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ACSEE

AUTOCLUSTERS

Automotive network for innovation

INNOVATION TRENDS AND CHALLENGES AND COOPERATION POSSIBILITIES WITH R&D IN AUTOMOTIVE INDUSTRY

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Content:

INTRODUCTION

Automotive Cluster – West Slovakia was the main initiator of project AUTOCLUSTERS in program South East Europe (SEE). The main project idea was born based on long term experiences of professional managers with the aim to create in SEE new area of cooperation in automotive R&D (Research and Development). Importance of R&D and innovation and education is well known and is great. This factor was the main driver for building up the project. The project brings together Universities, R&D institutions, SMEs support facilities from EU-15, NMS (New Member States) as well as IPA to prepare and **create the first automotive network in SEE**. The second level clustering activities proposed by the project are strictly oriented on the activities, which are improving the innovation capacities in the region and improve technology and know-how transfer improving the innovation circle.

According to ACEA (European Automobiles´ Manufacturers Association, http://www.acea.be/index.php/news/news_detail/automobile_assembly_engine_production_plants_in_europe/) information, in the countries of East Europe (BG-1, BIH-1, BY-3, CZ-11, EE-1, HU-6, KZ-1, PL-16, RO-4, RS-1, RU-25, SI-1, SK-3, TR-19, UA-5, UZ-1) there are **99 automotive production and assembly plants and** a lot of global suppliers plants and local and regional production units of subsuppliers. This great potential brings a lot of great opportunities for building and development of new business models, cooperations and partherships not only between countries of East Europe but **cooperation between East and West Europe** too. We in our project team suppose that this idea could increase R&D and innovation potential of the whole Europe. We think that R&D and innovation potential of the countries in SEE is not fully used. In this space, there are a lot of innovation and R&D capacities, like: universities, laboratories, domestic R&D institutions and centres, local engineering firms and technology centres of global automotive firms.

In the project, there is interesting combination of project partners: 2 partners from 2 Italy regions (Lombardia and Trento), Hungary and 2 partners from Slovakia, Romania and Bulgaria, and countries from Balkan area: Slovenia, Serbia, Croatia. Last partner is from Austria and this partner has role like observer.

One of the main aim in the project is creating an **automotive R&D Database**. This database consits of R&D capacities in project partners countries and regions with focus on automotive. Based on this aim we have identified **more than 200 R&D capacities** (without Austrian R&D capacities). It is great potential for building new dimension of cooperation and potential for popularisation of R&D. We want **to create strong automotive R&D and innovation region of SEE countries**. The main drivers for fulfil the vision, aims and objectives of the project are:

- Global financial and economic crisis
- Structural changes in the automotive industry
- Strong focus on ecology – development of environmental technologies, development of new types of cars (hybrids, electric cars), eco-innovation, cleaner production …
- Growing need for creating close collaborative automotive R&D in Europe
- Low cost production, low cost R&D, low cost cars, lighweight cars (development of new materials, plastics, steel…)
- Fast growing competition from Asian countries
- Focus on process improvement and process innovation – lean production
- Climate changes and energy
- Globalisation

- Safeguarding the future of production facilities
- Sustainable mobility and urbanisation
- Employment, health and safety
- New customer demands – more safety cars, more customer-oriented cars, urban city cars, …

Study *Innovation Trends and Challenges and Cooperation Possibilities with R&D in Automotive Industry* (next only "**R&D Study**") is one the main project outcomes. R&D Study is divided into 3 main chapters that could help to build and create automotive network in SEE. In the first chapter we analysed the basic world automotive trends and orientation of R&D in automotive industry. There are research findings about automotive R&D capacities in Project Partners´ countries/regions (next only "PPs countries/regions"). Second part of the R&D Study is focused on basic characteristics of automotive industry in PPs countries/regions. With this part we can better understand of character of automotive industry in SEE and orientation. Last chapter is oriented on setting up recommendations for automotive industry in SEE, topics for educational seminars and presentations in the frame of project and other results of the analysis of automotive industry.

In phase of preparation R&D Study, we have designed R&D Form as a tool for identification and data mapping of R&D capacities. This form was distributed to various potential organizations, which are focused on R&D activities in automotive industry. Another way of identification and data mapping information of R&D capacities was internet intelligence search. We have obtained information from web pages of R&D capacities in PPs countries/regions. In identification phase, we were oriented mainly on university centres, R&D organizations and institutions, OEMs development centres, global suppliers with own technological centres, engineering services firms and others.

METHODOLOGY OF THE ANALYSIS

Methodology represents basic way and steps for creation of our analysis.

R&D capacities as well as car producers and sub-contractors in automotive industries have to be invited into the process of data mapping (or identification). The major aim is to find in the whole business communities the areas where the reasonable cooperation between sub-contractors and universities or other relevant institutions is possible. This task has to be performed in deep cooperation with car producers, who are the final users of this activity. European policies and trends have to be taken into account as well.

Our plan in Work Package No.4 (next only "WP4") is to analyse that innovation capacities in various number of sub-contractors from different countries/regions of SEE as well as from different fields of expertise and production. The goal is to identify strength and weaknesses in their production cycle, as well how they are ready to cooperate with R&D plus universities. The capability to support researchers, to produce the prototypes and finally to start production will be part of analysis as well. The results should input to the projects they could be financed at local level.

WP 4 is consisting from:
Activity 4.1:

- analysis of the innovation capacities (analysis will consist information not only about universities´, institutes´ R&D centres, laboratories, but SMEs centres and its R&D departments, enterprise innovation centres and R&D capacities, R&D expenses, product or process innovations, application into the praxis...),
- study about Innovation trends and challenges and cooperation possibilities with R&D for automotive industry,
- database describing the R&D and innovation capacities potential in SEE (creating of some type of networking based on R&D area, sustainability of database and whole network in life).

Typology of activities for activity 4.1:

- collecting, data mapping, identification, and processing information about R&D capacities on local level (actual Technological development centres, SMEs centres, Innovation centres, Engineering services centres, Centres of excellence, University centres, Science and technology parks, Institutions of academy of science and other types of centres wit focus on automotive),
- sharing information and experiences with project partners,
- creating of R&D database on project web page,
- collecting and processing information about local automotive trends in the project partners countries/regions and specific information about theory of R&D (types of R&D centres, role of R&D centres),
- processing R&D Study.

Managing activities:

- the responsible Project Partner (PP) for this WP4 is Lead Partner (LP) – Automotive Cluster – West Slovakia in Trnava, Slovakia,
- the LP coordinates all activities in WP4 and collects all materials, documents and processed information,
- the LP will inform PPs about time schedule of the WP4,
- the LP will lead communication with PPs,

- every PP is responsible for collecting and processing all requested information needed in WP 4 for creating analysis, R&D study and R&D database from its own local region or country.

The main partial activities:

- creating of R&D capacity classification for better identification of R&D capacities,
- collecting information, data mapping of R&D capacities by common form,
- contribution to the R&D study by the theory of R&D,
- choosing 2 good practices about R&D capacity in the PPs country/region,
- information letter for companies, car producers, sub-contractors, universities which are interested in cooperation in our project and its benefits for the future.

The main outputs of the WP4:

- study *Innovation trends and challenges and cooperation possibilities with R&D for automotive industry* (1x) – „R&D Study“,
- database: Innovation and R&D capacities in PPs´ countries/ regions of SEE (1x),
- national events – educational seminars (24x) – every PP will responsible for educational seminars in his country/region on local level.

Creating of recommendations for next development and building of cooperation initiatives:

- based on results of analysis of R&D capacities in PPs´ countries/ regions of SEE – preparing recommendation
- based or results of analysis of R&D capacities in PPs´ countries/ regions of SEE - creation of ideas, inspirations for preparing projects in WP6

1. MAJOR TRENDS IN AUTOMOTIVE INDUSTRY

Automotive industry is a key industrial sector of the European economy. Its development has growing tendency mainly in R&D activities, growing numbers of innovations and strong focus on education. R&D is more and more the high competitive advantage not only for industrial firms but for public and government sector too. R&D is one of the major characteristic features of advanced and modern economy, country, innovative orientation and human resources development. Automotive industry in Europe is characterized by:

- the most importatnt employer in compare with other industrial sectors,
- high automotive R&D expenditure per year (app. 20 bln.Eur),
- the most importatnt export sector,
- almost 300 automotive production and assembly plants in Europe.

In the world there are a lot of types of car producers. We can divide car producers into two main groups:

- global world car producers (Toyota, VW, GM, Ford, Honda, Nissan, PSA, Hyundai and other)
- local national car producers and special car producers (AC Cars, Koenigsegg, Pininfarina, Lotus Cars...)

Subcategories of car producers:

- car producers of luxury cars (Porsche, BMW, Rolls-Royce, Spyker, Aston Martin, Jaguar, Bugatti, Bentley, Maserati, Daimler, Mercedes-Benz, Lincoln, Lexus...)
- bus producers (MAN, Neoplan, Scania, Volvo, Renault, ...)
- car producers (passenger cars) - (VW, Toyota, Ford, GM, Honda, Daimler...)
- electric car producers (Tesla Motors, Think Global, Nissan, Mitsubishi, BYD Auto, Subaru, Toyota, BMW, VW, Daimler, Protoscar, Mindset...)
- producers of army special cars
- engine producers (AVL, Detroit Diesel, Yamaha Motor Company...)
- race car producers (Formula F1 – BMW in motorsport, Honda Racing, McLaren, Toyota Racing, ...)
- holiday travel car producers (Coleman Company, Hymer, Westfalia...)
- tractors producers (Ford, New Holland, MB Trac...)
- trolley bus producers (Mercedes-Benz, Škoda, Solaris...)
- truck producers (Iveco, MAN, Scania, Volvo...)
- motorcycles producers (BMW Motorad, Honda, Suzuki, Yamanha, Harley-Davidson...)

According to ACEA (European Automobiles´ Manufacturers Association) **in Europe there are 296 automotive production and assembly plants. Europe** includes the EU27 plus a number of neighbouring countries (Bosnia Herzegovina, Belarus, Kazakhstan, Norway, Russia, Serbia, Turkey, Ukraine, Uzbekistan).

In the frame of project **in PPs countries/regions there are 42 automotive production and assembly plants** (Tab. 1.1). **Besides these plants we have identified next 12 local car producers (Tab.1.2).** List of automotive production and assembly platns are in tables below. This amount of automotive plants together with suppliers' plants gives to local R&D capacities a great opportunity for creation of cooperation on projects in area of R&D.

Tab.1.1: Plants location in PPs´ countries/regions

Plant Location	Manufacturer	Type produced					Brand
		Engine	PC	LCV	CV	Bus	
Bulgaria – 1							
Lovech			x				Great Wall Motors (from 2011)
Hungary – 6							
Esztergom	SUZUKI		x				Suzuki, Fiat, Opel
Győr		x	x				Audi
Kaposvar	NABI					x	Nabi
Kecskemet	DAIMLER		x				Mercedes-Benz (from 2012)
Szekesfehervar (Budapest)	IKARUS HOLDING Rt.					x	Ikarus
Szentgotthard	GM	x					
Italy – 20							
Bairo	pininfarina		x				Car design & body making for Mitsubishi, Ford, Fiat Group, TATA
Bolzano	FIAT GROUP			x	x		Iveco defence vehicles
Brescia	FIAT GROUP				x		Iveco trucks, firefighting vehicles
Cassino (Frosinone)	FIAT GROUP		x				Fiat, Lancia
Castenedolo (Brescia)	bremach Italian Job			x	x		Bremach
Grugliasco (Torino)	FIAT GROUP		x				Chrysler, Jeep (from 2011)
Grugliasco (Torino)	pininfarina		x				Car design & body making
Maranello	FIAT GROUP		x				Ferrari
Melfi (Potenza)	FIAT GROUP		x				Fiat
Mirafiori (Torino)	FIAT GROUP		x				Fiat, Lancia, Alfa Romeo
Modena	FIAT GROUP		x				Maserati, Alfa Romeo sports cars
Modena	PAGANI		x				Pagani sprots cars
Piacenza	FIAT GROUP				x		Astra (IVECO) special vehicles

Pomigliano d´Arco (Napoli)	FIAT GROUP		x				Alfa Romeo
Pontedera (Pisa)	PIAGGIO			x			Piaggio
San Giorgio Canavese	pininfarina		x				Car design & body making, assembly for FIAT, electric cars (JV PSA-BOLLORE)
Sant´Agata Bolognese			x				Lamborghini
Suzzara	FIAT GROUP			x			Iveco
Termini Imprese (Palermo)	FIAT GROUP		x				Lancia (until 2011)
Val di Sangro	FIAT GROUP PSA PEUGEOT CITROËN			x			Fiat, Peugeot, Citroen at SEVEL plant
Romania – 4							
Brasov	ROMAN AUTOCAMIOANE BRASOV	x			x	x	Roman
Campulung	aro		x				Aro
Colibasi (Pitesti)	RENAULT	x	x	x			Dacia
Craiova	Ford	x		x			Ford
Serbia – 1							
Kragujevac	ZASTAVA FIAT GROUP		x			x	Zastava, Fiat, Ivecop (JV ZASTAVA-FIAT), Opel
Slovenia – 1							
Novo Mesto	RENAULT		x				Renault
Slovakia – 3							
Bratislava			x				Volkswagen, Audi, Porsche, Skoda
Trnava	PSA PEUGEOT CITROËN		x				Peugeot, Citroen
Žilina	HYUNDAI		x				Kia
Austria – 6							
Aspern	GM	x					

Graz	MAGNA STEYR		x				Mercedes-Benz (until 2015), Aston Martin (from 2009), Peugeot, Mini, Chrysler & Jeep (until mid-2010)
Graz	FIAT				x		Magirus firefighting vehicles (IVECO)
Steyr	BMW	x	x				BMW
Steyr	MAN				x		MAN
Vienna	MAN				x		MAN

Source: www.acea.be
PC – passenger cars, LCV – Light Commercial Vehicles + SUVs/Minibuses/Coaches≤ 3,5t, CV – Medium & Heavy Commercial Vehicles ≥ 3,5t

Tab.1.2: Local car producers plants

Plant Location	Manufacturer	Type produced					Brand
		Engine	PC	LCV	CV	Bus	
Bulgaria – 2							
Stara Zagora	Belchev motors HEPTI		x				**Belchev Motors** – the first electric car producer in Bulgaria, www.bgvolt.com
Plovdiv	balkancar RECORD				x		**Balcancar Record** – product range includes electric forklift trucks, diesel and LPG engine-powered industrial trucks, tow tractors of the RECORD family, www.balcancar-record.com
Slovakia – 2							
Bratislava	ATTACK		x				**K-1 ENGINEERING s.r.o.** - is the only Slovak car producer, which deals with small batch production "street" sports cars K-1 ATTACK ROADSTER and a special race cars K-1 ATTACK RACING. www.k-1attack.com
Prešov	TROLIGA MUS					x	**Troliga Bus**, www.troligabus.sk
Serbia – 4							
Sombor	ZASTAVA KAMIONI				x		**Zastava special vehicles**, www.zastava-kamioni.co.rs
Priboj	FAP				x	x	**FAP (Fabrika automobila Priboj)** www.fap.co.rs
Belgrade	IKARBUS					x	**Ikarbus A.D.** – www.ikarbus.rs
Novi Sad						x	**Neobus ad**, Novi Sad Bus Factory – www.neobus.rs
Croatia – 1							
Zagreb	DOK-ING		x		x		**DOK-ING** is a large designer and producer of unmanned multi-purpose robotic vehicles. Next activity is R&D in electric city cars. http://dok-ing.hr
Romania – 1							
Craiova							**S.C. Automobile Craiova S.A.**, owner is Ford Motor Company – www.acsa.ro
Slovenia – 2							
Maribor	TOVARNA VOZIL MARIBOR d.o.o. SKUPINA VIATOR&VEKTOR					x	**Tovarna avtomobilov Maribor** – www.tvm.si
Novo mesto	ADRIA			x			**Adria Mobil** - European manufacturers of caravans, mobile houses and motorhomes – www.adria-mobil.com

According to OICA (Organization of Motor Vehicle Manufacturers) car production volume in PPs countries in 2008 was 2 400 384 cars. It is 3.4% share of worldwide production. This potential is creating a lot of opportunities for building up new R&D and innovation capacities, testing laboratories, institutes with focus on new product, new technologies and process improvement in connection with ecological aspects. Car production by country 2008 is in Tab 1.3.

Tab.1.3: Car Production by Country 2008

COUNTRY	CARS	COMMERCIAL VEHICLES	TOTAL	% CHANGE
Argentina	399,577	197,509	597,086	9.6%
Australia	285,590	43,966	329,556	-1.5%
Austria	**125,436**	**25,441**	**150,877**	**-33.8%**
Belgium	680,131	44,367	724,498	-13.2%
Brazil	2,561,496	658,979	3,220,475	8.2%
Canada	1,195,436	882,153	2,077,589	-19.4%
China	6,737,745	2,607,356	9,345,101	5.2%
Czech Rep.	933,312	12,510	945,822	0.9%
Egypt	72,485	42,297	114,782	9.9%
Finland	18,000	376	18,376	-24.4%
France	2,145,935	423,043	2,568,978	-14.8%
Germany	5,526,882	513,700	6,040,582	-2.8%
Hungary	**342,359**	**3,696**	**346,055**	**18.5%**
India	1,829,677	484,985	2,314,662	2.7%
Indonesia	431,423	169,421	600,844	46.0%
Iran	940,870	110,560	1,051,430	5.4%
Italy	**659,221**	**364,553**	**1,023,774**	**-20.3%**
Japan	9,916,149	1,647,480	11,563,629	-0.3%
Malaysia	419,963	110,847	530,810	20.2%
Mexico	1,241,288	949,942	2,191,230	4.6%
Netherlands	59,223	73,271	132,494	-4.4%
Poland	840,000	110,908	950,908	20.0%
Portugal	132,242	42,913	175,155	-0.6%
Romania	**231,056**	**14,252**	**245,308**	**1.5%**
Russia	1,469,429	320,872	1,790,301	7.8%
Serbia	**9,818**	**1,810**	**11,628**	**17.4%**
Slovakia	**575,776**	**0**	**575,776**	**0.8%**
Slovenia	**180,233**	**17,610**	**197,843**	**-0.3%**
South Africa	321,124	241,841	562,965	5.3%
South Korea	3,450,478	356,204	3,806,682	-6.8%
Spain	1,943,049	598,595	2,541,644	-12.0%
Sweden	252,287	56,747	309,034	-15.6%
Taiwan	138,709	44,260	182,969	-35.4%
Thailand	401,309	992,433	1,393,742	8.3%
Turkey	621,567	525,543	1,147,110	4.3%
Ukraine	400,799	22,328	423,127	5.1%
UK	1,446,619	202,896	1,649,515	-5.8%
USA	3,776,358	4,928,881	8,705,239	-19.3%
Uzbekistan	195,038	13,000	208,038	12.5%
Supplementary	332,917	170,993	503,910	-15.8%
Total	**52,637,206**	**17,889,325**	**70,526,531**	**-3.7%**

Source: www.oica.net

Analysis of the world automotive trends and challenges was based on project activities with focus on R&D capacities and characteristics of automotive industry in PPs countries/regions and based on information from publications of prestigious world firms. Choosen findings from publications are summarized in table below (Tab.1.4).

Tab.1.4: Automotive Trends

PUBLICATION	AUTOMOTIVE TRENDS
KPMG: AutomotiveNew, 2009	New business segments for the automotive industry. Growing need to **diversificate business into new segments** like: - solar and wind turbines designed to produce electric power, photovoltaic production, - aerospace industry, - rail transport and shipping, - medical technology, - development of communications infrastructure with broadband cables and fibreoptic networks, - development of new drive systems in cars – electric cars, plug-in hybrid cars and others.
Deloitte: A new area. Accelerating toward 2020 – An automotive industry transformed, 2009	New areas of trends in automotive: - era of **„conscious consumption"** will emerge, - more cost conscious, - massive shift in the competitive landscape will see China, India, - **accelerated deep strucural changes** in automotive industry, - emergence of **new business models** characterized by alliances with players from other industries to support development of new technologies, - low cost of labour in emerging markets, - sources of new customers, **new demands** in the global markets, - developing **supplier networks** (low-cost production and design), - reduction of platforms – remain cost competitive – importance of global platforms – growth of car volume per platform, - regional design centres will have to be globally networked, - more attention to regional customer demand. Global customer trends: 1. Conscious consumption – growing emphasis on value - **value-oriented car customers** - value and safety – important features 2. Opportunities for growth in emerging markets in luxury cars segment 3. Chalenges for OEMs is to achieve manufacturing efficiencies with alternative powertrain by briging down the cost of batteries **4. Safety – primary customer need** - improving crash safety standards - other safety-related features 5. **Networked cars** – development of electronics industry (technology ecosystem, navigation, communiction, software systems, safety systems...) 6. Internet as a sales channel for cars 7. New demands for cars - older consumers – human factors will influence on car design - demographic trend – urbanization – smaller and more fuel-efficient cars
Booz & Company: The Best Years of the Auto Industry Are Still to Come, 2009	Markets are divided into: 1. Rapidly growth in emerging economies – BRIC + Malaysia, Argentina, Mexico, Turkey, Thailand, Iran and Indonesia 2. Lower-growth economies – about 100 nations 3. The mature economies Conditions: - differencies between industrialized (developed) countries and BRIC and other countries, - different population densities, geographics, natural resources, diverse priorities, public transportation, roadways, energy infrastructure, - wider range of consumers, - **car producers will need to more incorporate suppliers, assemblers, distributors from around the world into their value chains and design products and processes,** - car producers will need to develop **speedier innovation**s, with locally inspired solutions to local problems. Types of cars: - **cars for intracity travel**, moving people short distances (**e-cars**), - **cars that fill the need for regional travel** (suburban or semi-rural areas), distance are longer, speeds are higher – (**hybrid cars**), - **cars for long distance travel** – **advanced diesel-fueled cars.** Car production: - change the company´s own mission **from selling cars to solving mobility problems,** - companies (may also) have to adapt to cultural differences, - thinking freshly about the value chain – to find the best local approaches, car producers must know conditions across the globe – it means **developing a sophisticated international value chain** (in areas: innovaton, supplier base, assembly, distribution,

	sales and marketing.
IBM: Automotive 2020. Clarify beyond the chaos, 2008	Basic trends: - increasing challenges in consumer demand: for information, enviro responsibility, safety, entertainment, economy, - technology development – more intelligent cars, - globalization, - integration, - collaboration. Anticipated changes: technology progress, sustainability concerns, corporate social responsibility, and personal mobility. The 5 dimensions of differentiation Sophisticated consumer: - future top buying criteria: fuel efficiency, eco-friendly cars, traffic congestion, personalization, safety, alternative transportation modes, lifetime cost of ownership. **The intelligent car**: - electronics systems, - greater assistance in navigation, - information about car, - connectivity and lifestyle trends, - Level of innovation by 2020: - *high development of software and electronics systems,* - *engine and auxilliary systems,* - *powertrain,* - green cars (hybrids), - **connected cars (networked cars)** – vehicle 2 vehicle (V2V), vehicle 2 infrastructure (V2I), vehicle 2 homes, business, other (V2x) Dynamic operations: - growth strategies, - multiplex workforce – ability to work across diverse cultures, conversant in multiple languages, - effective working virtually, - building leadership talent, - **fostering a culture that supports learning and development**, - knowledge transfer to inexperienced employees, - **proactive flexibility** in operations and processes (product development, manufacturing) The integrated enterprise: - interdependent ecosystem, - close collaboration, - government, transportation, consumer electronics, energy, other industries (software, financial services...), communities, geographies, social networks, global consumers, other ecosystems.
VDA: Annual Report 2009	Trends: - innovation and investment in R&D provide foundations for a successful future, - in 2008, German manufacturers and suppliers invested a total 18,9 bln EUR in R&D and app. 85.000 people in R&D, - improving cost structures. Long term guarantors of success: - innovation, technological progress and strong brands, - efficiency and productivity, - qualified and motivated employees, - **environmental engineering**, - demand for **energy-efficient cars** will rise, - **„greenovation“,** - **cost-intensive R&D** work (luxury car segment), - continuous improving the competitiveness, - cost mix, - more cooperation between individual manufacturers, - suppliers are now responsible for as much as 75 % of value added in the industry - need for quality networks of subcontractors and other business partners, - **suppliers will become more and more integrated in development of new technologies, systems and vehicles,** - **value added chain will itself become more complex** due to the increasing complexity of vehicles, - **success is based on innovation strategy and innovation management,** - increasing model variety, - more vehicle customisation, - **shorter innovation cycles,**

