199,977	1,328,442

Figure 7 Projected Domestic Vehicle Sales in the Philippines (Source: DTI/BOI-JICA Report)

However, the DTI-BOI/JICA study also reports that with this forecasted demand, the Philippines may also experience huge trade deficits, especially with the increasing import of vehicles since 2016, and if no action will be taken by the government. For 2019, the trade deficit forecast will be at US$ 5.6 billion and for 2021 at US$ 9.2 billion. Below is the forecast by the JICA study team:



[Note]
- HS Code Analyzed (6-digit level)
  - ✓ Auto parts: 89 Codes
  - ✓ Passenger cars and commercial vehicles: 14 codes
- The projection is based on the CAGR from over last five years:
  - ✓ Exports: 2.55% per year
  - ✓ Imports: 17.81 % per year

Source: JICA Study Team based on the International Trade Centre (ITC)

Figure 8 Philippine Auto Industry 2018-2021 Projection

Further, with this scenario, the study emphasizes that the Philippines can be the ASEAN's largest importer of automobiles, or one of the top 3 automotive manufacturers in the region. The opportunity in the automotive market can be capitalized by the Philippines when it is capable to "produce one million units per year at the time when domestic demand exceeds one million (=around 2027), with roughly 50% to be exported", and that the Philippine government considers to provide investments to these incentives "according to production volume, and increase in the number of manufacturing models/body types" (DTI/BOI and JICA, 2019). These recommendations, however, will still be used for reference for the consideration of approving authorities, and that the provision of the investments will still have to pass through several procedures within the National government before they are provided. Nonetheless, there is an urgency to prepare and implement an industry development plan for the Philippine automotive industry so that it can contribute to additional value-added and create more jobs.

b. Auto Parts

The DTI/BOI-JICA report states that OEMs will be able to produce the target volume more efficiently when auto parts are locally available as this will cost cheaper and will be delivered faster. Below are the strategies that will support the development of the auto parts industry:

i. Complementing Strategy of the ASEAN Automotive Industry, where the Philippines can use its comparative advantage in the production of specific auto parts such as manual transmission. The increase in value-add for the manual transmission, the Philippines should upgrade its process, product and function on metal casting/forging and machining.

ii. Attraction Strategy of Focused Car Electronics

To support the functional upgrading in the E&E sector, companies that produce high-value added electronics such as motors, actuators, sensors and electronic control units should be attracted in the Philippines.

iii. Accumulating Strategy of Labor-Intensive Industry

Because of the availability of cost-effective and skilled labor force, "the Philippines can develop a competitive export-oriented industry using its human resources". Thus there is a need to attract investments from companies that produce auto parts that require labor-intensive manufacturing from these types of companies:

1. Those that manufacture with a good balance of semi-automation and labor intensive work
2. Whose products require labor-intensive work in the assembly and mid-inspection stages
3. Those that engage in labor-intensive manufacturing process that have a competitive edge similar operations in Japan

c. Advantages and Disadvantages of the Philippines

Advantages	Disadvantages
• It is the gateway of Southeast Asia in the Pan-Pacific Region, with easy access to and from Japan, USA and China. • It also has an abundant young labor force "with sound, US-style institutional framework in (higher) educational system (Liberalism and Democracy)" • It has accumulated solid manufacturing bases which originated from the "ASEAN Industrial Cooperation (AICO) scheme"[2].	• Culture and practices of Kaizen (continuous improvement) are not yet diffused. • Facilitation of investment promotion in E&E Component segments is not yet strengthened.

[2] The AICO scheme promotes "joint manufacturing industrial activities between ASEAN-based companies" where at least two companies in two different ASEAN countries can form an AICO Arrangement where the output (i.e. finished products, intermediate parts and components or raw materials) of the participating

Advantages	Disadvantages
• Presence of strong electrical, electronics and IT-service industries	

To address the growing demand for motor vehicles with the intent of establishing manufacturing bases in the country requires a good number of skilled workers. The abundant young labor force need to be trained for the jobs that will be required to address the manufacturing demand. With the amount of electronics in automobiles increasing, combined with the Philippines' strength in electrical, electronics and IT-service industries, the Philippines has the advantage in connecting automotive with electronics and IT-BPM and can be cited for the country's investment promotion activities. However, the culture and practices of Kaizen from among the local suppliers need to be spread to many more companies, and that Kaizen activities need to continue and be sustained.

Below is the summary of the strategies and the corresponding policy support for the automotive and auto parts sectors:

		Concepts and Strategies			
		Auto Parts Sector (KPI: Local procurement ratio increase from 50% to 70% by 2027)			**Automotive Sector** (KPI: One-million Production of new vehicle in 2027)
		Complementation Strategy of the ASEAN Automotive Industry	Attraction Strategy of Focused Car Electronics Industries	Accumulation Strategy of Labor-Intensive Industries	
Policy Domains	**1. Policy/System and major programs** (KPI: (1) Approve of Automotive Industry Promotion Plan and (2) Relaxing PEZA's 70% rule)	* Sophistication of processing technology. (3times of seminar by OEM and Tier 1 are held per year)	* Development strategy on attracting ESO (More than 20 R&D offices are being operated by year 2025).	* Framework development on HRD for technician and R&D (Development policy is authorized by concerned agency)	* Approval of Automotive Industry Promotion Plan * Subsidy for car purchasing
	2. Investment Promotion (KPI: Attracting 15 target companies/year)	* Attracting 5 companies/year (Incentive) * Incentive program targeting drive-train parts manufacturing	* Attracting 2 companies/year (Incentive) * Incentive for electric motor and parts of E-vehicle	* Attracting 8 companies/year (Incentive) * Strengthening existing incentive system	* Investment incentives (1) according to production volume and (2) according to an increase in the number of manufacturing models / body types.
	3. Local Supplier Development (KPI: 5 local suppliers conclude technical alliance with Tier 1-2 company)	* 2 local suppliers conclude technical alliance with Tier 1-2 company	* 1 local suppliers conclude technical alliance with Tier 1-2 company	* 2 local suppliers conclude technical alliance with Tier 1-2 company	* Establishment of dealer network system (attracting more dealers) * Increasing auto-finance dealers
	4. Industrial Human Resource and Technology Development (KPI: 10 faculties/courses specialized in automotive sector are newly set in higher education system by 2025)	* 200 graduates of production engineers from designated faculties/courses are newly hired by auto parts suppliers of this segment	* 100 graduates of electrical and electronic engineers from designated faculties/courses are newly hired by auto parts suppliers of this segment	* 200 graduates of engineers/specialists from designated faculties/courses are newly hired by auto parts suppliers of this segment	* Nurturing experienced engineer-based managers who have experienced model change.
	5. Infrastructure Development (KPI: Ranking of infrastructure development surveyed by "World Competitiveness Report" raises from 90s at 2015 to 60s in 2025.	* Handling capacity at Batangas .Port on automotive sector in 2016 increases by 100% in 2027.	* Electric cost per kwh reduced by 10% in 2025 compared to that of 2016.	* Each industrial park in Region 4a is accessible within one hour at the Max by road development.	* Development of all kinds of infrastructure (Electricity, Road/Sea/Air Transportation, Telecommunication)