	- **exceptional importance of innovation capacities,** - opportunities for innovation growth in electronics and mechatronics sectors, - **supplier-customer relationship** is important for innovation drive, - long-term developments **focused on ecology,** - **innovative suppliers** – primary aims: reducing the consumption and harmful emissions of fossil fuels, new engine generations, lightweight construction, optimised gears, carbon-particulate filters, semi and full hybrid vehicles.
Oliver Wyman: Car Innovation 2015, study 2007	Trends in automotive sector: - improving efficiency in all R&D processes, - **more integration of engineering service companies**, - concentration process in the supplier sector will improve innovative strenght and **networking opportunities** with other partners. Recommendations for innovative management by Oliver Wyman: - increase customer orientation and marketing focus on R&D, - generate a diverse innovation product & service portfolio, - improve R&D effectiveness and efficiency, reduce innovation risks, - **enhance the innovation culture and organization**. Cost innovation will become a major R&D focus driving the industry beyond 2015: - innovation focus widens from incremental improvements to **system innovations** (from single innovations to system innovations) - **electric and electronics – the most important area for automotive innovations**, - the single most important focus of the industry lies in: emissions, fuel efficiency, weight, new powertrain concepts, - the needs to know more about customer requirements and make adequate attention to innovation marketing, - flexible manufacturing concepts, - R&D off-shoring activities: lower engineering costs, module approaches, new design and test-bed software (**virtual tests**) for developing automotive components and parts, - areas which could radically decrease costs: **developing new materials** (lightweight cars), modules (**low-cost module design**), processes (**new flexible car assembly concepts, optimalization of assembly,** manufacturing and R&D), - cost and process specialist (KIA, DACIA) – innovation based on new manufacturung processes, low-cost products, - focus on process innovation, network building, modularization, cost-oriented innovations (VW, Toyota), - functional process or product optimization, cooperation networks, open interfaces (ZF-system connector), - incremental process innovation, process focus, open to cooperations (ElringKlinger-process champion). Strategic partners: - **R&D networks are becoming a crucial success factor (innovation networks),** - **collaboration supplier-supplier and supplier-R&D institutions will increase (collaborative innovation culture),** - innovation management must adapt according to customer requirements and future market trends (customer-oriented innovation). **Building R&D centres focused on process iprovement close to local production and assemly plants will increase.**
Shell Passenger Car Scenarios up to 2030	- future of mobility – **Trend Scenario (Automobile Adaptation):** 2020 – 5.5% hybrid, 2025:11%hybrid cars, 2030: 20% hybrid, 2.5% electric, 4% other. **Alternative Scenario (Auto-Mobility in Transition**): 2015: 6.7%hybrids, 2020: 17.4% hybrid, 3.3% electric, 2025: 32.5 hybrid, 6% electric, 4.3% others, 2030: 50%hybrid, 10% electric, 5.5% others.

Results from the data mapping process and identification of R&D capacities in SEE

We consider that the most important trends in the actual situation in automotive industry are:

- **cost reduction** – companies are looking for new locations for doing business with lower costs – there is opportunity for countries of SEE mainly in R&D area, possibility for realization of innovation at lower costs,
- **accelerating innovation cycles** – companies have to bring new innovations in shorter times – opportunity for SEE countries for doing process improvement in

manufacturing, innovation process etc., effective using of R&D capacities, buidling R&D and innovation capacities with high productivity,

- **development new technologies and products** – mainly in environmental area - green innovations, new materials research, electronics, safety, new green cars (hybrids cars, electric cars,)
- **building of collaborative networks and clusters** – reinforce cooperation between universities and industrial firms based on project cooperation, reinforce cooperation between countries in the whole Europe, iniciatives of EUCAR: Collaborative Automotive R&D,
- **energy and environment** – renewable energy sources, research in alternative fuels, development of environemntal technologies, future scenarios in energetics.

Based on data mapping and identification of R&D capacities in PPs´ countries/regions in SEE we can set up results:

- we identified **212 R&D capacities** from October 2009 to half of February 2010,
- the most identified R&D capacities are in Slovenia (85), followed by Slovakia (36), Croatia (24) and Hungaria (20).
- based on results from analysis of automotive trends and information from data mapping and identification we have created 8 basic types of R&D capacities:

  - **Science and Technology Park**
  - **University Center –** working places and laboratories at univeristies
  - **Centre of Excellence** – specialization of the center
  - **Technological Development Center** – private centres which are operating near to production or assembly capacities mainly for support of production, improving and innovation of processes, product development and testing activities
  - **Research Center/Institutions** – this type of centres is consisted mainly by local domestic centres or institutions which are focused on basic and applied research
  - **Engineering Services Center** – centres focused on engineering, construction, designing services from early phase to virtual manufacturing phase, vehicle development services and prototyping
  - **Testing Center** – centres with focus on testing for exmple: durability tests, corrosion tests, simulation tests, metrology tests and other
  - **Innovation Center** – centres focused on new innovative solutions of products, production processes, systems, designing of testing laboratories, plant layouts, creating analytical documents, innovation intelligence.

- **by the type of centre**, we identified that the Technological development centres have the most presence in SEE countries (107 centres) followed by University centres (33), Research centres/institutions (25), Engineering services centres (24), Centres of Excellence (8), Innovation Centres (8), Testing Centres (4) and Science-Technology parks (3),
- we identified that in **Slovakia** there are 9 Technological Development Centres, 8 Research Center/Institutions, Centres of Excellence (7).
- we identified that in **2 Italian regions** (Lombardia, Trento) there are 6 Research Centres/Institutions and 3 University centres,
- in **Hungary** there are mainly Technological Development Centres (13), University centres (3), Engineering Services Centres (3).

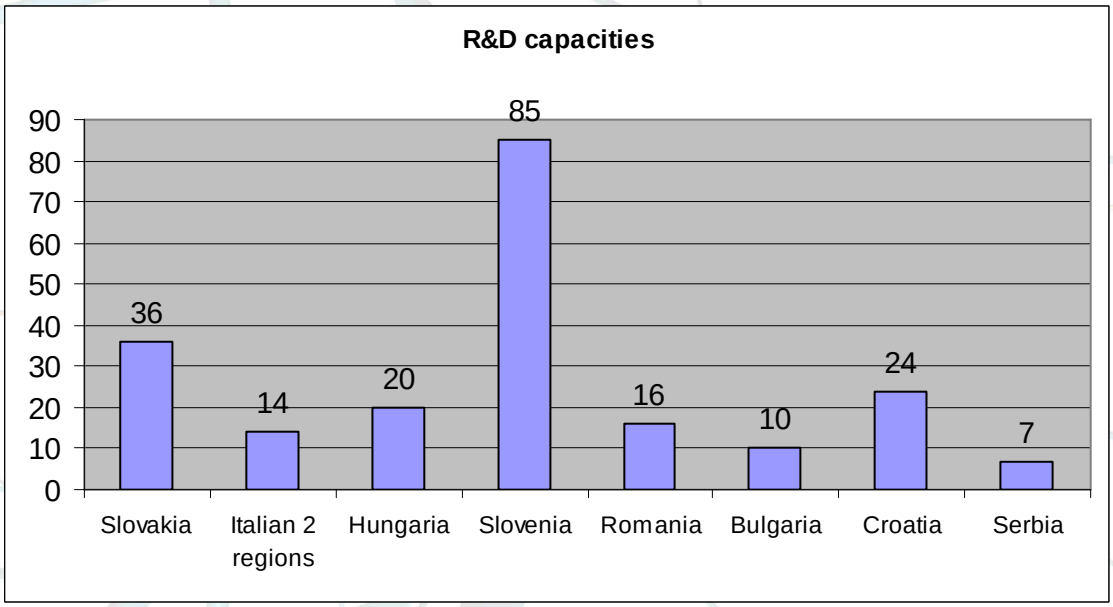
- in **Slovenia** there are Technological Development Centres (63), followed by Engineering services centres (8) and university centres (6),
- in **Romania** there are mainly Technological Development Centres (6),
- in **Bulgaria** there are mainly Technological Development Centres (10), University centres (13)
- in **Croatia and Serbia** there are the most University centres (13) resp. (5)

- **by the industry sector orientation**, we have identified 45 centres in group electronics and electrotechnical engineering, hydraulics and pneumatics, 40 centres in group manufacturing technologies, mechanical engineering and mechatronics, 33 centres in group Material research and chemistry, 31 centres in group vehicle design, product development & prototyping,
- in **Slovakia** we have identified 8 centres in group Material research and chemistry, 7 centres in group manufacturing technologies, mechanical engineering and mechatronics and 7 centres in group vehicle design, product development & prototyping
- in **2 Italy regions**, there are centres with focus on Testing and analysis (5), material research and chemistry (3), ICT and Intelligence Systems (3),
- in **Hungary** there are centres in group Electronics and electrotechnical engineering, hydraulics and pneumatics (6), Chassis, brake systems, steering system, car body parts (5) and Vehicle Development, Product Development and Protoytoping (4),
- in Slovenia
- in **Romania** - Electronics and Electrotechnical Engineering, Hydraulics and Pneumatics (6) and Vehicle Development, Product Development and Protoytoping (5),
- in **Bulgaria** - Electronics and Electrotechnical Engineering, Hydraulics and Pneumatics (8),
- in **Croatia** - Manufacturing Technologies and Mechanical Engineering and Mechatronics (9), Material Research and Chemistry (5),
- in **Serbia** - Manufacturing Technologies and Mechanical Engineering and Mechatronics (5)

- **by the ownership**, the most R&D capacities are in Business enterprise sector (143), Higher education sector (44), Government sector (21).
- in **Slovakia** - Business enterprise sector (18), Higher education sector (9), Government sector (9),
- in **2 Italy regions** (Lombardia, Trento) - Business enterprise sector (5), Higher education sector (3), Government sector (3),
- **Hungary** - Business enterprise sector (16), Higher education sector (3), Government sector (1),
- **Slovenia** – Business enterprise sector (75), Higher education sector (6), government sector (3)
- **Romania** - Business enterprise sector (10), Higher education sector (3), Government sector (3),
- **Bulgaria** - Business enterprise sector (10),
- **Croatia** - Higher education sector (14), Business enterprise sector (8),Government sector (2),
- **Serbia** - Higher education sector (6), Business enterprise sector (1).

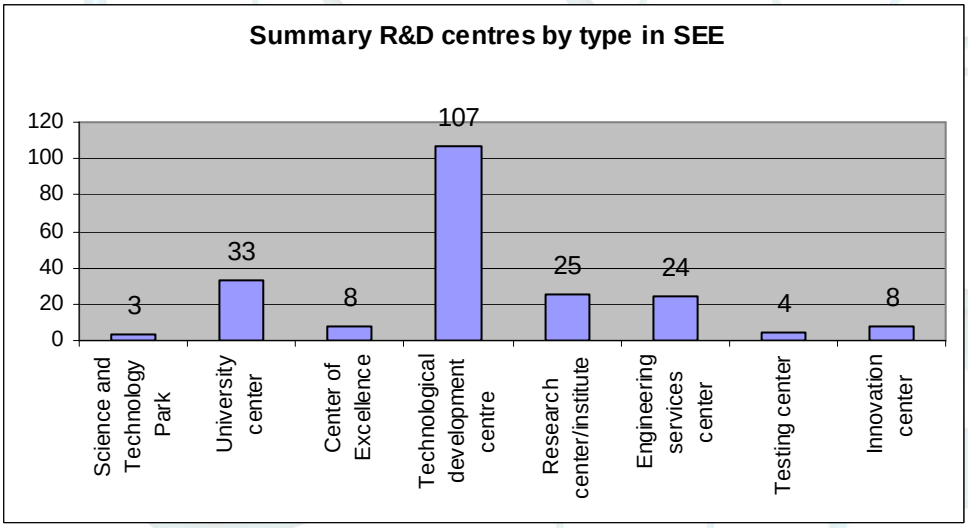
On the next pictures (graphs) we can see detailed facts about R&D capacities in PPs´ countries/regions in SEE. In the project Autoclusters we identified the most R&D capacities in

Slovenia (85), Slovakia (36) and Croatia (24). In case of Italy, there were identified R&D capacities only in 2 eligible regions in SEE.

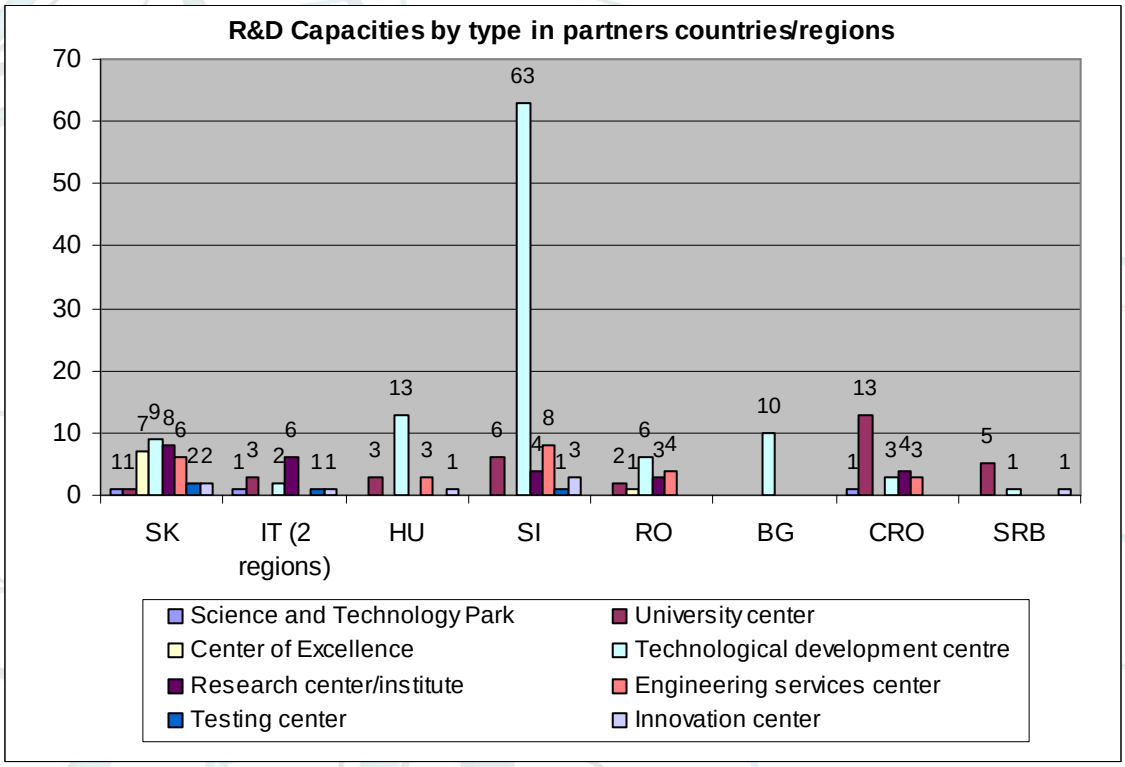


Pic. 1.1: R&D capacities

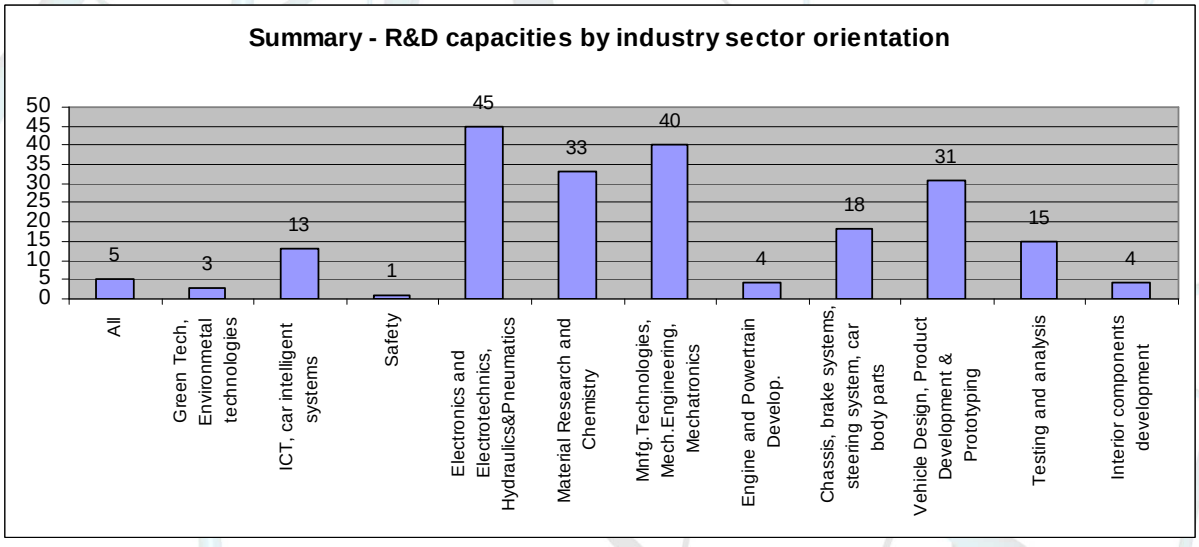
The important roles of future R&D activities of SEE R&D capacities will be mainly in combinations of cooperation between Technological development centres and University centres and local Research centres/institutes. Research findings of our analysis told us that Engineering services centres are centres with good potential for fast growth in the future. Basic focus of this type of centres will be mainly on vehicle development or car components development, prototyping and design. University centres and local research institutions have the high potential for building effective cooperation in automotive R&D area between west European and SEE countries. We suppose that there is very small percentage of cooperation with private R&D centres (Technological development centres).



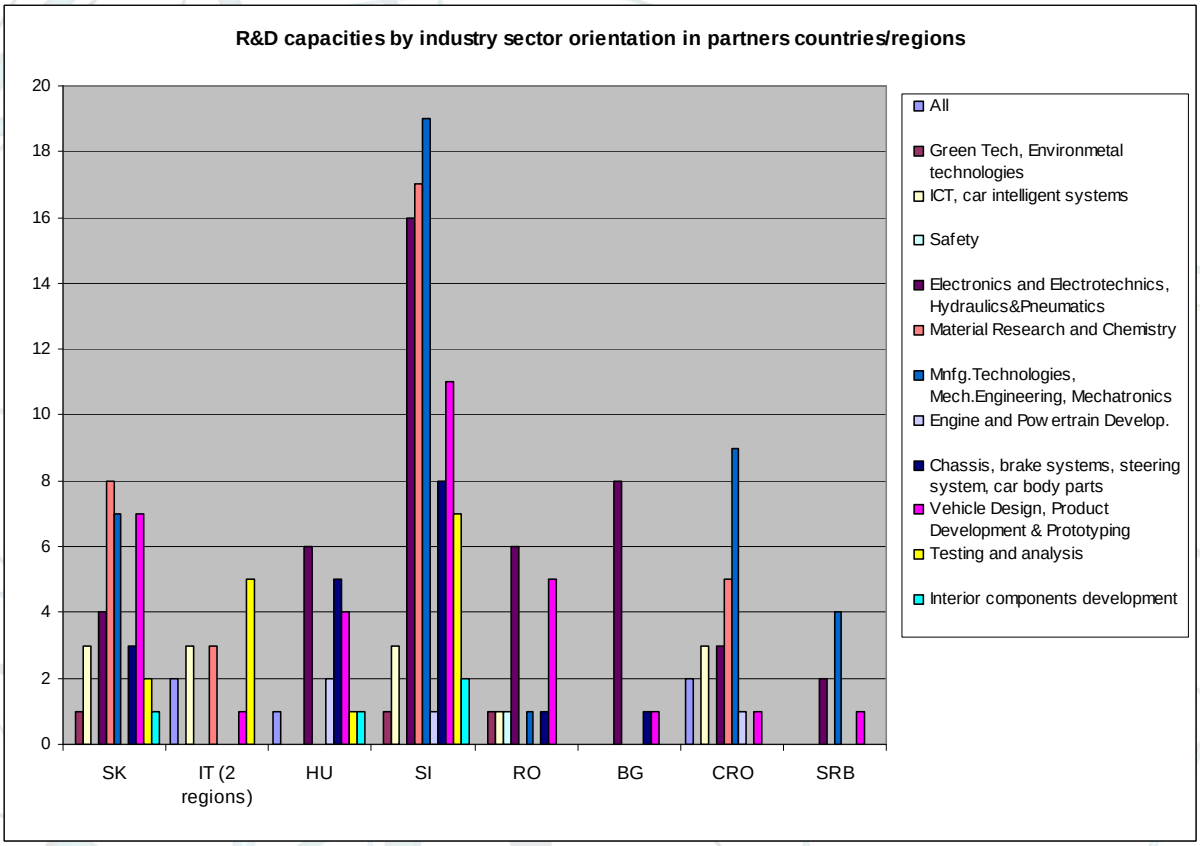
Pic. 1.2: Summary R&D centres by type in SEE



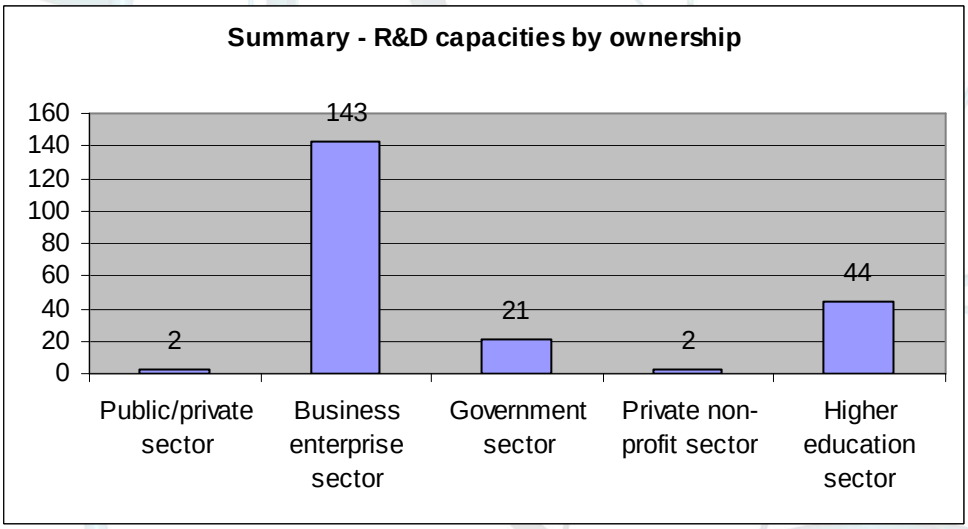
Pic. 1.3: R&D capacities by type in partners coutries / regions



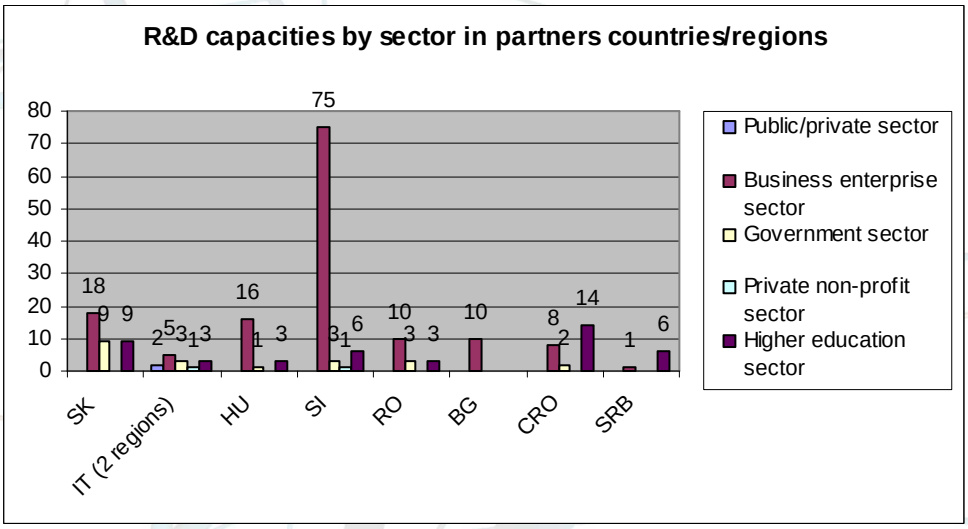
Pic. 1.4: Summary - R&D capacities by industry sector orientation



Pic. 1.5: R&D capacities by industry sector in partners coutries/regions



Pic. 1.6: Summary-R&D capacities by ownership



Pic. 1.7: R&D capacities by sector in partners countries/regions

We have identified more than 200 R&D capacities in PPs countries/regions of SEE. List of R&D capacities is on tables below:

Tab.1.5: Automotive R&D capacities in Slovakia

No.	AUTOMOTIVE R&D CAPACITY - SLOVAKIA	Web page
1.	Johnson Controls Engineering Centre in Trenčín	www.jci.com
2.	LEONI Autokabel Slowakia R&D Center in Trenčín	www.leoni.com
3.	Konštrukta-Industry, a.s. R&D Center in Trenčín	www.kotaind.sk
4.	ON Semiconductor Slovakia, Bratislava Development Center in Bratislava	www.onsemi.com
5.	CEIT - Central European Institute of Technology in Žilina	www.ceit.eu.sk
6.	Institute of Technology of Slovak Academy of Sciences in Bratislava	www.ti.sav.sk
7.	First Welding Company, Inc. In Bratislava	www.pzvar.sk
8.	Transport Research Institute, Inc. In Žilina	www.vud.sk
9.	Vývoj Martin, a.s. in Martin	www.vyvoj.sk
10.	Slovak Productivity Center (SLCP) in Žilina	www.slcp.sk
11.	Centre of Information and Communication Technologies for Knowledge Systems in Košice	www.cna.sk
12.	Laboratory of Automotive Electronics in (LAE) in Košice	www.fei.tuke.sk
13.	Innovation Center of Automotive Industry (ICAV) in Košice	http://web.tuke.sk/sjf-icav/
14.	Centre of Excellence: Centre for Materials, Layers and Systems for the Extreme Condition Applications in Bratislava	www.machina.sk
15.	Centre of Excellence in Nano-/Micro-electronic, Optoelectronic and Sensoric Technologies in Bratislava	www.fei.stuba.sk
16.	National Centre of Excellence in Renewable Resources Research and Application in Bratislava	www.nc-oze.stuba.sk
17.	Centre of Excellence in SMART Technologies, Systems and Services in Bratislava	www.fiit.stuba.sk
18.	Centre of Excellence in 5-axis Machining in Trnava	www.mtf.stuba.sk
19.	Centre of Excellence: Centre for Development and Application of Progressive Diagnostic Methods in Processing of Metal and Non-metal Materials in Trnava	www.mtf.stuba.sk
20.	KraussMaffei Engineering Center in Žilina	www.kraussmaffei.com
21.	EDAG Slovakia, s.r.o. (Engineering Services) in Bratislava	www.edag.de
22.	Rücker SR, s.r.o.(Engineering Services) in Bratislava	www.ruecker.de
23.	U.S. Steel Košice – Labortest, s.r.o. in Košice	www.usske.sk/labortest/
24.	Continental Automotive Systems Slovakia, s.r.o. (R&D Center) in Zvolen	www.conti-online.com
25.	Knott, s.r.o. (Testing Center) in Modra	www.knott.sk
26.	Zeleziarne Podbrezova R&D Center in Podbrezova	www.zelpo.sk
27.	Karmann Engineering Services, s.r.o. in Trenčín	www.ces-engineering.de
28.	TECHNODAT, CAE - systémy, s.r.o. (Engineering Services) in Trenčín	www.technodat.sk
29.	Institute of Materials & Machine Mechanics of the Slovak Academy of Sciences in Bratislava	www.umms.sav.sk
30.	VÚSAPL, a.s. in Nitra	www.vusapl.sk
31.	DCA Engineering s.r.o in Dubnica nad Váhom	www.dupres-group.com

32.	IPM Engineering, s.r.o. in Zvolen	www.ipmeng.sk
33.	Institute of Materials Research of the Slovak Academy of Sciences in Košice	www.imr.saske.sk
34.	Vedecko-technologický park Žilina (Science and Technology Park in Žilina)	www.vtpzilina.sk
35.	Elastogran, s.r.o. in Malacky	www.elastogran.sk
36.	Robotec, s.r.o. in Sučany	www.robotec.sk

Tab.1.6: Automotive R&D capacities in Italy regions

No.	AUTOMOTIVE R&D CAPACITY – ITALY (REGIONS: LOMBARDIA and TRENTO)	Web page
1.	CRF - Centro Ricerche Fiat in Orbassano	www.crf.it
2.	CRP - Centro Ricerche Plast-Optica S.p.A. in Amaro	www.crpo.it
3.	CSI S.p.A. in Bollate	www.csi-spa.com
4.	C.S.M.T. Gestione S.c.a.r.l. in Brescia	www.csmt.it
5.	Kilometro Rosso Science Park in Bergamo	www.kilometrorosso.it
6.	Laboratory for the Safety of Transport - La.S.T. (Politecnico di Milano) in Milano	www.aero.polimi.it
7.	SINTESI A.B. (Societa Innovazione Tecnologica e Sviluppo Industriale) in Milano	www.sintesiab.it
8.	Department of Mechanics of the Politecnico di Milano in Milano	www.mecc.polimi.it
9.	CREATE-NET in Trento	www.create-net.org
10.	Centro Studi sui Sistemi di Trasporto S.p.A. in Orbassano	www.csstspa.it
11.	Dipartimento di Ingegneria e Scienza dell'Informazione (DISI), University of Trento in Povo	www.dit.unitn.it
12.	Fondazione Bruno Kessler (FBK) Center for Information Technology (IRST) in Trento	www.fbk.eu
13.	Friuli Innovazione in Udine	www.friulinnovazione.it
14.	CNR – ISMN Institute of Nanostructured Materials in Roma	www.ismn.cnr.it

Tab.1.7: Automotive R&D capacities in Hungaria

No.	AUTOMOTIVE R&D CAPACITY - HUNGARY	WEB PAGE
1.	The European Institute of Innovation and Technology (EIT)	http://eit.europa.eu/
2.	Advanced Vehicles and Vehicle Control Knowledge Centre, Budapest University of technology and Economics	http://portal.bme.hu www.ejjt.bme.hu
3.	Regional University Knowledge Centre for the Vehicle Industry, University of Győr	http://info.sze.hu/ http://jret.sze.hu/
4.	College of Dunaújváros, Department of Mechanics and Mechatronics	http://portal.duf.hu/
5.	Audi Hungaria Motor Kft. – Győr	www.audi.com www.audi.hu
6.	AVL – Budapest	www.avl.com
7.	Bosch (Robert Bosch Power Tool Kft.) – Miskolc	www.bosch.hu
8.	Bosch (Robert Bosch Power Tool Kft.) – Budapest	www.bosch.hu
9.	Continental Teves – Veszprém	www.conti-online.com
10.	DENSO Manufacturing Hungary Ltd. – Székesfehérvár	www.denso-europe.com
11.	DHS Draexlmaier – Érd	www.draexlmaier.de
12.	EDAG – Győr	www.edag.de
13.	GE HUNGARY Zrt. - GE LIGHTING & GE POWER PROTECTION - Budapest	www.ge.com
14.	Knorr-Bremse Hungária Kft. – Budapest	www.knorr-bremse.hu
15.	Magna-Steyr – Győr	www.magnasteyr.com
16.	Continental Budapest Temic Hungary Kft. – Budapest	www.conti-online.com
17.	Semcon Kft. – Budapest	www.semcon.com
18.	ThyssenKrupp Presta Hungary Kft.– Budapest	www.thyssenkrupp-presta.hu www.thyssenkrupp.com
19.	Visteon Hungary Kft. – Székesfehérvár	www.visteon.com
20.	W.E.T. Automotive Systems Magyarország Kft.– Pilisszentiván	www.wet.de

Tab.1.8: Automotive R&D capacities in Slovenia

No.	AUTOMOTIVE R&D CAPACITY - SLOVENIA	Web page
1.	University of Ljubljana, Faculty of Mechanical Engineering	www.fs.uni-lj.si
2.	University of Maribor, Faculty of Mechanical Engineering	www.fs.uni-mb.si
3.	University of Maribor, Faculty of Electrical Engineering and Computer Science	www.feri.uni-lj.si
4.	Primorska Institute for Natural Sciences and Technology	www.pint.upr.si
5.	University of Ljubljana, Faculty of Natural Sciences and Engineering	www.ntf.uni-lj.si
6.	University of Ljubljana, Faculty of Electrical Engineering	www.fe.uni-lj.si

7.	RTC - Razvojno tehnološki center	www.rtc.si
8.	TECOS - Slovenian Tool and Die Development Centre	www.tecos.si
9.	Orodjarna & inženiring ALBA orodjarstvo, inženiring in proizvodnja d.o.o.	www.albatools.com
10.	Alpineon d.o.o.	www.alpineon.com
11.	ŠUMER d.o.o.	www.sumer.si
12..	C 3 M d.o.o.	www.c3m.si
13.	Cosylab d.d.	www.cosylab.com
14.	Em.tronic d.o.o.	www.em-tronic.si
15.	Grammer Automotive Slovenija, d.o.o.	www.grammer.com
16.	HIPOT - RR raziskave in razvoj tehnologij in sistemov, d.o.o.	www.hipot.si
17.	Isokon, d. o. o.	www.isokon.si
18.	RTI d.o.o.	www.rti.si
19.	Slovenian National Building and Civil Engineering Institute	www.zag.si
20.	Kopur, d.o.o.	www.kopur.si
21.	KOLEKTOR Nanotesla Institut	www.nanotesla.si
22.	J. Stefan Institute	www.ijs.si
23.	TECES	www.teces.si
24.	SIBO Group	www.sibo-group.eu
25.	Bosio d.o.o.	www.bosio.si
26.	AGIS ZAVORE D.D.	www.agis-zavore.si
27.	FLUID d.o.o. Batuje	www.fluid.si
28.	ELAPHE d.o.o.	www.elaphe.si
29.	INEA d.o.o.	www.inea.si
30.	Sistemska technika d.o.o.	www.st-ravne.si
31.	Telargo d.o.o.	www.telargo.si
32.	VILPO d.o.o.	www.vilpo.si
33.	AKA PCB d.o.o. Lesce	www.aka-pcb.si
34.	ALPMETAL & CO d.o.o.	www.alpmetal.si
35.	AREX d.o.o.	www.arex.si
36.	CAT CAM Lab d.o.o.	www.cadcam-group.eu/el/slo/home.html
37.	CIMOS d.d.	www.cimos.eu
38.	Difa, d.o.o.	www.difa.si
39.	Domel, d.d.	www.domel.si
40.	ELVEZ d.o.o.	www.elvez.si
41.	EMO Orodjarna, d.o.o.	www.emo-orodjarna.si
42.	EMO - TECH d.o.o. ŠEMPETER	
43.	ETI GUM d.o.o.	www.etigum.si
44.	GORENJE ORODJARNA d.o.o.	www.gorenje-orodjarna.si
45.	HELLA SATURNUS SLOVENIJA d.o.o.	www.hella-saturnus.si
46.	HELIOS TBLUS Količevo d.o.o.	www.helios.si
47.	HIDRIA AET d.o.o. HIDRIA ROTOMATIKA, d.o.o.	www.hidria.com
48.	Iskra Avtoelektrika, d.d.	www.iskra-ae.com
49.	ISKRA EMS d.o.o.	www.iskra-ems.si
50.	Iskra ISD d.o.o.	www.iskra-isd.si
51.	Iskra Mehanizmi, d.d.	www.iskra-mehanizmi.si
52.	Iskra TELA d.d.	www.iskra-tela.si
53.	JOHNSON CONTROLS - NTU d.o.o.	www.jci.com
54.	KGL d.o.o.	www.kgl.si
55.	KOVINOPLASTIKA LOŽ, d.d.	www.kovinoplastika.si
56.	KOLEKTOR LIV d.o.o.	www.liv.si
57.	MARIBORSKA LIVARNA MARIBOR d.d.	www.mlm-mb.si
58.	MAGNETI Ljubljana d.d.	www.magneti.si
59.	MOTOMAN ROBOTEC d.o.o.	www.motomanrobotec.si
60.	PLAMA - PUR d.d.	www.plama-pur.si
61.	Plamtex d.o.o.	www.plamtex.si
62.	Polycom, d.o.o.	www.polycom.si
63.	PRESEK d.o.o.	www.tom.si/presek
64.	PREVENT GLOBAL d.d.	www.prevent.si
65.	RESISTEC UPR,d.o.o. & Co.k.d.	www.resistec.si

66.	RIKO d.o.o.	www.rikogroup.com
67.	SECA PLAST d.o.o.	www.secaplast.si
68.	SEP, d.o.o.	www.sep.si
69.	SILIKO d.o.o.	www.siliko.net
70.	Štore Steel d.o.o.	www.store-steel.si
71.	TAB d.d.	www.tab.si
72.	TALUM d.d. Kidričevo	www.talum.si
73.	TBP, d.d.	www.tbp.si
74.	TCG UNITECH Lth-ol d.o.o.	www.tcg-group.eu
75.	Tesnila GK d.o.o.	www.tesnila-gk.si
76.	Teve varnost elektronika d.o.o. Kisovec	www.tevevarnost-elektronika.si
77.	TKG IN PROIZVODNJA VIJAKOV d.o.o.	www.tkg.si
78.	TPV d.d.	www.tpv.si
79.	TREVES d.o.o.	
80.	TT Okroglica, d.d.	www.ttokroglica.si
81.	TVM, d.o.o.	www.tvm.si
82.	UNIOR d.d.	www.unior.si
83.	Var d.o.o.	www.var.si
84.	VARKAR d.o.o.	www.varnost.si/proizvodnja
85.	VEYANCE TECHNOLOGIES EUROPE, DRUŽBA ZA PROIZVODNJO GUMENIH TEHNIČNIH IZDELKOV, d.o.o.	www.goodyear.com

Tab.1.9: Automotive R&D capacities in Romania

No.	AUTOMOTIVE R&D CAPACITY - ROMANIA	Web page
1.	Qualindser Center (Quality Management Laboratory)	www.qualindser.ro www.ee.tuiasi.ro
2.	Hydraulic & Pneumatic Research National Institute	www.ihp.ro
3.	National Institute of Research and Development for Mechatronics and Measurement Technique (INCDMTM)	www.incdmtm.ro
4.	Electrical Machines for Intelligent Systems and Automation (MESIA)	www.tuiasi.ro/facultati/eth/
5.	Metrology and measurement systems (METROS)	http://iota.ee.tuiasi.ro/~metros/
6.	Proto Technology	www.prototechnology.ro
7.	Renault Technologie Roumanie (RTR)	www.renault.com
8.	Renault Design Central Europe (RDCE)	www.renault.com
9.	Autoliv Engineering Center Timisoara	www.autoliv.com
10.	Continental Automotive R&D Centres in Iasi, in Sibiu, in Timisoara	www.conti-online.com
11.	Infineon Technologies Romania	www.infineon.com
12.	Yazaki Technology R&D Center Timisoara	www.yazaki-europe.com
13.	VORTEX Design	www.vortexdesign.com.ro
14.	Caelynx Europe SRL	www.caelynx.com
15.	INAS S.A.	www.inas.ro
16.	National institute for research and development in electrical engineering (INCDIE ICPE-CA)	www.icpe-ca.ro

Tab.1.10: Automotive R&D capacities in Bulgaria

No.	AUTOMOTIVE R&D CAPACITY - BULGARIA	Web page
1.	Belchev Motors	www.bgvolt.com
2.	BSM Ltd.	www.bsm-bg.com
3.	ZMD Eastern Europe EOOD	www.zmdi.com
4.	AMK Drives and Control Ltd.	www.amk-drives.bg
5.	Magnetic Media Automotive Ltd.	www.mmautomotive.com
6.	Tremol SMD Ltd.	http://smd.tremol.bg
7.	Ixetic Plovdiv EOOD	www.ixetic.com
8.	Yazaki Bulgaria EOOD	www.yazaki-bulgaria.com
9.	EPIQ Electronic Assembly in Botevgrad	www.epiq-bg.com
10.	MONBAT Plc.	www.monbat.com

Tab.1.11: Automotive R&D capacities in Croatia

No.	AUTOMOTIVE R&D CAPACITY - CROATIA	Web page
1.	University of Zagreb - Faculty of Mechanical Engineering and Naval Architecture in Zagreb	www.fsb.hr
2.	University of Zagreb - Faculty of Transport and Traffic Engineering in Zagreb	www.fpz.hr

3.	University of Zagreb - Faculty of Electrical Engineering and Computing in Zagreb	www.fer.hr
4.	University of Zagreb - Faculty of Metallurgy in Sisak	www.simet.hr
5.	University of Zagreb - Faculty of Organizations and Informatics in Varaždin	www.foi.hr
6.	University of Zagreb - Faculty of Chemical Engineering and Technology (Fakultet kemijskog inženjerstva i tehnologije) in Zahreb	www.fkit.hr
7.	Science and Technology Park of the University of Rijeka Ltd. in Rijeka	www.step.uniri.hr
8.	University of Rijeka - Faculty of Engineering in Rijeka	www.riteh.hr
9.	University of J.J.Strossmayer, Osijek - Mechanical Engineering Faculty in Slavonski Brod	www.sfsb.hr
10.	University of J.J.Strossmayer, Osijek -Faculty of Electrical Enginering in Osijek	www.etfos.hr
11.	University of Split - Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture in Split	www.fesb.hr
12.	University of Split - Faculty of Chemistry and Technology in Split	www.ktf-split.hr
13.	Brodarski Institut d.o.o. (Croatian Institute of Advanced Technologies) in Zagreb	www.hrbi.hr
14.	Ruđer Bošković Institute in Zagreb	www.irb.hr
15.	KONČAR – Electrical Engineering Institute, Inc. in Zagreb	www.koncar-institute.hr
16.	Centar za razvoj proizvoda, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb	www.crp.fsb.hr
17.	Ctt - Centar za transfer tehnologije, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb	www.fsb.hr/ctt/
18.	Ad Plastik d.d. in Solin	www.adplastik.hr
19.	AVL AST d.o.o in Zagreb	www.avl.com
20.	P. P. C. Buzet d.o.o. in Buzet	www.cimos.eu
21.	CadCam Design Centar d.o.o. in Zagreb	www.cadcam-group.eu
22.	CAT Logistika Tereti d.o.o. in Karlovac	www.groupecat.com
23.	EAG Centar d.o.o.	www.eag.hr
24.	Maziva Zagreb d.d.o.	www.maziva.hr

Tab.1.12: Automotive R&D capacities in Serbia

No.	AUTOMOTIVE R&D CAPACITY - SERBIA	Web page
1.	Zastava Institute	www.zastava-automobili.com
2.	Faculty of Electronic Engineering, University of Niš	www.elfak.ni.ac.rs
3.	Faculty of Mechanical Engineering, Belgrade University	www.mas.bg.ac.rs
4.	Faculty of Technical Sciences, University of Novi Sad	www.ftn.uns.ac.rs/
5.	Faculty of Mechanical Engineering, University of Niš	www.masfak.ni.ac.rs
6.	Faculty of Mechanical Engineering, University of Kragujevac	www.mfkg.kg.ac.rs
7.	University of Belgrade, School Of Electrical Engineering (Innovation Center of the School of Electrical Engineering - ICEF)	www.etf.bg.ac.rs www.icef.etf.rs

Good practices of automotive R&D capacities

Tab.1.13: Good Practices of Automotive R&D capacities

No.	AUTOMOTIVE R&D CAPACITY - **SLOVAKIA**	Web page
1.	**Johnson Controls Engineering Centre in Trenčín**	www.jci.com
2.	**Institute of Technology of Slovak Academy of Sciences in Bratislava**	www.ti.sav.sk
No.	AUTOMOTIVE R&D CAPACITY – **2 ITALY REGIONS**	Web page
1.	**Kilometro Rosso Science Park in Bergamo**	www.kilometrorosso.it
2.	**Department of Mechanics of the Politecnico di Milano**	www.mecc.polimi.it
No.	AUTOMOTIVE R&D CAPACITY - **HUNGARY**	Web page
1.	**Audi Hungaria Motor Kft. in Győr**	www.audi.com

		www.audi.hu
2.	**Advanced Vehicles and Vehicle Control Knowledge Centre, Budapest University of technology and Economics**	http://portal.bme.hu www.ejjt.bme.hu
No.	AUTOMOTIVE R&D CAPACITY - **SLOVENIA**	Web page
1.	**University of Ljubljana, Faculty of Mechanical Engineering**	www.fs.uni-lj.si
2.	**Hidria Institute for Ignition Systems and Electronics**	www.hidria.com
No.	AUTOMOTIVE R&D CAPACITY - **ROMANIA**	Web page
1.	**Continental Automotive Romania SRL in Iasi**	www.conti-online.com
2.	**Renault Technologie Roumanie (RTR) in Bucharest**	www.renault.com
No.	AUTOMOTIVE R&D CAPACITY - **BULGARIA**	Web page
1.	**ZMD Eastern Europe EOOD in Varna**	www.zmdi.com
2.	**TREMOL SMD Ltd. in Veliko Tarnovo**	www.tremol.bg
No.	AUTOMOTIVE R&D CAPACITY – **CROATIA**	Web page
1.	**Brodarski Institut d.o.o. Zagreb**	www.hrbi.hr
2.	**AVL-AST d.o.o. Zagreb**	www.avl.com
No.	AUTOMOTIVE R&D CAPACITY – **SERBIA**	Web page
1.	**Faculty of Technical Sciences, University of Novi Sad**	www.ftn.uns.ac.rs/
2.	**Faculty of Mechanical Engineering, Belgrade University**	www.mas.bg.ac.rs

2. AUTOMOTIVE INDUSTRY IN PPS´ COUNTRIES/REGIONS

Automotive Industry in Slovakia

Automotive industry in Slovakia has several great attributes, such as: the big power of the Slovak economy, the biggest employer in Slovakia, the biggest exporter in Slovakia, the fastest developing industry in Slovakia, the leader in car production per 1000 inhabitants in the world, and other. Automotive industry is for Slovakia very important and has a big potential for future growth not only in area of manufacturing and assembly but in area of research and development and innovation, too.