Source: JICA Expert Team

Table 3 Concepts and Strategies for the Automotive and Auto Parts Sectors

companies will enjoy a preferential tariff rate in the range of 0-5%. Additional information can be found on https://asean.org/?static_post=asean-industrial-cooperation-scheme.

Below is the proposed Action Plan on Human Resource and Technology Development for the Philippine Automotive Industry:

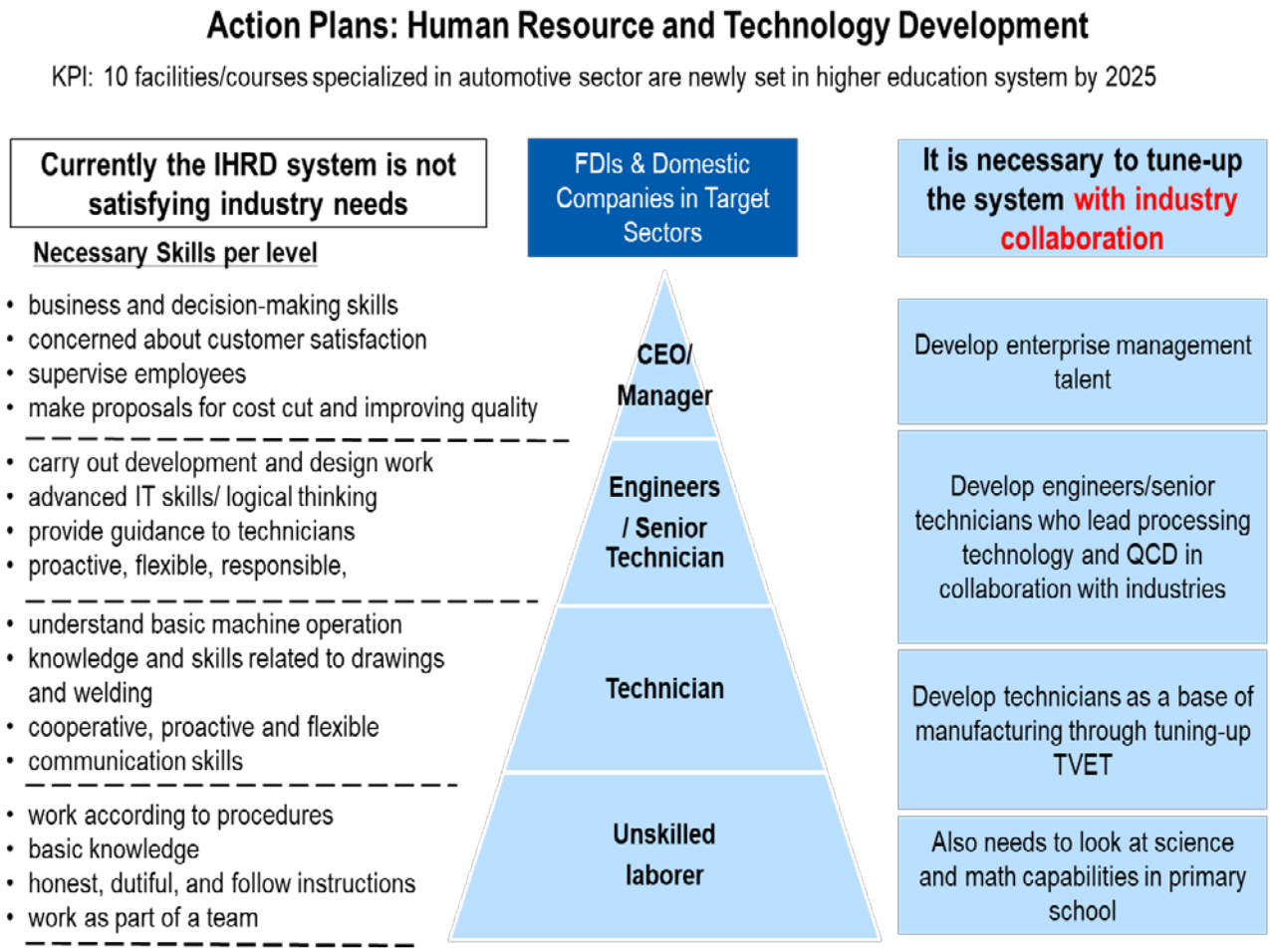


Figure 9 Action Plan for Human Resource and Technology Development in the Automotive Sector

VI. Employment

Roughly 58,000 are directly employed in the automotive manufacturing sector, while the DTI-BOI and JICA draft report on IHRD states that around 3.7 million indirect employment in the sector for 2016.