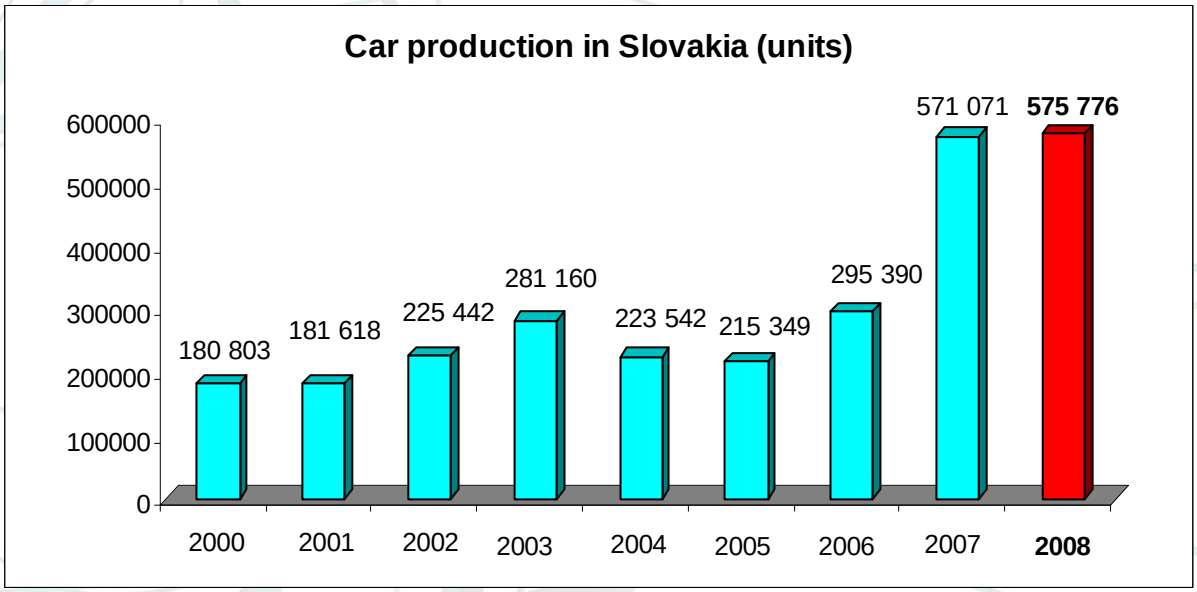
The modern evolution of automotive industry and related supply sector in Slovakia began with the establishment of production plant of car German producer Volkswagen in Slovakia in 1991. Volkswagen began manufacturing cars like VW Passat, and then VW Golf, VW Polo, Seat Ibiza in former Bratislava automobile plant. These days' cars like VW Touareg, Porsche Cayenne, Audi Q7 and Skoda Octavia are produced in **Bratislava plant**. **Volkswagen has other Slovak production plant in the town called Martin where it produces gearboxes and its components.** These include for examples differentials, flanges, brake drums and discs, wheel hubs, flange shafts and the synchronising rings, which form the largest part of production. Components are produced for the group brands Audi and Škoda, but also for Porsche.

Slovakia has successfully managed the transformation process to new European standards in automotive industry, adapted to car producer requirements and built strong supplier base. This supplier base composes not only from foreign automotive players but domestic firms as well. Good results of transformation process in the automotive industry were driving motivation factor for establishing other two production plants of two world car producers: **PSA Peugeot Citroen** and **Kia Motors**. Presence of three car producers in Slovakia created interesting supplier chain which is located near to OEM plants. Slovakia became interesting location for production and assembly of cars, modules, systems and components. Next positive point of Slovak automotive industry is expressed by words of Andreas Tostmann Volkswagen's CEO in Bratislava: *„Slovakia has strategic geographic position between West and East Europe region"*.

Slovakia needed replace fail of heavy industry (armament industry, ferrous and non-ferrous metallurgy, metal working industry, power industry, chemical and rubber industry, machinery industry) after economic transformation process. Slovak economic and industry analyses showed that automotive industry was the only opportunity for utilization of traditional machinery industry for next economic development. Slovakia offered good conditions for foreign direct investors, mainly in automotive industry. In the present, Slovakia is automotive industry country with 1st place in the world in 2007/08 – car production per 1000 inhabitants=105.7 cars.

Car production in Slovakia in 2007 was 571,071 cars
Car production in Slovakia in 2008 was 575,776 cars (Pic. 1)

- VW: 187,872 cars
- PSA: 186,397 cars
- Kia Motors: 201,507 cars



Pic. 2.1: Car production in Slovakia

Both automotive car producers and suppliers in Slovakia present the newest sophisticated technologies, production methods and close cooperation. Automotive industry influences other industry sectors and production. On Picture 2 is map of Slovakia and locations of foreign car producers.

Pic. 2.2: Map of car producer locations in Slovakia

Tab. 2.1: Three car producers in Slovakia and its characteristics

Company	Basic characteritics
	Volkswagen Slovakia, a.s. [joint stock company] is the Bratislava production and assembly plant of the German VOLKSWAGEN AG Group. In Bratislava plant are manufactured passenger vehicles and assemble gearboxes and in Martin plant vehicle and gearbox components are manufactured. Volkswagen Touareg, Audi Q7 and Škoda Octavia are currently entirely manufactured in Bratislava. Vehicles manufactured in Bratislava are exported mainly to EU countries (Germany, Italy, Austria, France, Great Britain, the Netherlands) and to the American continent. VOLKSWAGEN SLOVAKIA, a.s., is the largest Slovak exporter. It accounts for more than 15 percent of the Slovak Republic's total exports. **Capacity and products:** 400,000 units a year VW Touareg, Audi Q7, Porsche Cayenne, Skoda Octavia, gearboxes (assembly only), New Small Family cars – VW Up! and VW Space Up! (from 2011) Employees: 7,826
KIA MOTORS *The Power to Surprise™*	**Employees** around 2,700 **Capacity and products** 300,000 units a year 3 car models 4 types of engine **Plant Size** site: 166 ha buildings: 16.3 ha **Investment amount** Euro 1 billion
PSA PEUGEOT CITROËN	**Plant Size:** Site: 192 ha Capacity: 300,000 units a year Employees: around 3,000 Investment amount: 700 mil. EUR **Produkcia** Product range: Peugeot 207, Citroën C3 Picasso Actual production: more than 850 cars/day Car production in 2006: 52,000 units Car production in 2007: 180,000 units Car prodution in 2008: 190,000 units Forecast car production for 2009: 200,000 units

In automotive industry in Slovakia, there are app. 75,000 employees (app. 34,000 direct employees), more than 200 suppliers, good established local R&D network and technical universities in Slovakia. Automotive industry brought to Slovakia economic growth, high-tech technologies, new production methods and management of manufacturing culture in companies, more innovation and increasing of productivity and quality in all industrials sectors. Automotive industry influenced other industry sectors such as: machinery, chemistry, electronics and electrotechnics, transport, civil engineering and service development. Automotive industry with its supplier sector has key share on total industry production and it is key industry for growth of the Slovak economy. Slovak government supports investments into research and development and it emphasis importance of high-tech and innovation technologies. Here are built modern and high productive production capacities, quality human resource (availability of technicians, engineers, researchers and scientists), political stability, Euro currency, innovation policy and next important factors for foreign investors. Slovak supply chain was adapted to conditions and requirements of three different cultures of car producers (German, French and Korean).

Supplier Sector

Supplier structure of Slovak automotive environment belongs to the Central Europe automotive industry with strong connecting to Western European car producers and suppliers. Structure of supply chain is composed by 1-Tier, 2-Tier, 3-Tier suppliers and other small and medium enterprises or organizations and institutes in Slovakia. Examples of 1-Tier and 2-Tier suppliers working in Slovakia are in next tables (Tab. 2, Tab. 3). Suppliers are divided into five basic groups:

- electrical systems suppliers,
- interior equipment suppliers,
- propulsion suppliers,
- body suppliers,
- running gear suppliers.

Tab. 2.2: Scheme of the automotive 1-Tier suppliers in Slovakia

1-Tier Suppliers
Electrical Systems - Cables, bus systems, embedded systems, semiconductors
Delphi, Kromberg&Schuster, Leoni, SEWS, Siemens, Yazaki, ON Semiconductor, SE Bordnetze,
Interior Equipment - Cockpit, seats, dash-board, air conditioning
Faurecia, Gruppo Antolin, Hella Behr, Johnson Controls, Lear Corporation, Magna Slovteca, Visteon, SAS Automotive, Treves,
Propulsion - Power train, exhaust systems, engines, gearbox, batteries
AVC, Faurecia, GetragFord Transsmisions, VW Slovakia Martin, Tower Automotive, Hyundai Mobis, Pankl Automotive, Miba Sinter, ZF Sachs, Akutrade, Akuma, Inergy Automotive Systems
Body - Body, roof, glass, doors, lighting etc.
Brose, Dura Automotive, Edscha Daschsysteme, RF, Hella, Magna, Plasic Omnium, Hyundai Mobis, Valeo, HBPO, Dong Wong, Matador Automotive
Running Gear (chassis systems)- Suspension, brakes, axles, steering, tires
Contitech, FTE, Matador, TRW Steering Systems

Source: www.zapsr.sk

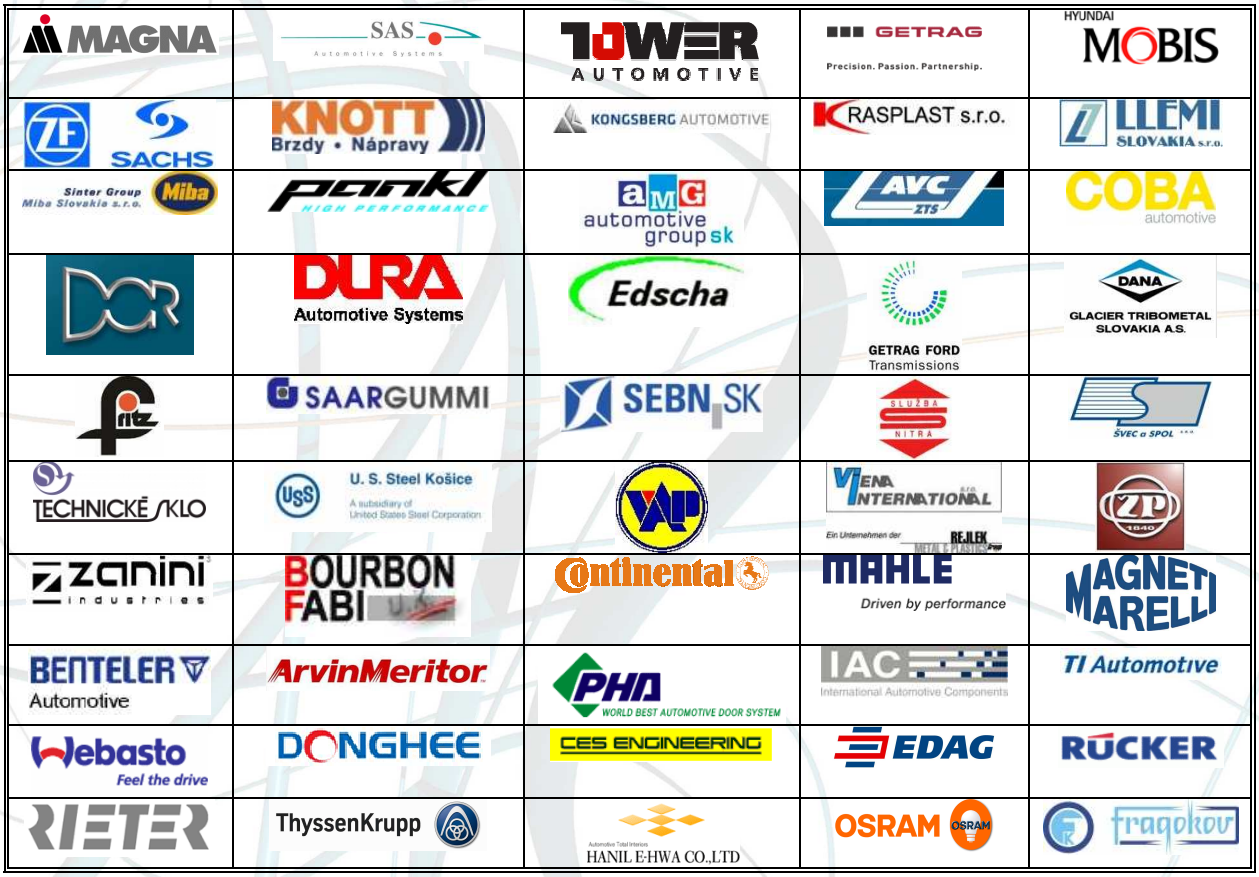
Tab. 2.3: Scheme of the automotive 2-Tier suppliers in Slovakia

2-Tier Suppliers
Electrical Systems - Cables, bus systems, embedded systems, semiconductors
CRT, Hefra, Küster, Molex, Sluzba VDI, Teleflex, Denisart Technology
Interior Equipment - Cockpit, seats, dash-board, air conditioning
Adtool, C.E.P Scherdel, Eismann, Gumotex, Molpir, Hanil, Heiland, Coba Automotive, Krasplast, Technické Sklo, Vural, Treves, Tramico
Propulsion - Power train, exhaust systems, engines, gearbox, batteries
Dana, DOR, Miba Sinter, Ribe, PFS, Rubena, ZF Sachs, ZSNP
Body - Body, roof, glass, doors, lighting etc.
Bourbon Fabi, Gumárne – Enco, HBPO, SaarGummi, US Steel, Osram, Sluzba Nitra VDI, LLEMI
Running Gear (chassis systems)- Suspension, brakes, axles, steering, tires
Continental Matador, Continental Teves, Fragokov, Knott, VAP Prešov, T-Gum

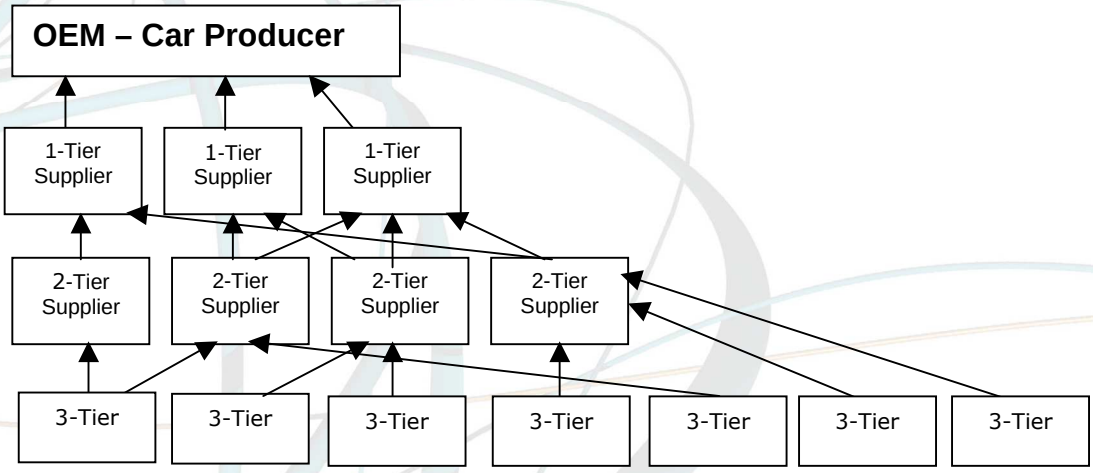
Source: www.zapsr.sk

Tab. 2.4: Logos of chosen automotive suppliers in Slovakia

HELLA	DELPHI Automotive Systems Driving Tomorrow's Technology	LEONI	SIEMENS	Johnson Controls
YAZAKI	SUMITOMO ELECTRIC WIRING SYSTEMS, INC.	ON Semiconductor	faurecia	Valeo
TRW	Visteon	Heuliez	GRUPO ANTOLIN	PLASTIC OMNIUM
HBPO THE MODULE COMPANY	brose Technik für Automobile	BEHR	Matador AUTOMOTIVE	LEAR CORPORATION



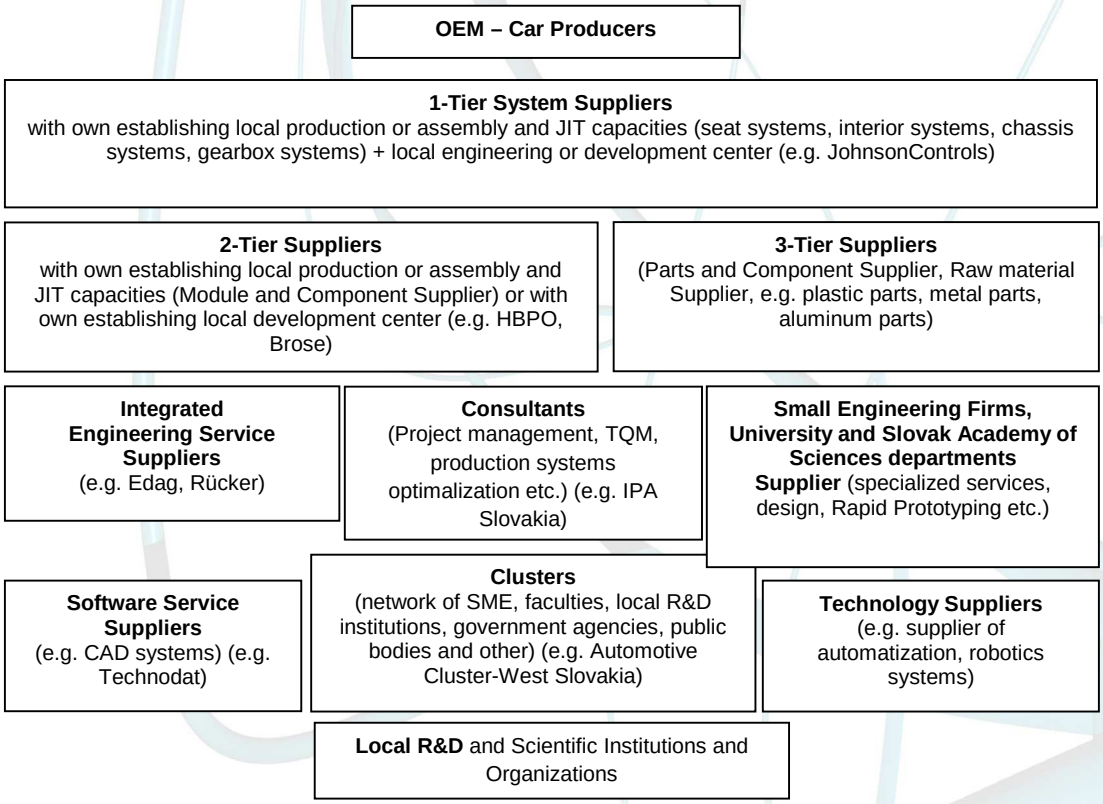
Jurgens, U. (2003) in his publication (*Characteristics of the European Automotive System: Is There a Distinctive European Approach?)* writes that engineering services companies play an increasingly important role in the network of actors involved in new product development. Most engineering services companies specialize in either product or process engineering, and in either the propulsion system or the body-interior parts of the car. In view of the shortening of time-to-market requirements and in order to compensate competence gaps of suppliers, engineering service firms often become third partners in the cooperation between suppliers and OEMs for new product development. On Picture 3 can be seen outgoing model of structure of the supply chain in Slovakia. Picture 4 shows new developing structure of the supply chain in Slovakia with new established types of suppliers.



Pic. 2.3: Scheme of traditional supply chain Slovakia in 90.years

Traditional Supply Chain in early 90.years in Slovakia:

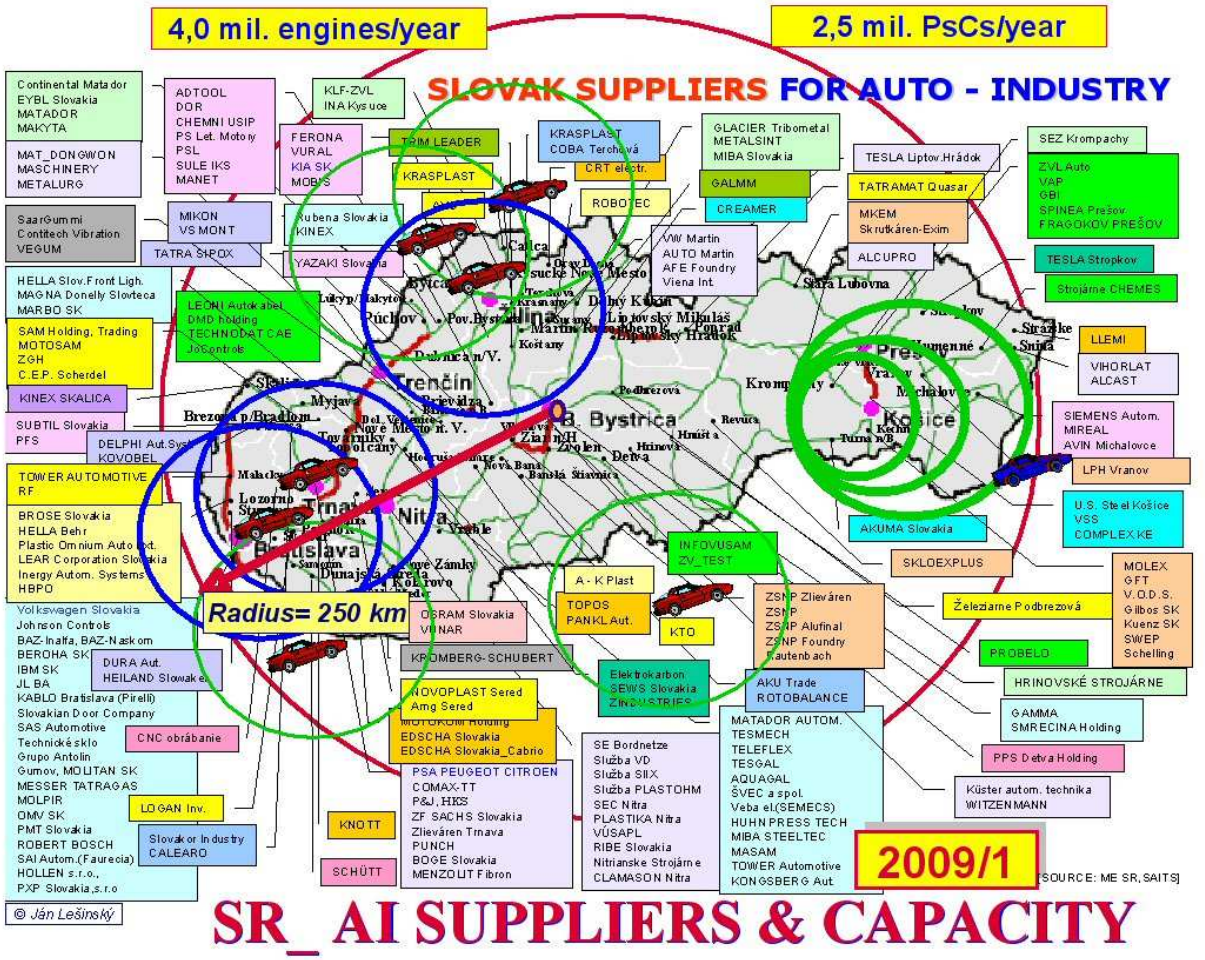
1-Tier suppliers – foreign companies with own production or assembly capacities establish near to OEM (mainly global world players)
2-Tier suppliers – foreign companies with own production or assembly plants establish near to 1-Tier suppliers (global or regional players)
3-Tier Suppliers – local home companies (manufacturing capacities for small simple automotive parts, raw material suppliers) that fulfil mainly quality and volume conditions of 2-Tier suppliers, some supplies for 1-Tier suppliers.