Direct Employment (in year 2016): Automotive Manufacturing		57,765
	Motor Vehicles	20,665
	Bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	6,517
	Parts and accessories for motor vehicles	30,583
	(incl. brakes, gearboxes, axles, road wheels, suspension shock absorbers, radiators silencers, exhaust pipes, catalysers, clutches, steering wheels, steering columns and steering boxes; safety belts, airbags, doors, bumpers, car seats, motor vehicle electrical equipment [generators, alternators, spark plugs, ignition wiring harnesses, power window and door systems, assembly of purchased gauges into instrument panels, voltage regulators], electric ignition or starting equipment for internal combustion engines, and other parts of accessories)	
Indirect Employment (2016)		3,682,276
Other Manufacturing Activities		*187,675*
	Refined petroleum products (incl. production of motor fuel)	6,567
	Tires	15,245
	Rubber hoses and belts and other rubber products	6,645
	Operation of blast furnaces and steel making furnaces	9,100
	Operation of steel works and rolling mills	37,520
Indirect Employment (2016)		3,682,276
Other Manufacturing Activities		*187,675*
	Non-ferrous smelting and refining except precious metals	1,341
	Manufacture of pipe fittings of non-ferrous metals	172
	Manufacture of basic precious and other non-ferrous metals	699
	Casting of iron and steel	182
	Casting of non-ferous metals	4,074
	Forging pressing stamping and roll-forming of metal	2,325
	Treatment and coating of metals; machining	7,858
	Manufacture of other fabricated metal products nec	6,452
	Manufacture of consumer electronics (incl. electronics for motor vehicles)	24,313
	Manufacture of measuring testing navigating and control equipment (incl. Manufacture of automotive emissions testing eqpt)	53,769
	Manufacture of batteries for vehicle	416
	Manufacture of electric lighting equipment (manufacture of lighting equipment for transport equip)	6,035
	Manufacture of other gen-purpose machinery (incl. manufacture of air conditioning machines for motor vehicles)	4,965
Automotive Use (Sales and Maintenance)		*534,333*
	Sale of motor vehicles (not including tricycles)	83,782
	Maintenance and repair of motor vehicles (not including tricycles)	365,190
	Sales of motor vehicles parts and accessories (not including tricycles)	85,362
Transportation and Storage		*2,706,615*
	Transport via buses	86,935

	Other passenger land transport (taxi, jeepny, rental cars, tricycles, PUVs, and trucks etc)	2,343,543
	Freight transport by road	276,137
Others		*253,652*
	Construction of roads and railways	164,375
	Wholesale of solid liquid and gaseous fuels and related products	16,712
	Retail sale of automotive fuel in specialized stores	72,566
	Service activities incidental to land transportation	18,032
	Non-life insurance (including	18,622

Table 4 Direct and Indirect Employment in Automotive Manufacturing, 2016 (Source: Philippine Statistics Authority)

The direct employment for the automotive manufacturing sector accounts only for about 1.5% of total employment in the automotive industry. The bulk of employment for the industry is on the transportation and storage at 72% overall, with Other passenger land transport accounting for almost 63% of employment for the industry.

In terms of job/skill segment, about 17% are hired as management personnel (including chief executive, administrative, production and specialized services), engineers, or professionals; 4% are hired as engineering associates/technicians, 17% are hired as plants and machine operators, and 44% are hired as workers in the manufacturing sector, based on the data from the Philippine Statistics Authority. The estimates based on the DTI-BOI and JICA draft IHRD report is that 20-30% are college graduates and 70-80% high school graduates or/and national certificate holders.

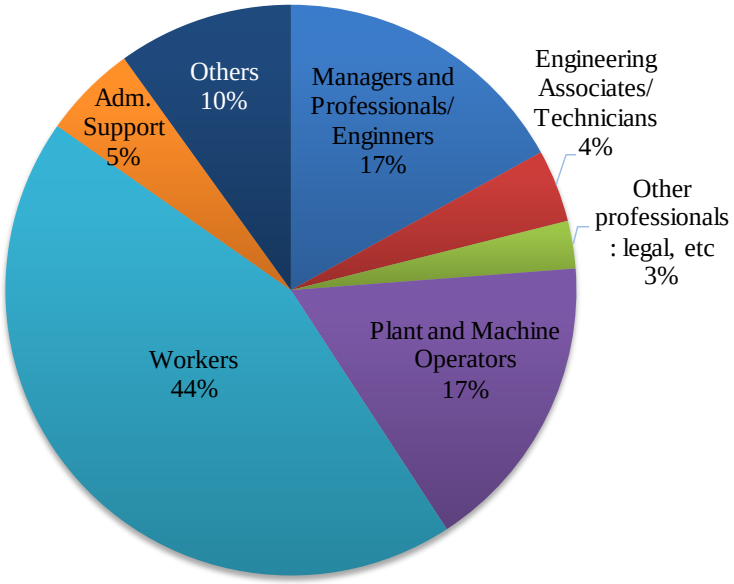


Figure 10 Employment by Job/Skill Segment in the Manufacturing Sector, 2017 (Source: Philippine Statistics Authority)

However, if the 1-million production vehicle scenario will be considered, the direct employment is estimated to increase to about 250,000-330,000:

	Philippines			Other Countries	
	2016	2027		Japan (2014)	EU (27 countries) (2013)
		Realistic	Optimistic		
Automotive Production	0.1 mil.	1 mil.		9.8 mil.	16.2 mil.
Total Employment of the Auto Industry (Share in the Overall Employment)	1.68 mill. (4.2%)	2.58 mill. (5.4%)	3.12 mill. (6.5%)	5.3 mill (8.3%)	12.7 mill. (5.8%)
Direct Employment (Manufacturing of Cars, Body, Parts)	0.06 mil.	0.25 mil.	0.33 mil	0.8 mil.	2.2 mil.
Indirect Employment (Automotive use [sales/maintenance] transportation [incl jeepney, taxi, bus drivers], construction, auto insurance, etc)	1.62 mil.	2.33 mil.	2.79 mil	4.5 mil.	10.4 mi.

Sources:

JICA Study Team based on the followings:

- Philippines: Philippines Statistics Authority
- Japan: Japan Automobile Manufacturers Association, Inc (JAMA)
- Europe: European Automobile Manufacturers Association (ACEA)

Table 5 Automotive Production and Employment Projection for the Philippine Automotive Industry

Nonetheless, there are various factors that need to be considered prior to the implementation of 1-million production in the Philippines. If subsidies will be provided by the government, a cost-benefit analysis on the incentive scheme has been requested by the Department of Finance.

VII. Skills Needs

The following necessary skills were identified as lacking or need to be improved for Senior Technicians/Technicians in the automotive industry:

Technical Skills	Soft/Essential Skills
• Math (trigonometric functions, metric systems) • Applied Mathematics (i.e. mechanics of materials, metal corrosions, thermal designing) • Processing technology and QCD • Understand basic machine operation • Knowledge related to drawings and welding	• Communication • Teamwork • Problem solving • Proactive, flexible, responsible, cooperative

VIII. TESDA Initiatives

a. Training Regulations

The table shows the list of occupations with direct and indirect employment in the automotive sector and their corresponding TESDA Training Regulation:

Direct Employment (in year 2016): Automotive Manufacturing	TESDA Training Regulation
Motor Vehicles Bodies (coachwork) for motor vehicles; Parts and accessories for motor vehicles (incl. brakes, gearboxes, axles, road wheels, suspension shock absorbers, radiators silencers, exhaust pipes, catalysers, clutches, steering wheels, steering columns and steering boxes; safety belts, airbags, doors, bumpers, car seats, motor vehicle electrical equipment [generators, alternators, spark plugs, ignition wiring harnesses, power window and door systems, assembly of purchased gauges into instrument panels, voltage regulators], electric ignition or starting equipment for internal combustion engines, and other parts of accessories)	Plastic Machine Operation NC III
	Tinsmithing NC II
	Automotive Electrical Assembly NC II
	Automotive Electrical Assembly NC III
	Automotive Mechanical Assembly NC III
	Automotive Wiring Harness Assembly NC II
	Forging NC II
	Forging NC III
	Foundry Melting/Casting NC III
	Foundry Melting/Casting NC II
	Foundry Molding NC III
	Foundry Pattern Making NC II
	Foundry Pattern Making NC III
	Laboratory and Metrology Calibration Services NC II
	Laboratory and Metrology Calibration Services NC III
	Metals Stamping NC II
	Painting Machine Operation NC II
	Process Inspection NC II
	Process Inspection NC III
	Mold Designer*
	Mold Maker*
	Mold Assembler*
	Deburring Operations*

Indirect Employment (2016)	
Other Manufacturing Activities	
Refined petroleum products (incl. production of motor fuel)	
Tires	Rubber Production NC II
Rubber hoses and belts and other rubber products	Rubber Processing NC II
Operation of blast furnaces and steel making furnaces	Foundry Melting/Casting NC II
	Foundry Melting/Casting NC III
	Heat Treatment NC II
Operation of steel works and rolling mills	Shielded Metal Arc Welding (SMAW) NC I

Indirect Employment (2016)	
	Gas Metal Arc Welding (GMAW) NC I
	Gas Tungsten Arc Welding (GTAW) NC IV
	Gas Welding NC I
Non-ferrous smelting and refining except precious metals	Foundry Melting/Casting NC III
Manufacture of pipe fittings of non-ferrous metals	
Manufacture of basic precious and other non-ferrous metals	
Casting of iron and steel	Foundry Molding NC III
	Foundry Melting/Casting NC II
Casting of non-ferous metals	Foundry Melting/Casting NC II
	Foundry Melting/Casting NC III
	Foundry Molding NC III
Forging pressing stamping and roll-forming of metal	Forging NC II
	Forging NC III
	Metal Stamping NC II
Treatment and coating of metals; machining	Heat Treatment NC II
	Machining NC I
	Machining NC II
	Machining NC III
Manufacture of other fabricated metal products nec	Tool and Die Making NC II
Manufacture of consumer electronics (incl. electronics for motor vehicles)	
Manufacture of measuring testing navigating and control equipment (incl. Manufacture of automotive emissions testing eqpt)	
Manufacture of batteries for vehicle	
Manufacture of electric lighting equipment (manufacture of lighting equipment for transport equip)	
Manufacture of other gen-purpose machinery (incl. manufacture of air conditioning machines for motor vehicles)	
Automotive Use (Sales and Maintenance)	
Sale of motor vehicles (not including tricycles)	Customer Services NC II

Indirect Employment (2016)	
Maintenance and repair of motor vehicles (not including tricycles)	Auto Engine Rebuilding NC II
	Automotive Body Painting/Finishing NC I
	Automotive Body Painting/Finishing NC II
	Automotive Body Painting/Finishing NC III
	Automotive Body Repairing NC II
	Automotive Servicing NC I
	Automotive Servicing NC II
	Automotive Servicing NC III
	Automotive Servicing NC IV
	Transport RAC Servicing NC II
	Automotive Servicing - Hybrid Vehicles*
Sales of motor vehicles parts and accessories (not including tricycles)	Customer Services NC II
Transportation and Storage	
Transport via buses	Driving (Passenger Bus/Straight Truck) NC III
Other passenger land transport (taxi, jeepny, rental cars, tricycles, PUVs, and trucks etc)	Driving NC II
Freight transport by road	Driving (Passenger Bus/Straight Truck) NC III
	Driving (Articulated Vehicle) NC III
Others	
Construction of roads and railways	Carpentry NC II
	Masonry NC I
	Heavy Equipment Operation (Bulldozer) NC II
	HEO (Crawler Crane) NC II
	HEO (Forklift) NC II
	HEO (Hydraulic Excavator) NC II
	HEO (Motor Grader) NC II
	HEO (Rough Terrain Crane) NC II
Construction of roads and railways	HEO (Truck Mounted Crane) NC II
	HEO (Wheel Loader) NC II
	Scaffolding Works NC II (Supported Type Scaffold)
	HEO (Articulated Off-Higway Dump Truck) NC II
	HEO (Concrete Pump) NC II
	HEO (Paver) NC II
	Rigging NC I
	HEO (Rigid Off-Highway Dump Truck) NC II
	HEO (Road Roller) NC II
	HEO (Transit Mixer) NC II