Pic. 2.4: Scheme of new developing structure of the supply chain in Slovakia

We can identify various types of suppliers in new developing structure of supply chain in Slovakia. Actual and the main emphasis are on process improvement and innovation, R&D activities (local and regional automotive R&D centres), innovation of products, engineering services, manufacturing processes (welding, stamping, injection moulding). Suppliers and organizations, which are able to supply services in production process optimisation, services in cost reduction and engineering services will have strong competitive advantage in region of East and Central Europe. One of good example of this emphasis is universities and its faculties or departments. Chosen services:

- Designing of production processes and systems and its improvement, lean management
- Designing and building automotive R&D Centres, testing laboratories, testing stands, product design and development, testing activities and experiments, car design, rapid prototyping
- Study programs prepared according to car producers and suppliers requirements
- Diploma and PhD. thesis with focus on material research, manufacturing processes, research reports, market research



Pic. 2.5: Slovak suppliers for auto industry

Source: Lešinský J. SAITS, 2009, www.saits.sjf.stuba.sk

R&D and Universities

According to strong representation of world automotive industry in Slovakia, there is a significant interest to be not only manufacturing and assembly country but R&D country, too. Slovakia has built and still building own R&D network consists from university centres, domestic R&D institutes and institutes and centres of Slovak Academy of Sciences. Industrial centres of worldwide companies create next group of R&D centres. The most know R&D centres in Slovakia in automotive industry are:

Tab. 2.5: Chosen company R&D capacities in Slovakia

R&D Centres	Company Logo
Johnson Control Technology Center in Trencin	
Leoni Autokabel Slowakia Development Centre in Trencin	
ON Seminconductor Bratislava Development Center in Bratislava	
Konštrukta Industry Development Center in Trencin	
U.S. Steel Košice – Labortest in Košice	
Continental Automotive Systems R&D Center in Zvolen	
Other centres which will be built in the near future	
Magneti Marelli R&D Centre in Kechnec	
Visteon R&D Centre in Nitra	
Engineering services companies	
EDAG Slovakia in Bratislava	
Rücker SR in Bratislava	
Karmann Engineering Services in Trenčín	

Slovak specialized secondary schools and universities have started a vast cooperation with automotive companies and regional municipalities. This cooperation is mainly made through the establishment of new educational facilities and laboratory centres and the development of educational study programs which are created to simulate real production to enable students to learn under real conditions and hence to be prepared practically for real life in companies. Education in automotive specialization at the University level:

Slovak University of Technology in Bratislava (www.stuba.sk)
Faculty of Mechanical Engineering: Study programs: Automobiles, ships and combustion engines; Mechatronics; Process engineering; Production engineering and quality management; Applied mechanics; Automation and Informatics of machines and processes; Automatic production systems …
Faculty of Electrical Engineering and Information Technology: Study program: Automotive electrical engineering
Faculty of Architecture: Study programs: Product design, Interior design
Faculty of Material Sciences and Technology in Trnava: Study Programs: Manufacturing Equipment and Systems, Machining and Assembly, Welding and Joining of Materials, Computer Aided Design and Production, Non-Metallic Materials and others.

Academy of Fine Arts and Design in Bratislava (www.vsvu.sk)
Study program: Industrial design

Technical University of Kosice (www.tuke.sk)
Faculty of Mechanical Engineering: Study program: Automotive production
Faculty of Electrical Engineering and Informatics: Study programs: Electrical engineering, Informatics and control systems in mechatronics, Automotive electrical engineering, Automotive mechatronics …
Faculty of Arts: Study program: Design

Alexander Dubcek University in Trencin (www.tnuni.sk)
Faculty of Mechatronics: Study program: Automotive mechatronics

University of Zilina (www.utc.sk)
Faculty of Operational and Economical Transportation: Study programs: Road transport, Railway transport, Air transport, Professional pilot, Transport engineering
Faculty of Mechanical Engineering: Study programs: Technology and machines for transport; Vehicles and engines

The Cluster

The important factor of successful automotive industry is close cooperation and building of partnerships. Slovakia has several clusters for cooperation and support of the activities in automotive industry and supplier sector. Natural configuration and localization of automotive suppliers is near to car production plants (VW, PSA, KIA). Next smaller groups of suppliers are established near to 1-Tier suppliers (near to the industrial cities for example: Nitra – Visteon; Dubnica nad Váhom - Matador Automotive, Sauer-Danfoss; Trenčín – JohnsonControls; Košice – GetragFord Transmission, Magneti Marelli; Prešov – Lear Corporation).

But there are established other types of clusters or associations with the common interests, activities, aims etc. with typical features of Porter definition of cluster. The most known automotive cluster in Slovakia is **Automotive Cluster-West Slovakia** in Trnava (www.autoklaster.sk) - the main aim of cluster is to contribute to the development of automotive industry and technology-oriented companies in Slovakia by strong composition of business subjects, universities, science-research institutes and next public and government bodies. This cluster will help to increase competitiveness of its members, support of development human resources, and development of cooperation activities, partnerships with domestic and foreign subjects with focus on automotive sector.

Other interesting industrial clusters are: Plastics Cluster in Nitra, the 1st Slovak Engineering Cluster in Banská Bystrica, Electrotechnical Cluster in Trnava, IT Valley Cluster in Košice, Z@ICT Cluster in Žilina.

The most know automotive association in Slovakia is **Automotive Industry Association of the Slovak republic** in Bratislava (AIA SR) (www.zapsr.sk) – member of OICA, ACEA. Aims of the association are: the development of automotive industry and suppliers sector and its presentation in abroad, networking with other similar association in abroad, organization of auto-exhibition, shows, seminars, conferences, involvement of Slovak supplier base with European and world supplier networks, etc. Next related associations are: Federation of Mechanical Engineering of the Slovak Republic; Association of Electro-technical Industry of the Slovak Republic, Association of industrial, research and development organizations and others. Strengths and Weakness of Automotive Industry in Slovakia

Strengths:

- Strategic location between West and East Europe with possible development on the East (Russia, Ukraine)
- Bratislava, Poprad, Zilina and Kosice International Airports and in close distance Vienna International Airport (within 30 min. travel)
- Stable macroeconomic environment
- Strong mechanical engineering tradition
- Traditionally quality technical education and built domestic R&D network
- Presence of world-class car producers and suppliers
- Three the most modern and sophisticated car production plants in its company groups
- Good quantity of local sub-suppliers
- Growing cooperation activities between industry and universities
- Favourable labour costs and high labour productivity
- Government and EU support for building new innovation capacities in these years: 45 Centres of Excellence, 8 Regional Innovation Centres

Weaknesses:

- Educational system suffering from insufficient financing, insufficient involvement of private financing
- Not utilizing the R&D potential of local universities and R&D institutions
- Need to renew measuring apparatus and equipment for research and development at universities

Opportunities:

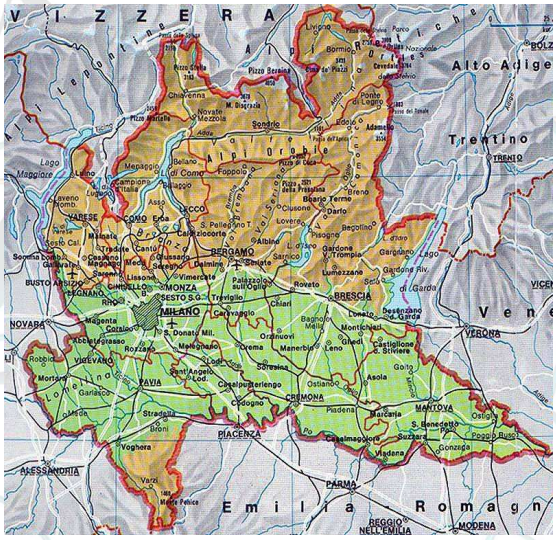
- New supplier opportunities due to relocation of global automotive and electronics R&D towards CEE countries
- Support for the innovative environment in the automotive industry
- Emerging automotive and machinery/electronics/plastics clusters (Automotive Cluster-West Slovakia in Trnava, Plastics Cluster in Nitra and other) with strong domestic supplier base
- Strengthening cooperation between car producers, sub-suppliers, engineering companies and universities as well as the openness of universities towards cooperation with industries
- Opportunities for the creation of new applied research institutions and research institutions
- Taking advantage of research networks under the EU framework programs with strong support and interest in establishing new R&D centres

Threats:

- Unbalanced external dependency of the automotive sector
- Automotive industry is very concentrated in Bratislava and Trnava regions and due to this fact is raising issue of insufficient skilled labour force here

The Lombard automotive industry

Regional and market specifications

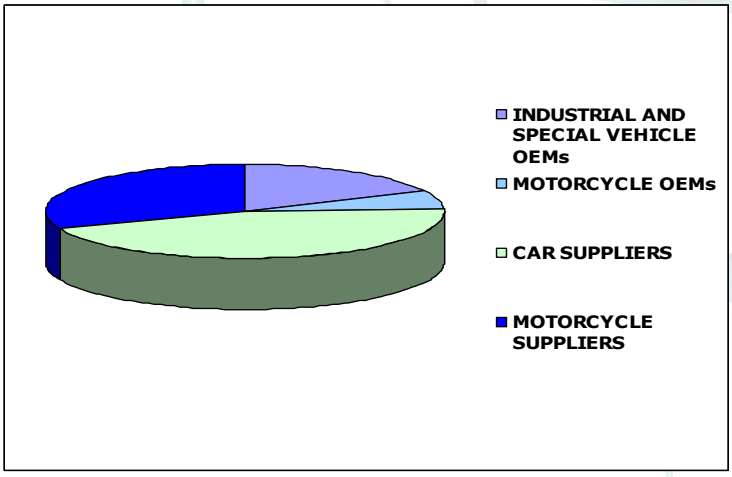


Covering an area of 23.858 square metres and inhabited by around nine million people, Lombardy Region is the fourth largest and the most densely inhabited Italy's Region. Lombardy contributes over 20% of the national GDP, being the most productive Italian Region. The geographic area is the most industrialised in Italy, with about 800.000 companies. A strong entrepreneurship tradition and a high dynamism on international market are good evidence of a regional development model based on change and innovation. Lombardy Region has an excellent research infrastructure, including 12 leading universities (7 of which in the Milan area) and about 200 research centres working at the cutting edge of new technologies.

Over the last twenty years the Lombardy automotive industry had a deep decrease due to the closure or reassessment of many important plants such as *Alfa Romeo* in Arese, *Fiat Autobianchi* in Desio, *Innocenti* in Milan and *OM* in Brescia.

Nevertheless the Lombardy automotive industry maintains a good dimension as shown by a research done during BeLCAR activity on a sample of 90 big/medium automotive companies. The research pointed out that there are about 30000 employees working and a turnover of 11000 billion€

The good dimension of the Lombardy automotive industry, is supported by its neighbourhood with the most powerful Italian automotive region (Piedmont – Fiat group) and by its strong internationalization vocation which allowed the creation of good technical and commercial relationships with other European nations such us Germany, France and Spain.

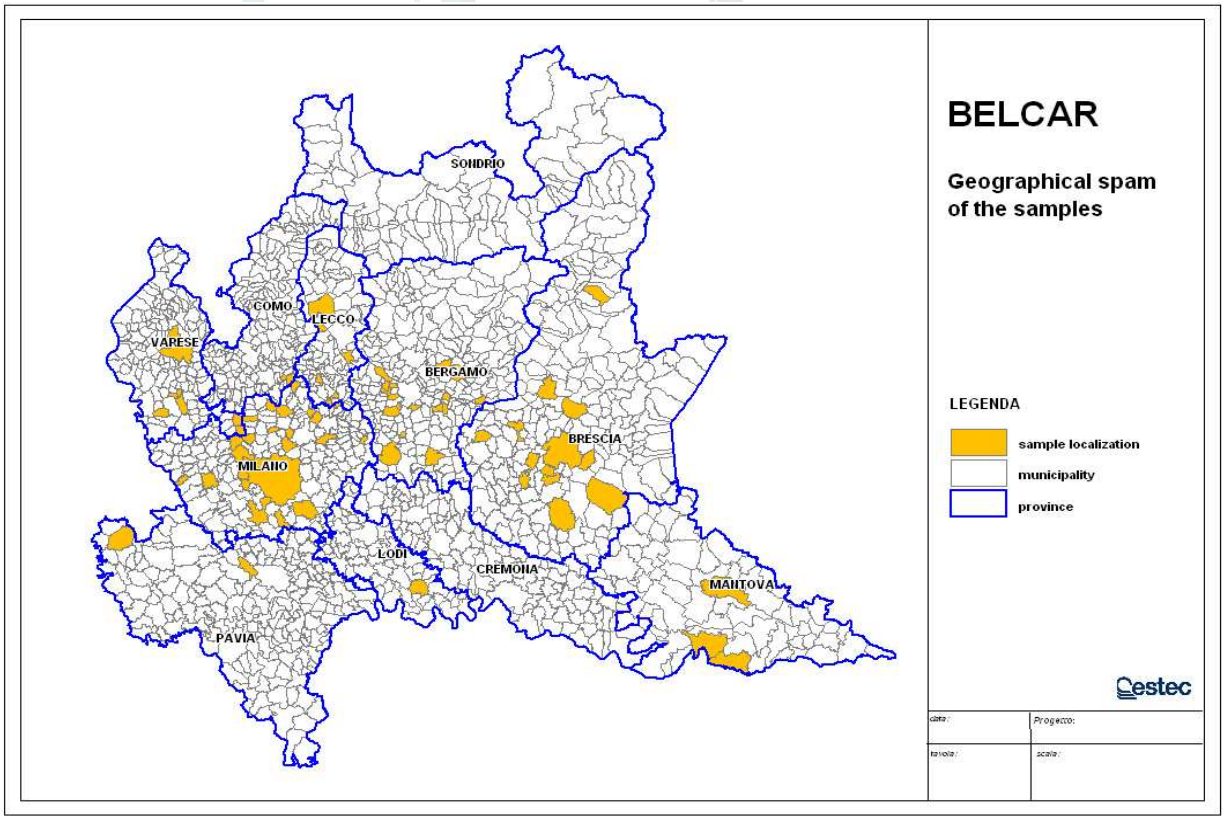


Pic. 2.6: Distribution of automotive industry in Lombardy

The Lombardy automotive industry is characterized by an important presence of components suppliers but there is also a significant presence of industrial/farm vehicles and motorcycles OEMs. At the moment there are not car OEMs due to the closure of important plants as mentioned above. Mould and tooling suppliers (mainly MICRO enterprises) with high technology are also significant for the automotive industry. Finally the basic mechanic industry (foundries, mechanic manufacturing) which has a diversified production,

some of which direct to the automotive industry, plays an important role. The automotive enterprises are mainly located in Milan, Varese, Bergamo and Brescia provinces.

VEHICLE MANUFACTURERS



Pic. 2.7: BELCAR map

The lack of car OEMs is partially compensated by the presence of industrial/farm vehicles and motorcycles OEMs. Among the most important there are:

***SAME DEUTZ-FAHR (SDF) IN** TREVIGLIO (BERGAMO)*
With the brands SAME, Lamborghini, DEUTZ-FAHR and Hürlimann, the company is one of the world's leading manufacturers of tractors, engines, combine harvesters and other farm machines.

In 2003, the company became the largest single shareholder in the German DEUTZ AG, an independent leading manufacturer of industrial diesel engines, quoted on the Frankfurt stock exchange. This operation gave SAME DEUTZ-FAHR an important role within the industrial diesel engines industry.

SDF has always pursued a strategy of internationalisation based on the rational location of manufacturing facilities throughout the world. Today the company's products are made in five production plants: Treviglio, Italy, Lauingen, Germany, Lublin, Poland, Ranipet, India

and Zupanja, Croatia. This efficient distribution of manufacturing resources is backed up by a long-standing strategy based on far-reaching international distribution. SDF today boasts around 100 importers all over the world, serving a sales and service network of some 3000 dealers. The product range, which includes models from 30 to 265 HP, therefore covers all possible requirements, including special purpose and crawler tractors. The company's strategic growth objectives include technology, innovation, reliability, quality and excellent customer service, and this tradition of development demands constant investments in R&D. In 2004 SDF achieved a turnover of 905 million euro from the manufacture of 32.300 tractors, 21700 engines and 20000 transmissions. The company, which employs around 3.000 people.

***IVECO** IN BRESCIA AND SUZZARA*

Iveco (Industrial Vehicles Corporation) is one of the world's largest manufacturers in the transport sector. The group operates through the following brands:Iveco, Iveco Motors, Iveco Magirus, Astra, Seddon Atkinson and Irisbus.

The company designs, builds and markets:

- a comprehensive range of light (2.8 – 6 tonnes GVW), medium (6 – 16 tonnes GVW) and heavy (over 16 tonnes GVW) commercial vehicles for use on and off the road
- engines for vehicle and industrial applications
- passenger transport vehicles
- special vehicles
- fire fighting vehicles

Plants number 49 and research and development centres 15 in 19 countries on the five continents. Iveco operates in over 100 through joint ventures, licensees and participating investments countries.
In Lombardy IVECO Turin has two important plants in Brescia and Suzzara with more than 3000 employees which produce medium light commercial vehicles industrial vehicles and component body.

***MOTO GUZZI** IN MANDELLO SUL LARIO*

Moto Guzzi is one of the most important and historical Italian company, now belonging to the PIAGGIO group; it has an annual production of more than 40000 vehicles and 300 employees. It is one of the most famous brands among the motorcycles producers thanks to the reliability of their engines, and it is also a historical supplier of vehicles for the Italian police.

***MV AGUSTA** IN VARESE*

MV Agusta represents the milestone of the made-in-Italy motorcycle field. It's the only non-Japanese group to have products in each segment of the motorcycling market. The Firm groups three prestigious brands, which are strongly distinguished by their value and technical contents.
The most exclusive brand of the entire motorcycle industry is MV Agusta. A myth sanctioned by the 75 world titles gained (37 manufacturers and 38 racers) and celebrated through a production able to conquer the appreciation of the specialised critics. Recognised by a seductive style, the MV Agusta F4 and Brutale bikes are equipped with a refined four cylinder inline engine with the arrangement of radial valves, a peculiarity that makes the products unique in the motorcycle world outline.

A brand with Swedish origins characterised by a centennial history. It is one of the highest point of reference for the off - road market thanks to an image tightly connected to competitions (42 world titles gained in Enduro and Cross disciplines). Produced since 1987 at the MV Agusta factory, Husqvarna has recently developed its range of products thanks to the use of an innovative D.O.H.C. engine available on the e250cc, 450cc and 510cc.

Born in 1978 the firm produce a wide range of on road models, from 125 to 1000 cc, known for the good balance between style, technique and price. In 25 years of history the Cagiva brand has signed sport events like the victories conquered in the GP 500 World Championship by Eddie Lawson and Jhon Kocinski or the triumph in the Paris Dakar and in motocross races.

MV Agusta's production installation are still centred on its famous seat in Schiranna, but have also expanded to the renovated factories in Morazzone and Cassinetta. These three sites, which deal respectively with the production of the engine, with the production of the frame and with final assembly and after sales care, integrate with the group's two technical centres: Crimson Centre in Morazzone and CRC - the Cagiva research centre - in San Marino. The MV Agusta is present on all main word markets through a network of subsidiary, importer and on the national market over 100 authorised dealers.

YAMAHA MOTOR ITALIA in Lesmo (Milan)

Yamaha Motor Italia has a little plant and commercial offices in Lesmo; they are also planning to concentrate in Lesmo the R&D activity strictly linked with the Japanese headquarter.

SUPPLIERS

The presence of components suppliers is really important for the Lombard automotive industry; among national companies there are a lot of foreign multinationals.
Among the national suppliers there are:

BREMBO IN CURNO – BERGAMO
Leader producer of break currently operates in 3 continents with production plants in 9 countries. At present, Brembo employees over 4300 people, nearly 10% of which are engineers and product specialists working in research and development. Brembo is specialized in the most demanding applications in sport cars, sedans, SUV's, sport motorcycles and confidently guarantees an unbeatable level of performance for the most prestigious cars currently produced in Europe, the United States and Japan. (www.brembo.com)

CF GOMMA IN PASSIRANO – BRESCIA
CF Gomma is one of the leading European suppliers of components for the automotive sector (cars and commercial vehicles). Their production includes antivibration items, air springs, brake hoses and low-pressure hoses, technical mouldings (boots and precision rubber items), torsional dampers and car body sealings. (www.cfgomma.com)

SOGEFI GROUP IN MANTOVA
Sigefi is an Italian Group, leader in the auto parts components, specialized and first on the worldwide markets in the systems of engine, cabin filtration and the suspensions components. SOGEFI is a multinational company, partner of the most important car manufacturers in the world. The Company has a global presence: 4 continents and 14

countries, with 50 offices of which 41 plantsit has two product lines the systems of engine and cabin filtration and the suspensions components. (www.sogefi.it)

MAGNETI MARELLI ELECTRONIC SYSTEMS IN CORBETTA – MILAN
MM is an international leader in the design and production of high-tech components and systems for the automotive industry. (lighting, electronics system, exhaust system, powertrain and suspension). Magneti Marelli has industrial and R&D facilities in Italy, France, Spain, Great Britain, Germany, Poland, Czech Republic, Russia, Turkey, the U.S., Mexico, Brazil, Argentina, China, Malaysia and South Africa. Magneti Marelli supplies the world's major car manufacturers such as Renault, Citroën, Peugeot, Fiat Group, Ford, Volkswagen, Audi, Seat, BMW-Rover, DaimlerChrysler, GM-Opel, Volvo, Saab, Nissan, Toyota and Daewoo. (www.magnetimarelli.com)

OMR IN REZZANO – BRESCIA
OMR is specialized in manufacturing mechanical components for cars, vehicles using tires, industrial and earth moving vehicles. (pedal gears, brake cylinder, engine block, cylinder head and covers, exaust manifolds, gear box housing, aluminium casting). (www.omrautomotive.com)

PIRELLI TYRE – Milan:
Pirelli is the world's fifth largest operator in terms of turnover on the tyre market, with levels of profitability among the highest in the sector. In 2005, the activities today under the aegis of Pirelli Tyre generated revenues of around 3.63 billion Euros, with a growth of almost 12% with respect to the previous year. Producer of standard, high performance and sports competitions tires for automobiles and other various types of vehicles (including industrial vehicles, busses, motorcycles and other two-wheelers). (www.pirelli.com)

MAGNETTO GROUP IN Torino:
MAGNETTO is a leader in production of wheels for car, industrial and commercial vehicles. In Lombardy there are two production plants in Rho and Ceriano Laghetto, Milan. (www.magnetto.com)

Among the foreign multinational there are:

ST MICROELECTRONICS:
ST is one of the world's largest semiconductor companies whit net revenues of 7 billion€ and 50.000 employees in the world; head quarter in Geneva (Switzerland); in Lombardy there are two important facilities in Agrate and Cornaredo with 5000 employees. The Automotive sector represented the 15% of total activities. The products are Microcontrollers and Memories, Standard Solutions for Automotive DC-Motor Control, Special devices and systems. These products cover a wide range of application: body and convenience, Powertrain, Driver information and entertainement, Safety.

EXIDE ITALIA IN ROMANO DI LOMBARDIA (BERGAMO):
batteries, 500 employees. Head Quarter Georgia (USA)

ROBERT BOSCH ITALIA IN MILAN:
gasoline, diesel and chassis systems and car electronics. 5000 employees, 2 plants (Crema and Offenengo) producing vacuum pumps and hydrulic systems for industrial vehicles. Head Quarter Stuttgard (Germany)

OSRAM ITALIA MILANO AUTOMOTIVE LIGHTING:

1300 employees. Production plant in Italy: Bari and Treviso. Head Quarter in Munchen (Germany)

MORSE TEC EUROPE IN ARCORE (MILAN):
timing and transmission system, belongs to group Borg e Wagner (USA)

LEAR CORPORATION ITALY IN POZZO D'ADDA (BERGAMO):
automotive interior systems and components. 2500 employees in Italy. Lear provides complete seat systems, electronic products and electrical distribution systems and other interior products.1 production plant in Lombardy. Head Quarter in Michigan (USA)

TRW AUTOMOTIVE ITALIA:
Active safety systems (brake, steering, suspension), passive safety systems (Airbag, seat belt, steering wheel), electronic systems. One Production plant in Lombardy Gardone Val Trompia (Brescia) producing valves for hydraulic steering .Head Quarter Michigan (USA)

NOVEM CAR INTERIOR DESIGN ITALIA IN BAGNATICA (BERGAMO):
Decorative components and functional elements for vehicle interiors. 300 employees in Bagnatica facilities (production and logistic) Head Quarter Bavaria (Germany)
About the 60% of the production has an Italian market (mainly FIAT and IVECO) while the last 40% has an European one (mainly Germany, France and Spain). The component suppliers are highly specialized and can be divided into two groups:

- car suppliers
- other vehicles suppliers (special and two wheelers vehicles).