Indirect Employment (2016)	
	HEO (Rigid On-Highway Dump Truck) NC II
	HEO (Backhoe Loader) NC II
	HEO (Screed) NC I
	Structural Erection NC II
	Pipefitting (Metallic) NC II
	System Formworks Installation NC II
	Reinforcing Steel Works NC II
Wholesale of solid liquid and gaseous fuels and related products	Customer Services NC II
Retail sale of automotive fuel in specialized stores	Customer Services NC II
Service activities incidental to land transportation	
Non-life insurance (including	

**These qualifications are part of the 74 qualifications that were prioritized by the TESDA Board in 2015.*

Based on this, it can be seen that the necessary qualifications to be employed in the automotive industry is not limited to qualifications under the Automotive and Land Transport Sector. Some of the qualifications are under the Metals and Engineering, Electrical and Electronics, Construction, Heating, Ventilation, Airconditioning and Refrigeration, Agriculture, and Wholesale and Retail Trading. Cross-industry linkages of the automotive industry to other industries is already happening. It can also be noted that there are some activities where there are still no TVET Training Regulations.

b. TVET Capacity

i. Registered Programs and Technical Vocational Institutions (TVIs) as of December 2018

Sector	TESDA Training Regulation	Registered Programs	TVIs
Agriculture Forestry and Fishery	Rubber Production NC II	10	10
	Rubber Processing NC II		
Automotive and Land Transportation	Automotive Electrical Assembly NC II*	3	2
	Automotive Electrical Assembly NC III*		
	Automotive Mechanical Assembly NC III*		
	Automotive Wiring Harness Assembly NC II*	2	2
	Forging NC II*		
	Forging NC III*		
	Foundry Melting/Casting NC III*		

Sector	TESDA Training Regulation	Registered Programs	TVIs
	Foundry Melting/Casting NC II*		
	Foundry Molding NC III*		
	Foundry Pattern Making NC II*		
	Foundry Pattern Making NC III*		
	Laboratory and Metrology Calibration Services NC II*		
	Laboratory and Metrology Calibration Services NC III*		
	Metals Stamping NC II*		
	Painting Machine Operation NC II*		
	Plastic Machine Operation NC II*		
	Plastic Machine Operation NC III*		
	Process Inspection NC II*		
	Process Inspection NC III*		
	Tinsmithing NC II*		
	Heat Treatment NC II*		
	Auto Engine Rebuilding NC II	1	1
	Automotive Body Painting/Finishing NC I	2	2
	Automotive Body Painting/Finishing NC II	3	3
	Automotive Body Painting/Finishing NC III		
	Automotive Body Repairing NC II	1	1
	Automotive Servicing NC I	335	291
	Automotive Servicing NC II	351	319
	Automotive Servicing NC III	12	12
	Automotive Servicing NC IV	6	6
	Driving NC II	353	298
	Driving (Passenger Bus/Straight Truck) NC III	21	18
	Driving (Articulated Vehicle) NC III	7	7
	Motorcycle/Small Engine Servicing NC II	115	97
Construction	Carpentry NC II	202	87
	Masonry NC I	32	29
	Heavy Equipment Operation (Bulldozer) NC II	38	30
	HEO (Crawler Crane) NC II	1	1
	HEO (Forklift) NC II	53	40
	HEO (Hydraulic Excavator) NC II	59	50
	HEO (Motor Grader) NC II	17	13

Sector	TESDA Training Regulation	Registered Programs	TVIs
	HEO (Rough Terrain Crane) NC II	5	5
	HEO (Truck Mounted Crane) NC II	3	3
	HEO (Wheel Loader) NC II	63	13
	Scaffolding Works NC II (Supported Type Scaffold)	73	59
	HEO (Articulated Off-Higway Dump Truck) NC II		
	HEO (Concrete Pump) NC II		
	HEO (Paver) NC II		
	Rigging NC I	7	6
	HEO (Rigid Off-Highway Dump Truck) NC II	1	1
	HEO (Road Roller) NC II	10	8
	HEO (Transit Mixer) NC II		
	HEO (Rigid On-Highway Dump Truck) NC II	24	19
	HEO (Backhoe Loader) NC II	53	39
	HEO (Screed) NC I		
	Pipefitting (Metallic) NC II	47	39
	System Formworks Installation NC II		
	Reinforcing Steel Works NC II		
Electrical & Electronics	Electronics Products Assembly and Servicing NC II	9	9
	Electronics Back-End Operation NC II	6	3
	Electronics Front-of-Line Operation NC II		
	Electronics/Semiconductor Production Line Machine Servicing NC III		
	Instrumentation and Control Servicing NC II	22	15
	Instrumentation and Control Servicing NC III	8	7
	Instrumentation and Control Servicing NC IV	3	2
	Mechatronics Servicing NC II	61	47
	Mechatronics Servicing NC III	11	9
	Mechatronics Servicing NC IV	4	3
	Semiconductor Back-End Operation NC II		
	Semiconductor Front-of-Line Operation NC II		
Metals and Engineering	Shielded Metal Arc Welding (SMAW) NC I	442	363

Sector	TESDA Training Regulation	Registered Programs	TVIs
	Gas Metal Arc Welding (GMAW) NC I	19	18
	Gas Tungsten Arc Welding (GTAW) NC IV		
	Gas Welding NC I		
	Machining NC I	22	18
	Machining NC II	43	40
	Machining NC III	5	5
	Tool and Die Making NC II		
Heating, Ventilation, Airconditioning and Refrigeration	Transport RAC Servicing NC II	7	6
Wholesale and Retail Trading	Customer Services NC II	16	13

*TRs on Automotive Manufacturing

Table 6 Registered Programs and TVIs in Identified Qualifications

This table shows that there are hardly any TVIs that offer training programs for the Training Regulations (TRs) that cater to automotive manufacturing. Most of the registered programs in the Automotive and Land Transport sector are in the driving and servicing training programs.

From among the listed qualifications in the table, the Shielded Metal Arc Welding has the most number of registered programs. However, most of the graduates of these training programs enter the construction sector. While welding is still a useful skill for labor-intensive manufacturing, many of the welding activities, especially for the larger auto parts and components are already done by robots in automotive companies visited in Thailand, Japan and India through the DTI-BOI/JICA project. Some companies in the Philippines visited are also utilizing robots for the welding of auto parts.

It should also be noted that Rubber Production is only present in regions whose geographical areas are suitable for planting rubber.

ii. Registered Programs and TVIs for Identified Qualifications by Sector, by Region as of December 2018

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
ARMM		27	45	7		4		83
CAR		27	20	6		10		63
CARAGA		32	20	4	2	13		71
I		51	29	20		23		123
II		56	19	20	2	7		104

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
III		55	51	72		68	2	248
IV-A		84	61	89		83	3	320
IV-B		43	24	22	1	16	1	107
IX	6	100	30	7	1	21		165
NCR		62	50	71		45	4	232
V		75	30	57		36	1	199
VI		64	36	9		51		160
VII		34	51	20		47	4	156
VIII		38	30	5		15		88
X	1	123	113	26		40		303
XI		99	23	8	1	24	1	156
XII	3	128	58	17		16		222
Grand Total	**10**	**1098**	**690**	**460**	**7**	**519**	**16**	**2800**

Table 7 Number of Registered Programs for Identified Qualifications by Sector, By Region as of December 2018

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
ARMM		19	27	6		4		56
CAR		18	11	6		8		43
CARAGA		17	12	4	2	9		44
I		35	10	20		21		86
II		29	8	17	1	4		59
III		36	20	49		46	2	153
IV-A		40	35	62		59	3	199
IV-B		19	11	15	1	13	1	60
IX	6	34	15	7	1	11		74
NCR		39	22	41		39	3	144
V		37	17	46		28	1	129
VI		29	12	8		37		86
VII		17	20	13		31	3	84
VIII		15	17	4		14		50
X	1	52	43	20		33		149
XI		39	11	7	1	18	1	77
XII	3	58	22	15		14		112
Grand Total	**10**	**533**	**313**	**340**	**6**	**389**	**14**	**1605**

Table 8 Number of TVIs for Identified Qualifications by Sector, By Region as of December 2018

Region IV-A has the highest number of registered programs and TVIs that offer the identified qualifications for the automotive industry. Region III and

Region X also belong to the top three regions with the highest number of registered programs and TVIs.

iii. Number of National TVET Training Certificate (NTTC) Holders for Identified Qualifications by Sector, by Region as of December 2018

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
ARMM		22	28	10		1		61
CAR		121	62	12		47	0	242
CARAGA		62	61	16	3	4		146
I		157	78	49	1	5		290
II		138	53	58	3	4		256
III		158	102	149		6	11	426
IV-A		270	165	210	1	25	8	679
IV-B		118	104	63	0	5	2	292
IX	27	152	59	21	2	11	2	274
NCR		287	320	229		30	40	906
V		168	36	68	1	2	8	283
VI		200	95	47	1	8		351
VII		93	149	43		22	3	310
VIII		128	122	7		1		258
X	7	184	156	52		7		406
XI		198	78	35	1	9	5	326
XII	15	228	92	48	2	1		386
Grand Total	**49**	**2684**	**1760**	**1117**	**15**	**188**	**79**	**5892**

Table 9 Number of NTTC Holders for Identified Qualifications by Sector, By Region as of December 2018

NTTC holders are the TESDA Certified Trainers for various occupations. Overall, there are a total of 5,892 certified trainers for the identified qualifications in the automotive industry. The National Capital Region has the most number of certified trainers, followed by Regions IV-A and III.

iv. Assessment Centers (ACs) and Competency Assessors for Identified Qualifications by Sector, by Region as of December 2018

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
ARMM		4	4	1		1		10
CAR		7	7	1		3	1	19
CARAGA		6	9	1	1	3		20
I		7	13	3	1	4		28
II		7	9	1	1	2		20
III		7	10	4		3		24
IV-A		11	15	4		5	1	36
IV-B		6	11	2	1	1		21
IX	1	7	9	1	1	3		22
NCR		7	21	6		6	1	41
V		5	11	1		3	1	21

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
VI		7	17	1		6		31
VII		6	17	2		3	1	29
VIII		7	6	1		2		16
X	1	8	16	3		3		31
XI		5	11	3	1	4		24
XII	1	5	11	1		3		21
Grand Total	**3**	**112**	**197**	**36**	**6**	**55**	**5**	**414**

Table 10 Number of Assessment Centers for Identified Qualifications by Sector, By Region as of December 2018

Region	Agriculture, Forestry and Fishery	Automotive and Land Transportation	Construction	Electrical and Electronics	HVAC/R	Metals and Engineering	Wholesale and Retail Trading	Grand Total
ARMM		4	2	1		1		8
CAR		7	8	1		2	1	19
CARAGA		5	8	1	1	3		18
I		7	13	3	1	4		28
II		8	10	1	1	2		22
III		8	11	4		3	1	27
IV-A		9	14	4	1	5		33
IV-B		5	9	2		2		18
IX	1	8	9	1	1	3	1	24
NCR		8	19	6		4	1	38
V		5	11	1		3	1	21
VI		6	12	1		6		25
VII		6	16	3		3	1	29
VIII		8	11	1		2		22
X	1	8	13	4		2		28
XI		5	9	3		3	1	21
XII	1	5	10	1	1	1		19
Grand Total	**3**	**112**	**185**	**38**	**6**	**49**	**7**	**400**