Among the car suppliers there are mainly big companies not interested in the "other vehicles" market because of the low production volume, the big flexibility and the low investments that this market requires. On the other site there is a good number of technological and dynamics SMEs operating in the above mentioned "other vehicles" market.

Over the last twenty years Italian suppliers tried to diversify their markets to avoid a unique dependence from FIAT group shifting their attention to foreign OEMs (particularly the German and French ones). As a consequence, when the economic environment was favourable, many of them moved their plants to other European countries, bringing there also the production for the Italian market. This has caused a decrease of the workforce despite an increase of turnover

Concerning multinational companies with transplant in Lombardy it has to be taken in account that, since the labour cost in Lombardy is very high, there is a risk that they could leave our country. To avoid this risk it is essential to offer a good environment for their development. First of all it is necessary to guarantee an Italian OEM market: fortunately the FIAT group is now coming out from a long crisis period.

Secondly Lombardy guarantees many positive factors such as:

- the flexibility of the job
- the political stability
- the educational level
- the logistic position
- the industrial scientific and technologic network
- local incentives for innovation that contribute to make Lombardy Region more attractive for foreign investments.

R&D

The continuous increasing competition in the global automotive market calls for:

- shorter time to market for innovative products
- high engineering and production flexibility
- improved development and application services.

This enforce companies to strengthen their R&D centres. Some of the most important Lombard automotive companies established multidisciplinary R&D centres, among them:

A) Brembo Research Center inside Kilometro Rosso Science Park (Bergamo)is already operational, and involves both mechatronics and sensortronic sciences. This is a joint-venture laboratory with DaimlerCrhrysler (involving composite and ceramic base materials); these two concerns alone will host about 650 employees in R&D by the end of 2006

B) Pirelli Labs represents the Group's pole of technological excellence. Born in May 2001 with a starting investment of 135 mn Euro, the research centre at Milano - Bicocca is active in the field of photonics and optical fibres and employs about 150 researchers. Pirelli Labs, the group's innovation engine, has carried out numerous research projects representing the hub of a network of qualified international partners, including the Massachusetts Institute of Technology, the Georgia Technical University, CNR, ENEA and the Milan Politecnico University, and domestic labs such as CORECOM and CORIMAV. Pirelli Labs have focused on the following specific fields of activity:
   - new-generation optical components and chips based on nanotechnologies;
   - new materials and processes for tyres;
   - sensors and telemonitoring;
   - fuel cells.

However there are many universities and academic institutions with degree programs related to the automotive industry; among them:

A) POLITECNICO TECHNICAL UNIVERSITY IN MILAN[1]:
   1) Engineering university degree course in:
      - Automation engineering
      - Electronics engineering
      - Mechanical engineering
      - Material engineering
   2) Design university degree course in:
      - Industrial design

B) UNIVERSITY OF BRESCIA:
   1) Engineering university degree course in:
      - Mechanical engineering
      - Automation engineering
      - Material engineering

[1] The Politecnico has other various faculty located in Lombardy Region in Como, Cremona, Lecco, Mantova. Concerning courses/master we are related to the automotive sector there is: in Como Industrial Design, in Cremona Master in mechatronic system planning and in Lecco Mechanical Enginnering

- Industrial design

C) UNIVERSITY OF PAVIA

1) Engineering college degree course in:
   - Mechanical engineering

Among the public research institutions there are:
- CNR –ITIA Institute Of Industrial Technologies And Automation
- CIMAINA - Interdisciplinary Nanostructured Material Development Center (Milan University)
- Chemistry And Physics Department For Engineering And Materials (Brescia University)
- Electronics For Automomation Department (Brescia University)
- Industrial Engineering Department (Bergamo University)
- Mechanics Engineering Department (Brescia University)
- Mechanics Department (Politecnico University)
- Materials Tests Laboratory Foundation (Politecnico University)
- Transport Safety Laboratory (Politecnico University)
- Chemistry, Materials And Chemistry Engineering Department – Giulio Natta (Politecnico University)
- Electronics Department (Pavia University)

Among the private research institutions there are:
- Breda Scientific Institute
- AQM
- CE.S.I.- Industrial Study Center
- CSI - Certification And Behavioural Analysis Center
- CSM S.P.A - Materials Development Center
- Fuel Experimental Station – SSC
- Pirelli Labs

Tab. 2.6 Facts about the region

Facts about the region			
Population	9475202	GDP per capita	28.000 €
Employment	8071000	GDP per capita	
Unemployment (%)	4,10%	Economic growth	1,10%

Total automotive companies in Lombardy*		90
OEM's		5 (+18 conveting vehicles)
Suppliers		67
of which are:	System suppliers (Tier 1)	31 (19 car and 12 motorcycles)
	Component suppliers (Tier 2)	
	Parts suppliers (Tier 3)	
Other		13
of which are:	Engineering companies	4
	Logistics companies	9
	...	
Total employment in automotive industry		30000
employment at:	OEM's	7000 (6000 industrial vehicles and 1000 motorcycles)
	Suppliers	
	Other	
Joint turnover of the automotive companies:		12 billion euro
Gross value added in the automotive industry:		

Most important automotive companies (in order of importancy)**			
Name	Supply chain position	Employment**	Technology field
Brembo	Tier 1	4500	Brakes
SAME DEUTZ	OEM	3500	Tractors and farm vehicles
Pirelli	Tier 2	20000	Tyres
Magneti Marelli	Tier 1	20000	Lighting and electronics components
SOGEFI Group	Tier 1	6000	Cabin filtration and suspensions components
Cf Gomma	Tier 2	5000	Antivibration item and air springs- rubber components
OMR	Tier 1-2	2000	Mechanical parts and assembly

* The data provided regards a research done during the BeLCAR project about a sample of 90 automotive enterprises. The regional industrial statistical classification does not allow to individuate exactly the automotive industry dimension, so it was decided to do a research on a sample of the most representative Lombard automotive enterprise to provide more precise data.
** Only companies with headquarters in Lombardy
*** Total employees over the world

THE CLUSTER

The particular characteristics of the Lombard industrial fabric, characterized by an high diversified production and the delocalization of industrial plants, drove the Lombard Government to carry out the "metadistrict"[2] policy. For this reason Lombardy Region does not have an automotive cluster.

The realistic BeLCAR goal is to awake the regional Government about the importance of the automotive industry to allow, without setting up a cluster, its introduction among the industrial and innovation policy priorities.

This should be made concrete by:

- the introduction of the automotive companies among the beneficiaries of specific support innovation programs;
- the setting up of an observatory aiming at a deeper monitoring of the automotive industry status and needs than that done by the BeLCAR project;
- the involvement of some automotive leader companies in research and innovation projects in the framework of the FP7 and the CIP[3].

[2] According law 317/1991 industrial discrits are: "territorial systems that are limited geographically and made up of connecting areas in which there are concentrations of small enterprises having the same kind of productive specialization". In 2000 Lombardy Region redifined the industrial discritcts map and next to the 16 industrial discrits (9 specialized in textiles and apparel, 3 in mechanics/metallurgy, 2 in shoes industry, 1 in furniture, 1 in wood-processing, 1 in electric and electronic equipment, 1 in rubber items) introduced the metadistricts.
Metadiscrits are areas:

- not limited territorially,
- with a strong inter-sector integration,
- with a strong link with the research and innovation world.

The Lombard Metadistricts are the following:

- **BIOTECHNOLOGICAL FOOD METADISTRICT**: it is spread over 121 municipalities of the 11 Lombard Provinces. The metadistrict is made up of 11 research centers and employs 30,455 people.
- **NON-FOOD BIOTECHNOLOGIES METADISTRICT**: it is spread over 58 municipalities within 8 Lombard Provinces. It is made up of 26 research centers and employs 46,266 people.
- **DESIGN METADISTRICT**: it is spread over 65 municipalities of 6 Lombard Provinces. It is made up of 11 research centers and employs 44,958 people.
- **MATERIALS METADISTRICT**: it is spread over 103 municipalities of 10 Lombard Provinces (excluding Cremona). It is made up of 29 research centers and employs 32,748 people.
- **FASHION METADISTRICT**: it is spread over 126 municipalities of 9 Lombard Provinces (excluding Sondrio and Lecco). It is made up of 4 research centers and employs 120,406 people.
- **ICT METADISTRICT**

Lombardy Government planned to distribute 60 ML€ to promote the excellence between metadiscrits using the European model "call for proposal".

[3] Among the most important Programs related to industry specific for important aspects such as the innovation, the research and development, the internationalization, the access to credit and environmental aspects. There are:

A) **THE REGIONAL LAW 35/1996 "REGIONAL INTERVENTIONS FOR SMES DEVELOPMENT"**: it integrates different aspects for the intervention in industrial policy with special focus on SMEs. The different measures aim at balancing the regional production structure and developing local production systems, with particular attention to support SMEs in facing the most critical issues for their development such as: access to credit, internationalization and innovation. In 2001 Lombardy Region introduced new fulfilment criteria for the Regional Law 35/1996 and it identified new intervention measures concerning research, innovation and technological transfer. This measures are:

- **MEASURE INTEC 1**: development of SMEs support centres performing services in the field of innovation and technological transfer;
- **MEASURE INTEC 2**: projects presented by SMEs support centres aiming at to boost innovation and technological transfer among SMEs;
- **MEASURE INTEC 3**: creation of new enterprises to support process/product innovations;
- **MEASURE INTEC 4**: realization of projects concerning the dissemination and consolidation of technological innovation;
- **MEASURE INTEC 5**: SMEs participation to EU and national research programme
- **MEASURE INTEC 6**: internships for recently graduated students in SMEs for the realization of research and technological development projects;
- **MEASURE INTEC 7**: fund for the innovation and the realization of innovating projects.

STRENGTHS AND WEAKNESS

STRENGTHS

- The Lombard automotive industry is characterized by a productive diversification: presence of farm vehicles - industrial vehicles - motorcycles OEMs;
- Lombardy hosts top level Italian components suppliers headquarters and strategic directions so guaranteeing the future presence of the enterprise;
- there are good suppliers in the field of prototypes and moulds;
- Lombard industry is well developed in all the sectors (about 255000 enterprises); this allows high opportunity of technology transfer between the different sectors among the automotive one;
- Lombardy Region is one of the European motors and it has a strategic geographical position and Milan hosts new exhibition area which offer many business opportunities;
- Presence of engineering and technical university fundamental for the research and technological development.

WEAKNESS

B) **THE TECHNOLOGICAL INTEC VOUCHER:** In the framework of the programme "Innovative Action Minerva", Lombardy Region introduced for the first time, in an experimental way in the objective 2 areas, the tool of the technological voucher aiming at:

- the support of innovative enterprises start ups and spin offs;
- the introduction and dissemination of the enterprises innovation.

In consequence of the success of the Pilot Action Lombardy Regional Government decided to spread the application of Technology Voucher to the whole regional territory experimenting a new innovative measure the **TECHNOLOGICAL INTEC VOUCHER.**

The new measure aims at:

- connecting research and enterprises sector assuring an effective match between demand and offer;
- simplifying administrative procedures for funding calls;
- increasing SMEs' propensity to innovation and supporting new start ups.

The INTEC VOUCHER finances four kinds of actions:

1. **PATENT ASSISTANCE**: assistance at national and European level during the patent procedure;
2. **TECHNOLOGICAL DUE DILIGENCE**: consulting services to evaluate innovation and competitiveness level of technologies proposed for an entrepreneurial or technological transfer project;
3. **BUSINESS EVALUATION**: consulting activities for the evaluation of economical and financial aspects of project concerned with innovation or technological transfer;
4. **RESEARCH VOUCHER**: scientific research through cooperation partnership, selection of qualified personnel perform scientific and technical research

The sectors financed by the Intec voucher are:
Biotechnologies (food and not food), electronics, mechanics, electro-mechanics, textile, chemicals, industrial design, new material, ICT, environmental technologies, robotics, artificial intelligence, low –zero emission industrial technologies

C) **THE "NEXT" PROGRAMME** :a closed-end fund of funds, dedicated to institutional investors, with a target financial dimension of 60 Millions Euro.
"NEXT" has been instituted to develop a Venture Capital Market in Lombardy Region, specifically dedicated to innovation, R&D and new technologies, with the purpose of improving technology transfer processes focusing on profitable sectors (biotechnologies, electronics, electro mechanics, new materials, ICT, environmental and energy technologies) with high possibilities to obtain satisfying economical results.
The peculiar characteristic of "NEXT" is the availability of a guarantee offered to its investors on the subscribed capital. This system, granted by Lombardy Region, sum up to 20 millions Euro.

D) **PIA - INTEGRATED PACKAGE FACILITATION :** is a new interesting financing opportunity for the 250.000 Lombard handicraft enterprises and SMEs in support to innovation, new technologies and new economy. Main purpose is the opportunity for the Lombard enterprises of a strategic investment and the simplification of the procedure in managing and obtaining the regional aids.
This regional tool concerns three topics related to the research and innovation:

- "PIA New High Tech Enterprises",
- "PIA Research and innovation-minor projects"
- "PIA Investment Innovation in Advanced Technologies"

The aim is integrating different regional and national laws (the competence of which is transferred to the regions), to finance the same intervention or project. Lombardy Region finances projects having a minimum amount of 103.000 euro and it gives preference to enterprises belonging to an industrial district or meta-district.

- Disappearance of historical car OEMs (Alfa Romeo, Innocenti, Autobianchi) and related decrease of the supplier network;
- some suppliers are too much dependent on FIAT Group;
- some automotive enterprises have too much management turnover this means lack of a consolidated company structure and presence of short time strategies;
- low appeal of a technical/technological career for young employees who prefer career with possibility of success in short time: risk to move the know how in the way of suppliers;
- low collaboration with university/research centres;
- no cooperation network among companies and too strong competition;
- generational business transfer: lack of successors in the SMEs;
- difficulty to access credit due to the rigid banking system;
- education sometime doesn't match with the industry needs;
- high labour and lands cost;
- low knowledge of foreign languages;
- over crowded transport system: only wheel transport and a law developed/efficient railway.

OPPORTUNITIES

- Resumption of the FIAT and PIAGGIO groups;
- customization: to anticipate and to comply the customers needs is an opportunity to avoid the import from the low cost workforce countries;
- new policies on traffic and pollution which promote the development of new technologies;
- collaboration with other national and European regions;
- development of topics related to safety, traffic and pollution.

THREATS

- Competition from low cost manpower countries;
- the high cost of labour the high taxes and the complex Italian legislative system cloud force multinational companies to leave Lombardy;
- too many actors working on the same topics without coordination (for example Association, Public body, University, Banks);
- lack of a regional cluster culture due to the productive diversification.

Automotive Industry in Italy

Industry in Italy, in general, is very well developed, making the country one of the most industrialized countries in the world. The automobile industry is among the most active ones and has a great contribution for this and in addition made Italy proud throughout the world. According to the Italian Automotive Service Equipment Manufacturers Association (AICA, www.asso-aica.it), Italy boasts the largest concentration in the world of companies specialized in the sector. Also according to AICA, 40% of production is concentrated in Piedmont, thanks to the induced activity of the Fiat group, which provides work for around a thousand companies.

For Italian automobile components, the foreign market is worth more than the domestic market. Out of an overall production value of €24bn in 2004 (+7% on 2003), exports in fact accounted for €13bn, 54% of the total. Italian companies are appreciated above all in Europe (which absorbs 75% of exports), but are building increasingly strong bonds with the Americas (12% of exports), and Asia (8%). The Italian Association of Automobile Industries (ANFIA, www.anfia.it) considers Japan as one of the most interesting trade partners in coming years.

To provide incentives for their business, Italian companies are moving towards greater diversification and specialization: new American distributors, constant large-scale investments in research and new machinery are the keystone of their success.
Fiat, which is a major name in Italy auto industry, is buying 35 percent shares in Chrysler. This buyout is part of a concerted effort of both these companies to cope up with global financial meltdown. As part of this deal Chrysler would be able to get access to state of art automobile technology, at disposal of Fiat.

After a few difficult years, at the beginning of 2006 the imports of Italian cars in Mexico restarted, thanks to the agreement between Fiat and a local distributor for the commercialisation of several models and the development of a sales and after-sales services network on Mexican territory. In Mexico the automotive components, accessories and spares industries accounts for 1,3% of national GDP and 7,3% of exports for the manufacturing industry. The sector is heavily concentrated: 6% of firms produce 59,7% of the industry's total output. And although Italy cannot claim yet to have a significant role in Mexico as an automotive supplier, in recent years the presence of its firms has progressively grown thanks to the appreciation in the market for the quality, design and creative features that - particularly for accessories - set apart 'Made in Italy' products.

Present situation and statistics

In 2008 Italy appeared to be surviving the global recession. There were only a few cut backs over Xmas. No Italian banks have gone bankrupt, Italian mortgage interest rate was capped at 4% for variable interest rate Italian mortgages.

The situation has changed since the start of 2009. The global automobile recession has arrived in Italy. The industry contributes 11.5% to the Italian GDP 300,000 jobs are at risk.
As per experts, in 2009 there would be a decrease of 13.5 percent in car sales in Italy automobile industry. This rate is lesser than estimates for 2008.

In November 2008 only 138,352 cars of automobile industry of Italy were sold in that country. This was a drop of 29.46 percent from October in that year and worst drop, on a monthly basis, after 1993. Until November 2008 only 2.018 million cars of automobile industry of Italy were sold. This was a decrease of 13.40 percent. Auto industry associations in Italy have

been urging national government to emulate Germany and France and come up with financial aid for its ailing automobile industry.
Experts are citing ongoing global financial meltdown as main reason behind decreasing projections. It is estimated that 1.85 million cars would be sold in 2009. Previously 2.14 million cars were predicted to be sold in that year. There have been lots of other causes behind decreasing sales of auto industry of Italy.

Experts have also said that this trend would continue for a long period of time. Major auto makers in Italy are finding it extremely hard to cope up with effects of global financial recession. Most of these companies, such as Fiat, are looking out for other automobile establishments to either join forces with them or buy stakes in their companies.

Prices of various fuels are touching sky and it has been tough for consumers of auto industry in Italy to get access to financial aid that is necessary for purchasing new cars like loans. These loans have become more expensive as well. Incentives, announced by Italian government for purchasing new cars, have not had their desired effect on consumers. The Government has introduces measures such as:

- 1500 euros for those who buy a new car and write off their existing one;
- Super road taxes on SUV's upto 500 euros.

Regionally concentrated supplier networks
Italy's leading international position owes much to the supplier networks specialising in the production of spare parts and accessories. The Turin area and the Piedmont region as a whole accommodate the nation's most important industrial clusters. More than 470 component makers, 40% of Italy's suppliers are located there (with 33% of the workforce), with a peak of 75% for suppliers of modules and systems. As a whole, the regional supplier system employs over 43,000 people, about 70% of which is located in the province of Turin.

Sources of new technologies
The automotive sector is Italian manufacturing's star performer not least because of the important contributions it makes to R&D at the national level and to its role in the introduction of new technologies on the international scene. Worldwide R&D expenditure (including cars, trailers, semi-trailers, buses, spare-parts, etc.) amounted to about €2bn in the year 2005. Several universities offer tailored graduate or post-graduate courses of particular interest for the automotive industry, such as the specialized automotive courses or **programs run by the Turin "Politecnico", the University of Modena and Reggio Emilia, the University of Pisa and the Federico II University in Naples.**

Moreover, automakers and automotive related industries can also profit from the research activities of other centres of excellence. Among the most important, "CENTRO RICERCHE FIAT" **(CRF) (**http://www.fiatgroup.com/en-us/innovation/crf/pages/default.aspx**)** is specialized in research & development activities on engines, vehicles, electronic systems, productive processes and technical/managerial methodologies. To cope with global competitive pressures and the mounting demand for products that continue to break new ground in terms of safety, performance and respect for the environment, the companies in the entire Group's operating sectors have allocated higher proportions of their revenues to research and development. To promote sustainable mobility on multiple fronts, Fiat's research and development work involved approximately 13,200 people at 116 centres around the world. R&D investments totalled some 1.6 billion euros, or around 3.2% of net revenues of Industrial Activities. The CRF is unique within the Italian R&D community being entirely financed by private capital and wholly dedicated to transferring its R&D results to

industry. In addition to its headquarters in Orbassano on the outskirts of Turin, the C.R.F. has three other centres located in Bari, Trento and Foggia, as well as a controlling interest in CRP, the plastics and optics research centre in Udine, which focuses on advanced research in optics and plastics for automotive lighting systems.

Pic. 2.8: ELASIS – research center map

"Elasis" (http://www.fiatgroup.com/en-us/innovation/elasis/Pages/default.aspx**)** is another highly specialized research center which carries out applied R&D in the automotive sector focusing on the study of new design methodologies and advanced trials and on their application in the development of highly innovative products/processes. Set up in 1988 by the Fiat Group as a company dedicated to research work in the framework of development programs for Southern Italy, Elasis has grown into a highly specialized research centre whose work addresses technological innovation, complete vehicle development, mobility and its environmental impact, and traffic safety. The Centre has two sites in Pomigliano d'Arco and Lecce, both located in Southern Italy, with approximately 800 employees and is provided with sophisticated computer-aided design and calculation tools and advanced physical and virtual testing equipment which are based on an ability to develop and manage information systems that puts Elasis in the front ranks of the world's R&D centres

Also worthy of mention is the "**Centro Sviluppo Materiali**" (http://www.c-s-m.it/layout_html_standard/english/home.html) which is a national and international reference point for research into innovative materials and related production design and technologies. CSM's technological offer to the mechanics and land based transportation industry (i.e. rail, automotive, ship) is provided by integrating more and more performing and cost-effective materials with reliable processes able to satisfy the needs of transportation industries, taking advantage of a through-the-process concurrent engineering approach putting together the knowledge on materials, forming and surface technologies, virtual and physical modelling, and cost analysis.