Table 11 Number of Competency Assessors for Identified Qualifications by Sector, By Region as of December 2018

Overall, there are a total of 414 assessment centers and 400 competency assessors for the identified qualifications in the automotive industry. The National Capital Region has the most number of assessment centers, followed by Regions IV-A and VI. It is almost the same for the competency assessors with NCR and Region IV-A as top 1 and 2, respectively; but Region VII has the third highest number of competency assessors.

v. Enrollment (E), Graduates (G), Assessed (A) and Certified (C) for Identified Qualifications, January to December 2018

Sector	TESDA Training Regulation	E	G	A	C
Agriculture Forestry and Fishery	Rubber Production NC II	683	706	949	828
	Rubber Processing NC II				
	Automotive Electrical Assembly NC II	37	30		

Sector	TESDA Training Regulation	E	G	A	C
Automotive and Land Transportation	Automotive Electrical Assembly NC III				
	Automotive Mechanical Assembly NC III				
	Automotive Wiring Harness Assembly NC II	7862	3163		
	Forging NC II				
	Forging NC III				
	Foundry Melting/Casting NC III				
	Foundry Melting/Casting NC II				
	Foundry Molding NC III				
	Foundry Pattern Making NC II				
	Foundry Pattern Making NC III				
	Laboratory and Metrology Calibration Services NC II				
	Laboratory and Metrology Calibration Services NC III				
	Metals Stamping NC II				
	Painting Machine Operation NC II				
	Plastic Machine Operation NC II	1079	2081		
	Plastic Machine Operation NC III				
	Process Inspection NC II				
	Process Inspection NC III				
	Tinsmithing NC II				
	Heat Treatment NC II				
	Auto Engine Rebuilding NC II	67	61		
	Automotive Body Painting/Finishing NC I	8	8		
	Automotive Body Painting/Finishing NC II	64	84		
	Automotive Body Painting/Finishing NC III				
	Automotive Body Repairing NC II				
	Automotive Servicing NC I	20737	19966	42044	38442
	Automotive Servicing NC II	19353	19042	35565	32242
	Automotive Servicing NC III	226	231	676	591
	Automotive Servicing NC IV	135	256	1167	954
	Driving NC II	33028	31055	56634	52351
	Driving (Passenger Bus/Straight Truck) NC III	2595	2697	6865	6378
	Driving (Articulated Vehicle) NC III	241	295	2190	2119
	Motorcycle/Small Engine Servicing NC II	5561	6016	11518	10675
Construction	Carpentry NC II	12415	13113	20896	19367
	Masonry NC I	1793	1876	1357	1296
	Heavy Equipment Operation (Bulldozer) NC II	657	576	954	904
	HEO (Crawler Crane) NC II			345	345
	HEO (Forklift) NC II	2010	2173	8958	8676
	HEO (Hydraulic Excavator) NC II	2696	2681	5674	5392
	HEO (Motor Grader) NC II	527	503	564	532
	HEO (Rough Terrain Crane) NC II	109	106	629	623
	HEO (Truck Mounted Crane) NC II	150	131	1052	1052
	HEO (Wheel Loader) NC II	2031	2176	3738	3490
	Scaffolding Works NC II (Supported Type Scaffold)	4970	5278	12740	12509
	HEO (Articulated Off-Higway Dump Truck) NC II				

Sector	TESDA Training Regulation	E	G	A	C
	HEO (Concrete Pump) NC II	1	1		
	HEO (Paver) NC II	19	0		
	Rigging NC I	374	373	2998	2979
	HEO (Rigid Off-Highway Dump Truck) NC II	46	43	694	675
	HEO (Road Roller) NC II	98	104	353	344
	HEO (Transit Mixer) NC II	4	2	180	180
	HEO (Rigid On-Highway Dump Truck) NC II	1610	1596	3743	3594
	HEO (Backhoe Loader) NC II	2153	2279	3216	2970
	HEO (Screed) NC I				
	Pipefitting (Metallic) NC II	3841	4681	7569	7381
	System Formworks Installation NC II				
	Reinforcing Steel Works NC II				
Electrical & Electronics	Electronics Products Assembly and Servicing NC II	19755	18452	37832	33049
	Electronics Back-End Operation NC II	184	176		
	Electronics Front-of-Line Operation NC II	719	84		
	Electronics/Semiconductor Production Line Machine Servicing NC III				
	Instrumentation and Control Servicing NC II	1443	1406	2330	2067
	Instrumentation and Control Servicing NC III	155	198	205	158
	Instrumentation and Control Servicing NC IV				
	Mechatronics Servicing NC II	2530	2342	3229	2894
	Mechatronics Servicing NC III	263	282	348	267
	Mechatronics Servicing NC IV		40	84	64
	Semiconductor Back-End Operation NC II	449	483		
	Semiconductor Front-of-Line Operation NC II	1074	1002		
Metals and Engineering	Shielded Metal Arc Welding (SMAW) NC I	26728	30794	47880	44497
	Gas Metal Arc Welding (GMAW) NC I	308	361	476	434
	Gas Tungsten Arc Welding (GTAW) NC IV				
	Gas Welding NC I				
	Machining NC I	856	722	941	893
	Machining NC II	1401	1378	1737	1620
	Machining NC III				
	Tool and Die Making NC II				
HVAC and Refrigeration	Transport RAC Servicing NC II	645	629	356	338
Wholesale and Retail Trading	Customer Services NC II	1013	894	2823	2815

Table 12 Enrollment (E), Graduates (G), Assessed (A) and Certified (C) for Identified Qualifications, January to December 2018

There are a total of 184,703 enrollments, 182,626 graduates, 331,509 assessed and 305,985 certified in the identified qualifications. The qualifications related to the direct employment in automotive manufacturing only registered 5,274 graduates or almost 3% for all the graduates in the identified qualifications. The number of graduates is about 1/5th of the anticipated number of direct employment in the automotive manufacturing.