Technology focus

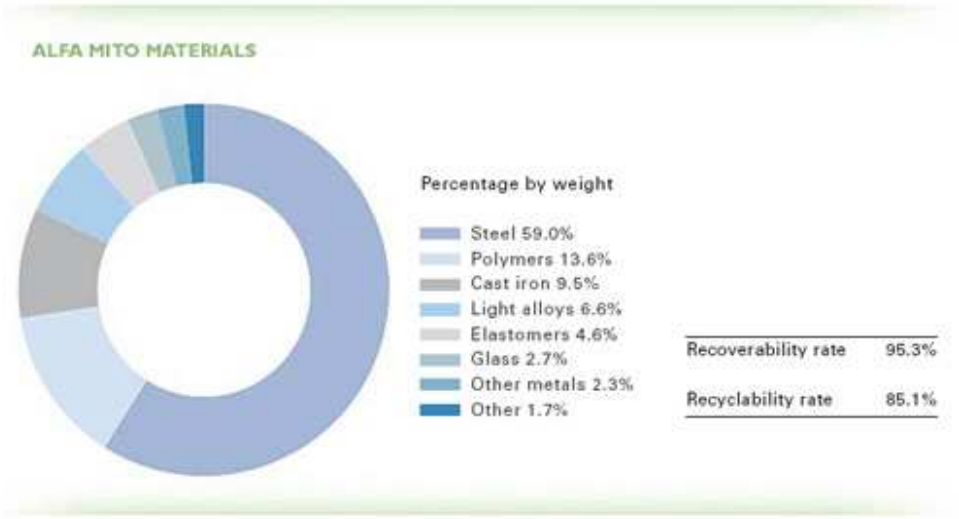
During 2008 the Fiat Group launched several important initiatives to ensure full alignment with international best practice. The first step was establishment of a unit dedicated to

facilitating a culture of economic, environmental and social responsibility internally and promoting the development of sustainable practices.
In addition, for the first time Fiat has produced a Sustainability Plan. It shows the Group's short and medium-term commitments by area of responsibility: from the promotion of ever more sustainable mobility to a reduction in the impact of our production processes on the environment; from the management and development of human resources to the quality of life in the workplace; from initiatives involving the sales network to those benefiting local communities. Significant milestones were already achieved:

In the environmental area, for example, Fiat was recognized as the European automaker with the **lowest level of CO_2 emissions**, making the brand and Fiat Group Automobiles the most virtuous in its peer group. In addition, with the launch of the Grande Punto Natural Power, Fiat strengthened its leadership in the area of environmentally-friendly natural gas powered vehicles, including through the contribution of new engines developed by FPT Powertrain Technologies. New Holland further consolidated its position as "Clean Energy Leader", offering a broad range of products which can run on pure biodiesel and Iveco – in addition to its existing product offer which already meets strict new standards for polluting emissions well ahead of the legal deadline – has also begun testing of hybrid diesel-electric vehicles. Finally, Magneti Marelli has been confirmed a major player in sustainable mobility, receiving one of the most prestigious automotive awards worldwide for its TetraFuel system, the first engine in the world capable of running on four different fuels: bioethanol, Brazilian gasoline, gasoline and natural gas.

Fiat Group Automobiles is working hard to increase the recyclability of new models and seeks to use environmentally-friendly recycled, recyclable or natural materials both for body exteriors and interior trim. New cars in the FGA line-up already have a recoverability rate of 95% by weight, well over the target that the **European Union's Reusability, Recyclability and Recoverability Directive (2005/64/EC)** mandates for new vehicles applying for type-approval starting in December 2008, and for all new vehicles registered from July 2010 onwards.

Safer and more versatile vehicles:
Together with Fiat Group Automobiles, C.R.F. developed a lane departure warning system with haptic interface which is available on the new Lancia Delta launched 2008. Preventive safety systems for Iveco's light and medium/heavy range trucks has been developed to monitor what's going on around the truck and alert drivers if they are following too closely behind the vehicle ahead or traveling at an unsafe speed.



Pic. 2.9: Alfa Mito materials

Source: http://sustainability.fiatgroup.com/responsabilita-ambientale/recuperare-riciclare.php

Automotive Industry in Hungary

Characteristics of local car production[4]

Central and Eastern Europe has become an important centre for the world's automotive industry. With 3.3 million passenger cars produced last year, the area is becoming an important production base for the EU market. **In 2008, while Western European motor vehicle production fell by 9.1%, production in the CEE countries grew by 7.5%. Hungary could boast of an 18.5% growth, the second highest in Europe.**

The automotive sector is one of Hungary's core industries and contributes 20 per cent of total exports. In 2008, vehicle sales outside Hungary were worth EUR 8.3 billion and engines accounted for EUR 5.3 billion. Over 600 companies employing a total of 100,000 people are active in the sector. Of these enterprises, 240 operate according to the ISO and/or TS 16949 quality management standards. The export ratio of Hungarianmade cars is 94 per cent, a figure that stands at 88 per cent for engine and component production.

The number of first- and second-tier equipment manufacturers is continually rising. Since the early 1990s, several foreign car manufacturers, such as Suzuki, Audi and General Motors, as well as 14 of the top 20 Tier 1 suppliers, have set up production facilities in Hungary.

Thanks to Hungary's EU membership, investors settling here find themselves on the south-eastern borders of a market of 493 million people. As a result, many multinational companies have also relocated their manufacturing, service operations, European headquarters and R&D centres to Hungary, translating to nearly EUR 60 billion in foreign direct investment to date. More than 36 per cent of total FDI in Hungary has been directed towards the manufacturing industry, with the automotive and its supplier industries leading the way.

General conditions of the Hungarian automotive sector

Hungary has plenty to offer whether it is a car producer looking for a cost-effective manufacturing base, or competitive component and part suppliers, or locations for logistics and R&D centres:

- Hungary is at the heart of Central Europe, a region characterised by dynamic economic growth driven by high industrial output, excellent export potential and increasing domestic demand.
- Hungary lies along the Eastern border of the EU and is within the Schengen zone. The country's strategic position, highly developed logistics and utilities infrastructure and traditional role as a trading post makes it increasingly important as a regional distribution centre and a natural service hub for the CEE region.
- Four trans-European motorways run through Hungary, more than in any of the neighbouring countries. Most countries in the Balkans can only be reached through Hungary.
- As a member of the European Union, Hungary has fully harmonised its legal system, adopting European safety and quality regulations related to automotive manufacturing.
- Hungary also compares very favourably when it comes to data security and enforcement of intellectual property rights.
- Highly skilled, creative and flexible human capital at competitive cost: companies can expect a 30–50% cost savings compared toWestern Europe and the US. The

[4] Source: ITD Hungary Zrt.: The automotive industry in Hungary - Engine of growth (2009)

average gross wage in Hungary is just EUR 740 per month while labour productivity is among the highest in the CEE region. The Hungarian labour force also rates highly in international comparisons for innovation and creativity, due to the country's renowned standards of schooling and tertiary education.

- Fourteen of the world's top 20 Tier 1 suppliers, including Robert Bosch, ThyssenKrupp, Denso, Michelin, Valeo, Bridgestone, Magna Steyr, BorgWarner, Visteon, Delphi, Continental, Lear, Siemens and Sumitomo are already present in Hungary. They have also surrounded themselves with clusters of home-grown small and medium-sized manufacturers and service suppliers.
- Renault-Nissan, General Motors, Porsche and DAF/PACCAR have chosen Hungary as a location for part centres supplying not only the Central and Eastern European markets but also Ukraine, Russia and the Balkans.
- Business processes have been simplified considerably in recent years. In addition, foreign companies willing to settle in Hungary are welcomed with comprehensive trade development services and supportive government policy.
- Hungary has a globally recognised academic and university infrastructure. Increasingly, automotive-related R&D activity is carried out in top universities and research institutions, while leading global manufacturers, including Audi, Bosch, Knorr-Bremse, Magna-Steyr and ThyssenKrupp, have established R&D centres in Hungary.
- Hungary is the regional leader in the production of petrol engines and the fourth largest exporter in Europe.

Key statistics of Hungarian automotive sector (2008) is as follows:

- Production value: **EUR 16.7 billion**
- Export: **EUR 15.0 billion**
- Export ratio: **90%**
- Skilled workers' average gross wage: **384 EUR/month**
- Share of foreign capital: **75%**
- Distribution of companies by ownership:
  Domestic: **54%,** Foreign: **25%**, Joint venture: **21%**
- Share of total national exports by Audi, Suzuki and GM Powertrain combined: **11%**
- Number of automotive manufacturing firms (OEM, Tier 1–Tier 2): **620**
- Number of automotive manufacturing firms with audited quality-assurance systems: **240**
- Number of employees: **100 000**
- Proportion of employees involved in main-unit manufacturing: **12%**
- Proportion of employees involved in part-unit manufacturing: **88%**

Major car producers of Hungary[5]

DAIMLER

Daimler started to invest EUR 800 million to manufacture 100 thousand Class A and B compact Mercedes cars yearly in the Central Hungarian city of Kecskemét. This will be the company's first plant in Eastern Europe. The investment will create 2,500 jobs and production is to start in 2012. The Hungarian Government supports the investment of Daimler with a package of measures giving the project a clear prioritization. Daimler considered sites in Romania, Poland and Serbia, in addition to Hungary, but Kecskemet offered Daimler the best conditions in terms of infrastructure, logistics, work force and wages.

[5] Source: ITD Hungary Zrt.: The automotive industry in Hungary - Engine of growth (2009)

AUDI

Audi manufactures high-end vehicles equipped with powerful, state-of-the-art engines supplied by Audi Hungaria. When Audi AG was looking for a new production site to manufacture a new series of engines in 1992, the northern Hungarian town of Győr was selected from 180 potential venues. AUDI HUNGARIA MOTOR Kft. was established with founding capital of EUR 1 million in 1993 as a wholly owned subsidiary of AUDI AG and is now one of the country's key industrial players and largest exporters. The Hungarian company has produced more than 15 million engines in the past 15 years and its four-, five-, six-, eight-, ten- and twelve-cylinder engines are used not only in Audi branded vehicles but also in a variety of Volkswagen, Seat and Skoda models. Audi Hungaria is also the only company in the world assembling Audi TT sports cars and Audi A3 Cabriolets as part of a cooperative manufacturing process with Audi's Ingolstadt plant. **Audi – Facts & figures (2008):** 1.9 million engines, 60,359 (+6%) cars, Audi TT, Audi TT-Roadster and Audi A3 Cabriolet, turnover EUR 5,617 million, workforce 5,879 people, total investments of over EUR 3,600 million, Hungary's largest exporter, world's third largest engine manufacturing plant.

SUZUKI

The company was established by its major shareholder Suzuki Motor Corporation in 1991. The kick-off model, Swift rolled off the production line in 1992, followed in 2000 byWagon R+, Ignis in 2003, the new Swift in 2005, SX4 in 2006 and Splash in 2008. By now over a million and a half Suzuki vehicles – assembled in the Esztergom factory – are used on domestic and European roads. Since the factory was set up, the company has spent more than HUF 280 billion on development. In addition to 4,300 jobs at the Suzuki factory, the company provides jobs for thousands of people in Hungary through its circle of suppliers. Apart from the emphasis it places on quality, Magyar Suzuki aspires to an environmentally conscious mode of operation. The technology in use at the Esztergom factory is in line with ISO 14 001 environmental and ISO 9001 quality assurance standards. All models currently assembled at Esztergom are built with engines complying with Euro 4 environmental standards. MSC also acquired the “Authorized Economic Operator” – AEO certification, an internationally acknowledged certificate, which proves the excellence of a company within international trading. Despite of the severe conditions in the car industry, Magyar Suzuki Corporation has increased its production by 21.28% compared to last year’s figures. **Suzuki – Facts & figures (2008):** 281,681 (+21,3%) cars (Swift, SX4, Ignis; Splash), turnover EUR 2.4 billion, workforce 4,300 people, total investment in excess of EUR 1.3 billion.

GENERAL MOTORS

General Motors Powertrain Hungary Ltd. was founded as a subsidiary of General Motors Powertrain Europe in Szentgotthárd in 1991. The company is the sole manufacturer of all Ecotec Family 1 gasoline engines (1.6-1.8 litre) and an exclusive producer of Allison automatic transmission for trucks and buses outside America. **General Motors Powertrain – Facts & figures (2008):** 392,378 engines, 605,643 cylinder heads, 20,437 Allison transmissions, workforce 640 people, total investment reached EUR 700 million by 2008.

ROBERT BOSCH

Bosch has been present in Hungary for 110 years. The company is the second largest foreign employer in Hungary with 12 local subsidiaries and a total headcount of more than 7,000. Bosch in Hungary is increasing its efforts to adapt the domestic technical higher education system to the needs of the market by supporting numerous training programmes in Budapest, Hatvan and Miskolc. Last year the company has spent EUR 36 million on R&D. By now already 430 engineers work in the Bosch Budapest Development Centre.

F.SEGURA

Spanish die-manufacturing and stamping company Grupo F.Segura has chosen the city of Szolnok to establish a new facility to design and manufacture metal components for the automotive industry for its customers FORD, VW, SEAT, AUDI and VOLVO. Initially the factory will be 11,000 sqm large, over a total area of 10 hectares. The overall cost of investment will reach EUR 11 millionand it will create 150 new jobs. From this privileged position in the centre of Europe and bordering on seven countries, F.Segura Hungaria KFT wants to obtain a major presence in the current and future European context. With this strategic decision F.Segura establishes itself in a multi-customer environment where privileged logistics conditions and additional benefits take profit of the new emergence markets in the region.

KNORR-BREMSE

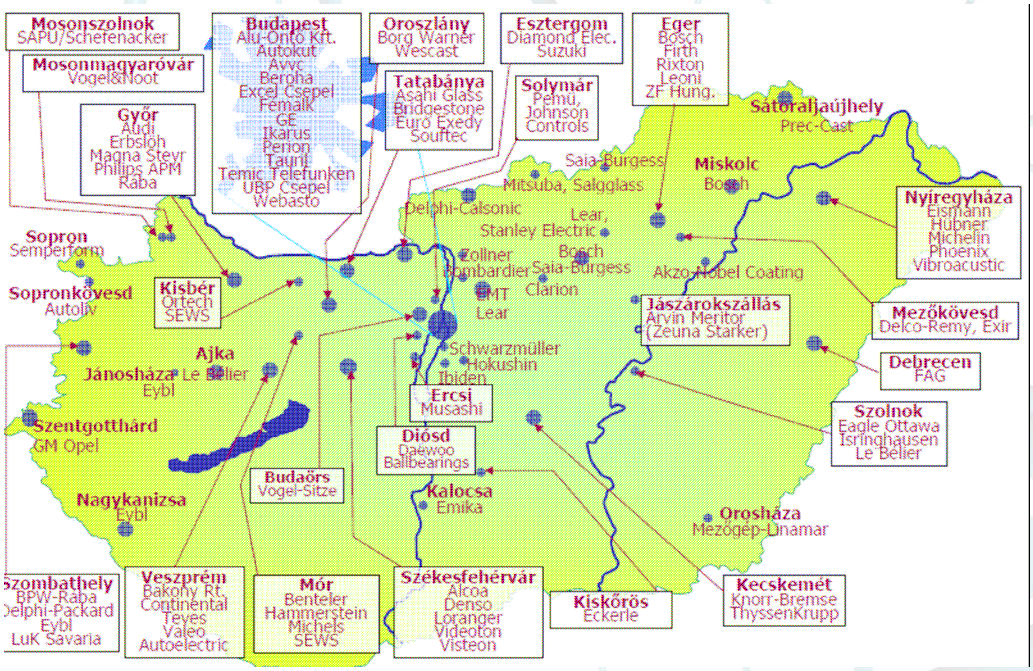
Knorr-Bremse Brake Systems Kft. announced that it will invest more than EUR 10 million in a research and development (R&D) project in Hungary which will employ 60 new engineers. The Knorr-Bremse Group is the world's leading manufacturer of braking systems for rail and commercial vehicles. The Hungarian branch has the most employees among the European factories. Knorr Bremse has established its development centre in 1999 in Hungary.

THE GEDIA GROUP

GEDIA Gebrüder Dingerkus GmbH develops and manufactures pressings and welded assemblies for the automotive industry, technical products and fastening systems for the household goods industry. The company announced that in addition to its already existing facility in Hungary, it will create 103 new jobs and an investment of EUR 21 million in the town of Tata to manufacture body parts for the vehicle industry.

BOSAL

Dutch company Bosal expands its operations in Hungary by building a new production hall and creating additional 250 jobs at its site in Kecskemét. Bosal who already has 200 employees, has been operating in Kecskemét since 2004 and produces towbars, jacks and toolkits.



Pic. 2.10: Major automotive companies of Hungary, Source: ITD Hunary Zrt.: Hungary - an ideal location for Investors

Characteristic of local supplier chains, networks, clusters, automotive R&D in Hungary

Characteristic of local supplier chains[6]

Hungary has a strong supplier base, with annual sales of around EUR 9 billion. There are over 350 companies manufacturing car components, with 90.000 employees. 70 % of them have audited quality control systems. 94 % of the cars produced in Hungary and 88 % of engines and components are exported. The average wage in the industry is 680 EURO/month, the proportion of foreign companies is 75 %. The following types of parts are supplied by Hungarian subcontractors: ABS sensors, brake locks, cable harness, clutch disks, controllers, door latches, door limiters, horns, gearboxes and brake systems for commercial vehicles, ignition switches, instrument panels, high precision injection moulded products, pressed and welded components, technical rubber components, seat covers, seat frames, screen wiper systems, suspension elements, etc. 90% of the production and export of the Hungarian Automotive Industry comes from Audi, Opel, Suzuki and Visteon. The exports of Audi, Opel and Suzuki make 17 % of the whole Hungarian exports.

Excellent local supplier network:

- Hungary - as one of the *"Detroit East"* countries - can supply manufacturers and customers in the whole of Europe
- The number of orders are on an increasing scale due to heavy investments by CBU manufacturers to expand capacities

Major automotive suppliers in Hungary:

- Prior to the global crisis manufacturers, such as Suzuki and Audi were steadily expanding capacities and workforce to meet growing demand
- 14 of the world's top 20 TIER-1s have already established operations in Hungary
- Several multinationals have set up R&D centres in Hungary including Audi, Bosch, Knorr-Bremse, Magna-Steyr, ThyssenKrupp, Arvin Meritor, Denso, Continental, Visteon, WET, Draxlmaier, Edag,Temic Telefunken, DENSO and ZF.
- In 2007/2008 two of the top awards presented by the Minister of National Development and Economy to most outstanding foreign investors was received by Daimler AG for its new investment in Kecskemét.

Automotive organizations, networks, clustering[7]

Over the last years, Hungary has seen the emergence of clusters in several of its industries, ranging from the automotive sector to logistics, construction and tourism. The investmentbased, export-orientated automotive industry has been the frontrunner in this development.

The Association of the Hungarian Automotive Industry: (MGSZ) has 27 members and represents the international interests of Hungarian producers in the Association of European Motor Vehicle Manufacturers (ACEA) and the International Organisation of Motor Vehicle Manufacturers (OICA).

Association of Hungarian Vehicle Component Manufacturers (MAJOSZ) was established in 1993 by 22 founding members. It currently has more than 290 members, of which 80 are supporting members. The Association's goal is to assist its members in climbing as high up the supplier hierarchy as possible, and to help them advance from

[6] Source: http://www.itdh.com/engine.aspx?page=Itdh_Priority_Sectors_Automotive
[7] Source: ITD Hungary Zrt.: The automotive industry in Hungary - Engine of growth (2009)

simpler to more sophisticated products, from contract manufacturing to product development projects. The Association is an official member of the European Association of Automotive Suppliers (CLEPA).

The Pannon Automotive Cluster (PANAC) was established in 2000 and now boasts 96 members. The organisation's mission is to facilitate national and international networking by providing opportunities for communication and partnerships, offering project sponsorship and promoting trust and willingness to cooperate among members. It also assists in company development, including surveys of supplier capacity, company benchmarking, organisation of specific automotive teaching/training programmes, and professional forums, programmes and technology exchanges.

MAJÁK: The aim of the Hungarian Vehicle Engineering Cluster (HVEC) is to coordinate the Hungarian engineering companies in the field of vehicle and vehicle part development.

R&D activity in the Hungarian automotive sector[8]

Since the 1990's, Hungary has become a new hub for automotive manufacturing. Satisfied with their results, several leading global manufacturers such as AUDI, GM, ZF, Knorr Bremse and Bosch have established R&D centres in Hungary. Increasingly, automotive-related applied R&D is carried out in top universities. A large number of SME-s conduct contract research in Győr, Veszprém, Székesfehérvár and Budapest.

Advanced Vehicles and Vehicle Control Knowledge Centre, Budapest University of Economics and Technology. Research extends to new areas of automotive technology-related research such as the control of vehicle fleets, vehicle-environment contact-based control, and control on the vehicle level. Cooperating partners are Knorr Bremse, Thyssen Krupp and TÜV Nord.

Regional University Knowledge Centre for the Vehicle Industry, University of Győr. The Knowledge Centre serves the research and development needs of the automotive industry in the area of Győr, such as Rába Undercarriage Ltd, Borsodi Workshop Ltd. and the SAPU Partnership. Research focuses on key pre-manufacturing technologies and finishing processing; primarily shaping processes, such as casting and mould-shaping of metals and manufacturing technologies for plastic parts.

College of Dunaújváros, Department of Mechanics and Mechatronics. The College offers a range of automotive technology-related testing and research services, including the determination of force characteristics of control devices and sensors (ABS), dimensional and fatigue tests of instrument boards. The College co-operates with some of the largest automotive manufacturers in Hungary, such as Bosch, Hankook and Audi. A new, complex car mechatronics test laboratory is being set up for suppliers in the metals (Musashi and DENSO) and the electronics (Bosch) industries.

European Institute of Innovation & Technology. In summer 2008, EU ministers chose Budapest to host the headquarters of the European Institute of Innovation and Technology. The EIT is a new initiative aiming to become a flagship for excellence in European innovation and face the challenges of globalisation head on. The organisation is the first European initiative to integrate fully the three sides of the "Knowledge Triangle" (higher education, research and business innovation) and will seek to stand out as a world-class innovation-

[8] Source: ITD Hungary Investment and Trade Development Agency: R&D in Hungary: With business in mind (2010)

orientated reference model. The institute concentrates on the fields of energy, climate change and information technology with the possibility of further broadening its areas of study.

Main automotive research companies in Hungary[9]:

- Audi – Győr: engine development
- AVL – Budapest: engine and powertrain development
- Bosch – Miskolc: electronic hand-tools designing
- Bosch – Budapest: electronic developments
- Continental Teves – Veszprém: development of electronics instruments for cars
- Denso – Székesfehérvár: fuel supplying system development
- DHS Draexlmaier – Érd: vehicle compartment designing
- EDAG – Győr: vehicle subunit development
- GE Lightings – Budapest: car lighting
- Knorr-Bremse – Budapest: electronic brake-system development
- Magna-Steyr – Győr: engineering centre
- Continental Temic – Budapest: car electronics development
- Semcon – Budapest: automotive design, informatics
- ThyssenKrupp – Budapest: electronic steering development
- Visteon – Székesfehérvár: vehicle part and subunit development
- WET – Pilisszentiván: electronic subunit development

Innovation challenges of automotive environment, problems[10]

2008 has been without doubt the most difficult year for the global automotive industry since World War 2. So far, Hungary have experienced a huge declines in sales (-6%), yet this is still much lower than those observed in Western Europe. The passenger car market in Hungary has been declining for a couple of years now, witnessing a 5.8% drop of new passenger car sales in 2007. Nevertheless, the reasons for the recent downturn on the Hungarian market are “home-made” rather than driven by international developments. The focus of the Hungarian government is reducing the budget deficit which is having a negative impact on both GDP growth and private consumption. Disposable income for private households decreased by 3.5% in 2007 and was further cut down in 2008. As a matter of fact, passenger car registrations in the third quarter 2008 were the worst of any quarter since the turn of the century.

Car density in Hungary is still below the level of other countries in the region. In Hungary, the number is 316 passenger cars per 1,000 inhabitants, whereas this ratio is 338 in Poland or even 404 in the Czech Republic (2006). On the other hand, there are still a couple of positive factors that might help to relaunch new passenger car sales to a level of 200,000 units in 2010 and beyond as projected in early 2008. Considering per capita GDP, new cars are still cheaper in Hungary compared to other markets in the region. In addition, the trend in car sales in Hungary is moving from smaller to medium-sized cars or even luxury cars, giving car dealers an opportunity to earn higher margins if they are active in that market. Luxury brands such as BMW or Mercedes-Benz showed sales increases of about 20% in the first three quarters of 2008 compared to the same period of 2007.

[9] Source: ITD Hungary Zrt.: The automotive industry in Hungary - Engine of growth (2009)
[10] Source: PricewaterhouseCoopers: Survey on car dealer’s market in Hungary (2009)

In the light of recent events, it is difficult to foretell the result of car sales in the nearest future. The largest unknown is the forint exchange rate. The Hungarian currency's fluctuations render it impossible to make exact forecasts. The situation will also depend, to a large extent, on the mood of the consumer, and on whether it will be feasible to calm consumers' frequently panicky and irrational behaviours in these difficult times.