The qualifications with the most number of graduates and certified are on Driving NC, Shielded Metal Arc Welding, Automotive Servicing, and Electronic

Products Assembly and Servicing. It would also be good to note that these qualifications with the most number of graduates and certified are in the NC I and NC II levels. The graduates and certified in the electrical and electronics sector are in the thousands, which somehow supports that the Philippines has a comparative advantage in electronics in terms of human capital.

IX. Analysis of Gaps

a. With no registered programs for the TRs on automotive manufacturing, there are no enrollment and graduates for the said qualifications.

b. Technicians that are currently employed in the automotive industry were reported to have skills gaps in both technical and soft skills. In terms of technical skills, these are on Math (trigonometric functions, metric systems), Applied Mathematics (i.e. mechanics of materials, metal corrosions, thermal designing), Processing technology and QCD, understanding of basic machine operation, and knowledge related to drawings and welding. For the soft skills, communication needs to be improved, along with teamwork and problem solving. Employers also desire that their employees will be more proactive, flexible, responsible, and cooperative.

c. Some employers report that the companies' needs are not sufficiently reflected in course contents.

d. Some TVET providers have insufficient training hours.

e. Many of the TVIs struggle with coordination/collaboration with industry in terms of facilitation and monitoring of linkages.

f. The number of trainers are lacking, and that existing trainers' work experience in industry is insufficient. There is a need to update/upgrade the trainers' knowledge and skills.

g. Equipment are insufficient in terms of number and quality, with some of them outdated.

X. Way Forward

a. The growing trend in automotive sales is something that the Philippines can capitalize as an opportunity to increase its manufacturing capability, and thereby increase the country's participation in the automotive global value chain. The Comprehensive Automotive Resurgence Strategy (CARS) Program is a way for the country to revitalize and develop its automotive manufacturing capability as it intends to attract strategic investments in the manufacturing of automotive and auto parts. Currently, the automotive manufacturing capabilities in the Philippines is still quite limited compared to its ASEAN neighbor Thailand. The Philippines can capitalize on its strengths in the Electrical and Electronics components, drivetrain parts, and engines and engine parts, as well as its cost competitive labor, in attracting investments. However, if the Philippines will not act on it, the Philippines may experience a huge trade deficit in the future.

b. For the expected growth of the industry, there is a strong need to have an abundant supply of people at all skill levels, starting from workers, technicians, engineers, and managers.

c. There is a need to "tune-up" TVET on the following issues/areas to increase its participation in the Automotive Global Value Chain:

    i. To address the weak mathematics and applied mathematics skills of technicians, these skills need to be covered in the qualification standards, curriculum.

    ii. To address workers and technicians' understanding of the job, both theoretical and practical knowledge should be strengthened during the training.

    iii. Enhance knowledge related to drawings and welding for relevant qualifications through the review of TRs/competency standards, and updating of curriculum.

    iv. TESDA should consider incorporating production management technologies in automotive and related courses such as Kaizen, Quality Cost Delivery (QCD) and Monozukuri in the TRs, CS and curriculum, as a response to government's policy in improving/upgrading the manufacturing sector.

    v. Improve the teaching and learning of essential skills for trainees such as communication, team work, problem solving, cooperation, flexibility and being pro-active.

    vi. There is a need to ensure that the required training hours and OJT are fulfilled by the TVET providers.

vii. There is a need to look into the non-utilization of TRs related to automotive manufacturing, such as Automotive Electrical and Mechanical Assembly (NC III), Forging, Foundry Melting/Casting, Foundry Molding, Foundry Pattern Making, Laboratory and Metrology Calibration Services, Metals Stamping, Painting Machine Operation, Process Inspection, Tinsmithing, Heat Treatment, Machining (NC III) and Tool and Die Making. TRs on specific qualifications are promulgated by TESDA for jobs or occupations that were deemed priority of the industry.

viii. There is a need to strengthen industry-academe linkage to address the issues on human resource development for the automotive industry, so that companies' needs are reflected in the TRs, competency standards and curricula, more institutions and enterprises can provide relevant work-based training for its trainees, and TVET trainers gain additional industry experience, as well as upgrade of knowledge and skills. TESDA can also look into how it can partner with local suppliers to support their human resource development needs.

ix. Further consultation is needed for the review of existing TRs/CS as well as in the identification of skills for the product and process upgrade in the product and process upgrade on metal casting, forging, machining and higher value E&E components so that TVET trainings remain relevant and up to date with the developments in the industry.

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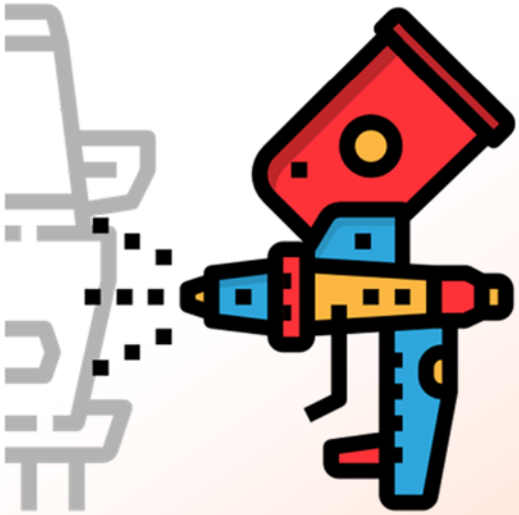

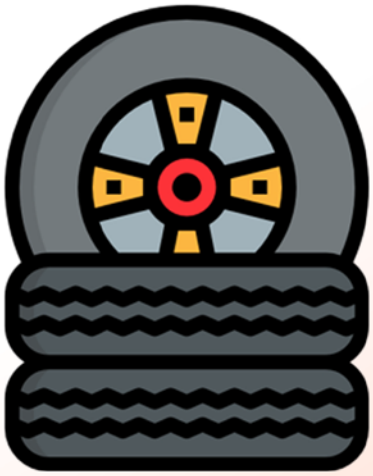

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