Innovation challanges

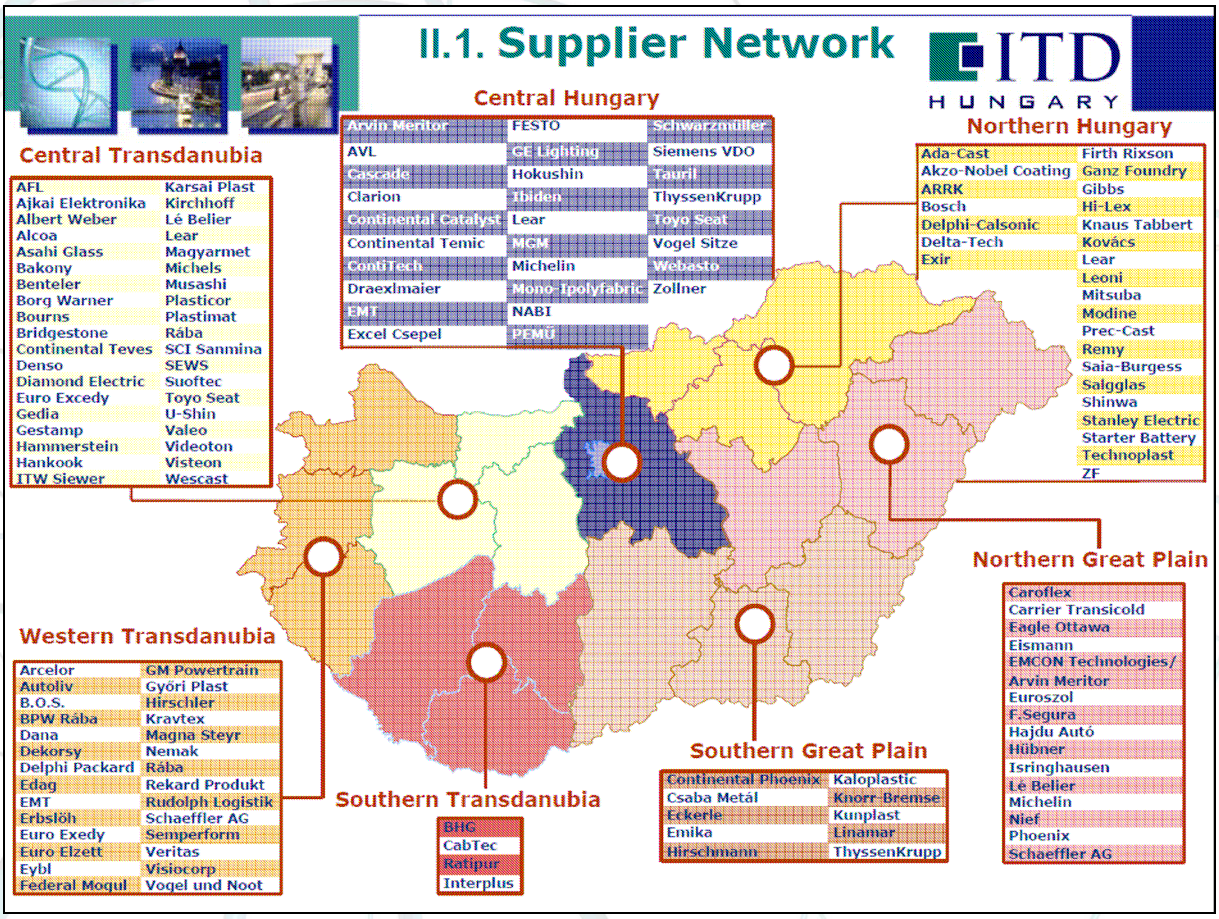
Several foreign investors are considering the possibility of relocating production from Hungary unless there is a marked improvement in productivity within a short period of time. A further problem is that companies do not know how their results compare to those of their competitors and international standards.
In order to be able to maintain competitiveness of the automotive industry despite of growing labour costs, ruthless competition and an unfavourable economic environment, international best practices should be introduced in areas where the performance of companies is below that of the industry leaders. This should not be effected in isolated areas, but within the framework of an integrated, well proven philosophy and methodology.

Tab. 2.7 Hungary's network of car producers and suppliers[11]:

Western Transdanubia	Central Transdanubia	Southern Transdanubia	Central Hungary	Northern Hungary	Northern Great-Plain	Southern Great-Plain
Arcelor	AFL	BHG	AVL	Csabacast	Caroflex	Continental
Audi	Ajkai Elektronika	CabTec	Cascade	Akzo-Nobel	Carrier	Phoenix
Autoliv	Albert Weber	Ratipur	Clarion	Coating	Transicold	Csaba Metal
B.O.S.	Alcoa		Continental	ARRK	Eagle Ottawa	Eckerle
BPW Rába	Asahi Glass		Catalyst	Bosch	Eismann	Emika
Dana	Benteler		Continental	Delphi-Calsonic	EMCON Technologies	Hirschmann
Delphi Packard	Borg Warner		Temic	Delta-Tech	Euroszol	Kaloplasztik
Edag	Bourns		ContiTech	Exir	F.Segura	Knorr-Bremse
EMT	Bridgestone		Draexlmaier	Firth Rixson	Hajdu Autó	Kunplast-Karsai
Erbslöh	Continental Teves		EMT	Ganz Foundry	Hübner	Linamar
Euro Exedy	Denso		Excel Csepel	Gibbs	Isringhausen	PATA
Euro-Elzett	Diamond Electric		FESTO	Hi-Lex	Le Bélier	ThyssenKrupp
Eybl	Euro Exedy		GE Lighting	Knaus-Tabbert	Michelin	
Federal Mogul	Gedia		Hokushin	Kovács	Nief	
GM Powertrain	Gestamp		Ibiden	Lear	Phoenix	
Gyôri Plast	Hammerstein		Lear	Leoni	Schaeffler AG	
Hirschler-Glas	Hankook		MGM	Mitsuba		
Kravtex	ITW Siewer		Michelin	Modine		
Magna Steyr	Karsai Plast		Mono-Ipolyfabric	Prec-Cast		
Nemak	Kirchhof		NABI	Remy		
Rába	Le Bélier		PEMÜ	Saia-Burgess		
Rekard Produkt	Lear		Schwarzmüller	Salgglas		
Rudolph Logistik	Magyarmet		Siemens VDO	Shinwa		
Schaeffler AG	Michels		Tauril	Stanley Electric		
Sempeform	Musashi		ThyssenKrupp	Starter Battery		
Veritas	Plasticor		Toyo Seat	Technoplast		
Visiocorp	Plastimat		Vogel-Sitze	ZF Hungária		
Vogel und Noot	Rába		W.E.T. Automotive			
	SCI Sanmina		Webasto			
	SEWS		Zollner			
	Suoftec					
	Suzuki					
	Toyo Seat					
	U-Shin					
	Valeo					
	Videoton					
	Visteon					
	Wescast					

[11] Source: ITD Hungary Zrt.: The automotive industry in Hungary - Engine of growth (2009)

Hungary's network of automotive suppliers[12]



Pic. 2.11: Supplier Network in Hungary

Source: Kalman Meszaros, dr. Commercial Counsellor (ITD Hungary): Automotive Industry - Securing Automotive Investments in the New Member States (Brussels, 4th November 2008)

[12] Source: Kalman Meszaros, dr. Commercial Counsellor (ITD Hungary): Automotive Industry - Securing Automotive Investments in the New Member States (Brussels, 4th November 2008)

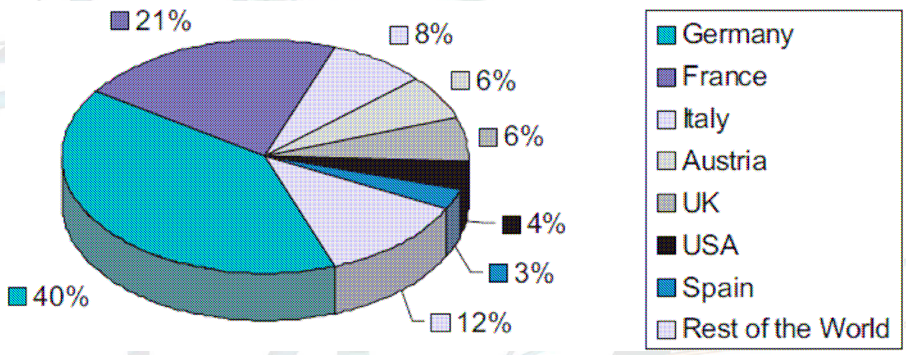
Automotive industry in Slovenia

Slovenia has a long industrial tradition. From the beginning of the automotive industry at the end of the 19 century, Slovenia has been following its development and has been providing technical and researchable contribution. Gradually Slovenia has strengthened the economic purpose of the automotive industry in the national economy. A well known person who can take credit for development of automobilism in the 19 century Austria was Janez Puh. He was born in Sakušaki, near Juršinci in Slovenske Gorice. In 1900 he manufactured his first motorbike, a tricycle with single - cylinder engine in Graz and the mass production started in 1906. The first industrial production of buses in Avtomonta a in Ljubljana started in 1936. This factory was one of the first in Europe that manufactured buses with steel body work. The upturn of production of industrial vehicles, first trucks, later also buses, followed after the end of the Second World War, in the early fifties in Maribor. TAM Factory of Automobiles Maribor manufactured vehicles and motors under licence and cooperational contract with Deutz from Germany. This production had a major influence on production of component parts or components, first in Maribor, then in Slovenia and other areas of former Yugoslavia.

The production of personal vehicles in 1959 started in Novo mesto with the establishment of IMV Industry ofmotor vehicles (already in 1954 the production of delivery vehicles started). The production of personal vehicles DKW started first, followed by the production of BLMC vehicles and from 1972, they have been producing vehicles Renault. Since 1960 at TOMOS in Koper personal vehicles Citroen were assembled; this was continued in CIMOS in Šempeter pri Gorici first and later in Koper until 1985. After that extensive production of automotive parts began; first for Citroen and later for other global vehicle manufacturers and system suppliers. After Slovenia became independent in 1991 the production of commercial vehicles was significantly reduced after the loss of markets in former Yugoslavia and other eastern markets and due to transitional deindustrialisation. The production of automotive components, especially for personal vehicles, transferred most of its production to Western European markets, especially to Germany and France.

The structure of automotive industry in Slovenia

Slovenian automotive suppliers industry includes about 95 producers that can be mainly defined as Tier 2 and Tier 3 suppliers. There are also Tier 1 system suppliers of pedal boxes, gear shift mechanisms, braking systems and other assemblies at CIMOS, auto-electric equipment at Iskra Avtoelektrika, ignition systems and electronics at AET, seats at TPV, bowden cables at TBP, headlights at Hella Lux. The buyers of components for the first implementation from Slovenia are VW, BMW, Audi, DC, MAN, Bosch, Ford in Germany, Renault, PSA, Brose in France, Lombardini, Landini, Fiat in Italy, Magna Steyr, Grammer in Austria and many others, also in England, the USA, Spain, Hungary and many other countries. These companies have an intensive development in introducing automatic systems into the production process and they are also flexible in adjustments to customers' needs.



Pic. 2.12

The Slovenian automotive supply industry's annual turnover exceeds 3,7 billion Euros 80%, of which comes from the export of goods and services to the EU and rest of the world Together with car production in REVOZ it represents approx. 20% of complete Slovenian export and 6% of DPH. In 2008 slovenian suppliers spent over 3% of sales turnover for R&D and invest 12% of sales turnover into new technology equipment in average.

The automotive sector in Slovenia today is represented by the production of **personal vehicles Renault in company Revoz** where 900 Clios Storia and Twigos are produced per day and a well developed automotive suppliers industry with about 95 big, medium-sized and small companies that are followed by over several 100`s specialized small companies that they cooperate with. The production of commercial vehicles has been becoming more active and has been gradually spreading its suppliers' network. The production of personal vehicles represents about 9% of the overall value of goods and services export form Slovenia. The production of component parts or components for automotive industry (and accessories) reaches the value over 1, 5 billion EUR, from that value around 80% is exported, which is close to 10% of Slovenian export of goods and services. Buyers are car producers and system suppliers in EU are (Germany 40%, France 21%, Italy 8%, Austria 6%, England 6%, USA 4%, Spain 3%...). Export of buses and other economy vehicles is around 30 million EUR. Over 140 million EUR represent the export of special tools and machines and investment and supporting services for automotive industry in EU. The whole section of automotive industry, vehicles and production of automotive parts, has directly involved around 27,500 employees, it represents 19% of all export of goods and services of Slovenia and it creates 6% GDP (indirectly more than 100,000 employees). Automotive section is above average in the field of investments, especially in investments into new production technological equipment, which guaranties the quality of vehicles and components and also assures high productivity. The competition due to relatively high labor force price (salary and other obligations that employers have) in comparison with the competition in Central and Eastern Europe (Czech Republic, Hungary, Poland, Slovakia) is achieved by Slovenian automotive and automotive component parts' producers by using high technology, innovation and labor force quality.

Investments into “soft factors”, are particularly high especially investments into training and extra qualifications of the employees (learning companies), into motivation of the employees and into efficient organization and managing quality. Numerous producers of automotive components have already obtained global certificates ISO TS 16949 (3/4 of ACS members!) Before that, they already had, because of their export intensity, VDA 6.1, EAQF and QS 9000. Big investments are also meant for the welfare of the environment, in accordance with strict EU regulations that Slovenia obeys; therefore numerous companies in automotive section have already acquired environment certificates ISO 14001.

The following are top 10 locations of the automotive supply base and manufacturing industry. For each we indicate maximum 4 automotive relevant sub-industries, number of companies in each sub-industry and the respective number of fulltime equivalent employees. As you could see the locations are widely spread in all Slovenia:

- sub-region Dolenjska&Posavje (Novo Mesto)
  - vehicle manufacturing, 1 company, 3,000 employees
  - body interior, 5 companies, 900 employees
  - small parts, 5 companies, 300 employees
  - electrical, 1 company, 150 employees

- sub-region Severna Primorska (Nova Gorica, Tolmin, Idrija)
  - engine, 2 companies, 3,000 employees
  - powertrain, 1 company, 400 employees
  - machinery, 2 companies, 200 employees
  - production technology, 1 company, 250 employees

- sub-region Južna Primorska (Koper)
  - powertrain, 1 company, 1,200 employees
  - engine, 1 company, 800 employees
  - production technology, 2 companies, 800 employees
  - machinery, 1 company, 250 employees

- sub-region Notranjska (Postojna, Lož)
  - body interior, 1 company, 400 employees
  - machinery, 2 companies, 400 employees
  - miscellaneous parts, 2 companies, 250 employees

- sub-region Ljubljana (Ljubljana)
  - body exterior, 1 company, 600 employees
  - machinery, 1 company, 300 employees
  - production technology, 3 companies, 1,100 employees
  - electrical, 1 company, 250 employees

- sub-region Gorenjska (Kranj, Škofja Loka)
  - electrical, 4 companies, 600 employees
  - powertrain, 2 companies, 800 employees
  - production technology, 4 companies, 1,200 employees
  - machinery, 4 companies, 250 employees

- sub-region Celje&Zreče
  - machinery, 3 companies, 700 employees
  - powertrain, 2 companies, 1,200 employees

- sub-region Maribor
  - vehicle manufacturing, 1 company, 200 employees
  - powertrain, 3 companies, 1,700 employees
  - production technologies, 2 companies, 800 employees
  - electrical, 1 company, 150 employees

- sub-region Koroška (Slovenj gradec, Ravne, Velenje)
  - body interior, 5 company, 2,000 employees

- body exterior, 1 company, 350 employees
- machinery, 1 company, 200 employees
- production technology, 2company, 1,500 employees

- sub-region Kidričevo, Štore
  - production technology, 1 company, 600 employees
  - materials technology, 1 company, 800 employees

Tab. 2.8

Total automotive companies in the region: (#)		207
OEM's		2
Suppliers		85
of which are:	System suppliers (Tier 1)	8
	Component suppliers (Tier 2)	29
	Parts suppliers (Tier 3)	48
Other		130
of which are:	Engineering companies	10
	Logistics companies	120
	...	
Total employment in automotive industry		26500
employment at:	OEM's	3000
	Suppliers	21000
	Other	2500
Joint turnover of the automotive companies:		2,4 bln EUR (only OEM and
Gross value added in the automotive industry:		26,500 EUR/employee

Automotive Research and Development

Planning and the introduction of a new product is a time-consuming process that can take years and even decades, therefore the expenses connected to this process are extremely high and for this reason the realisation of such a project is only possible in cooperation with the researchers (developers) from the company with external research institutions that have the knowledge. In all this the “available technological” environment and available sources are of key importance. In Slovenian automotive industry the research and development are directed towards the market requirements and the increase of profit. Slovenian automotive industry is doing business under pressure of fast changes and therefore it has limited resources for the research and development which is then supplemented by using the resources from universities. Currently more than 1,000 registered researchers are connected with Slovenian automotive industry at faculties, independent R&D institutes and R&D centres in the companies. Important automotive related indipendent R&D centres are:

- University of Ljubljana, Faculty for mechanical engineering, Laboratory for Structural Evaluation
  - Development and evaluation of structures and participation in development of metal and plastic parts and sets – car components
  - Research and participation in development of automotive products (Bowden cables,
  - springs, latches and batteries)

- University of Maribor, Faculty for mechanical engineering
  - Determination of car components life
  - Car security research by means of crash simulation

- University of Maribor, Faculty for electrical engineering
  - Research and development of magnetic sets, reciprocating engines, systems of
  - power electronics, adjustment and control

- TECOS, Slovenian Tool and Die Development Centre
  - Optimisation of injection moulding plastics products and technology
  - Optimisation of sheet metal products and tool manufacturing

- University of Ljubljana, Faculty for natural sciences and engineering
  - Introduction of ecologically sound materials and technologies
  - Development of shape memory AlCuNi alloys
  - Research and development of materials for turbochargers
  - Optimisation of thermochemical treatment of steel semi products for the automotive
  - industry

- University of Ljubljana, Faculty for electrical engineering
  - ASIC design for automotive applications, sensor structures
  - Discrete semiconductor sensors
  - Road scene recognition

Important R&D centres within the companies (according to their product and technology focus) are:
- ISKRA Avtoelektrika
- CIMOS
- Hidria AET
- Hidria Rotomatika
- UNIOR
- TPV
- PREVENT
- TBP
- KOVINOPLASTIKA
- ISKRA Mehanizmi
- ISKRA ISD
- others

Automotive industry in Romania

History of Automotive Industry in Romania

The beginnings of the Automotive industry in Romania was have their roots in the interdictions imposed to the Romanian aviation industry at the end of the World War II. The new industry started at the beginning of the 1950s and has grown and diversified since the 1970s especially. It included manufacturers of tractors, trucks, buses, off-road vehicles and cars.

S. C. Tractor UTB S.A., Brasov

The IAR (Romanian Aviation Company, founded in 1924) plant found itself at the end of World War II 70% destroyed by bombing so the aircraft manufacture was discontinued. Due to ban imposed to Romania to build planes, on May 20, 1946 the government decided to re-orientate plant production to tractors. On December 26, 1946 first tractor was leaving the assembly hall. In 1947 the name change in Intreprinderea Metalurgică de Stat (State Metallurgical Enterprises), and in 1948 became UTB - Uzina de Tractoare Braşov (Brasov Tractor Plant). The production volume increased from 250 tractors (1947), 773 (1948), 2000 (1949) to 3460 (1950), and in 1949 they started to manufacture the improved version and 23. In 1948 it was formed the first joint Soviet-Romanian (Sovrom) through which the Soviets wanted to control the country's economic activity. UTB also did not escaped, so that the end of 1948 to form Sovromtractor. Soviet directors imposed assimilation in manufacturing of soviet models. In 1954 the Sovromtractor company was disbanded and it immediately passed to modernize production. Original tractor models were introduced in 1958 and other model were assimilated. By 1990 diversification continued, although the growing involvement of the Communist Party and state leadership of the plant have seriously disrupted the work. In 1990, the government decided to set up SC UTB tractor S.A. Brasov. Following reconstruction of property rights of individuals on land which was to boost agricultural activities, loom a prosperous period for the company. The sharp increase in prices of tractors and permanent reduction of purchasing power have made these predictions to be infirmed. For comparison, while in 1987 the plant produced 44,000 tractors, ten years later, in 1997 production had fallen to just 1300 units (far under the profit level of 22,000 units annually). As a result, since 1995, the company began to record losses, which materialize in early 1998 over 300 billion debt to the state budget and more than 100 billion debt to the social security budget. Moreover, the lack of liquidity made it impossible to honor the important external commands.

S.C. ROMAN S.A., Brasov

First Romanian truck, model SR-101, Steagul Roşu (Red Flag) was produced in 1954. It was followed by more sophisticated models SR-131 of 3 tons (1962), SR-113 Bucegi of 5 tons (1963), SR-114 and SR-115. From 1969 the plant started the production of the first diesel engines under MAN license (West Germany). In 1971 the ROMAN series models are launched. After 1984, the product range has widened with heavy trucks (30 tons or more) as DAC series. Total production exceeded 650,000 units. After 1990, the low technical level of products performance and low reliability, high price and market development of imported trucks led to the decline of Romanian truck production. The company currently has debts of more than 140 million USD, an output of only 5% of that of year 1989, which ordered the government to put in a special administration.

S.C. ROCAR S.A., Bucharest

In 1956 it was set up in Bucharest the “Autobuzul” Company intended to build vehicles for public transport. After a year in 1957, producing the first bus TV-1 and the first trucks in 1958 (van) TV-4. Over the years it has developed a wide range of models, permanently

improved. After 1990 the company name becomes s.c. ROCAR S.A. In terms of quality and product reliability is sufficient to mention that in 1991 the company offered a guarantee for its car 6 months or 10,000 kilometers. The company currently has no orders, is in financial jam.

S.C. ARO S.A., Campulung Muscel

The first land rover vehicle in Romania was born in 1957 in the Intreprinderea Mecanică Muscel (Muscel Mechanical Company) and was named IMS 57. Since 1970 the company name becomes ARO (meaning the Romanian Vehicle) models launched the ARO M 461 and ARO 24 series. In 1979 appears a smaller range of models codified ARO 10. The weak part of the vehicle was the motor for both ARO 24 ARO 10 modles. That is why, after 1990, the company attempted motor the vehicles with foreign equipment (Renault, Peugeot, Ford, Daewoo, etc..). Domestic demand for such vehicles was relatively low, prices being prohibitive, while on foreign markets, even if sel at low prices, sales volume was low because body and outdated facilities. Company's debts reached 30 million USD in 1994, the situation continued to worsen. With an annual production capacity of 20,000 units and a break-even point of about 3,000 cars per year, the company was below this threshold ARO, producing only on demand. In September 2003 Romanian government sold the company to American company “Cross Lander”. In the privatization contract were sought some 2 million US investments but nothing was really finalized, in the end the equipment of the factory was sold out.

S.C. Automobile Dacia S.A., Pitesti

On August 20, 1968 UAP -**Uzina de Autoturisme Piteşti** (Pitesti car plant) opened - UAP (then named Enterprise Cars Pitesti), with the launch of Dacia 1100, made under Renault 8 license. After a year in 1969, entered into manufacturing Dacia 1300 made also as a Renault 12 license. This series recorded a high longevity in Romania and in the world. This last model began to be exported in 1973. Over time there has been a number of variants: Dacia 1300 Break (1973), Dacia 1310 Dacia 1210 Dacia 1410 (differences mainly of different amount of engine cylinder capacity), Dacia 1410 Sport (resulting in modiying body by the elimination of two doors), Dacia 1304 Pick-up (truck) and Dacia 1307 (double cabin). The Romanian Communist Party leadership called on the achievement of a new model is launched in 1988 Dacia 1320 (CN1 - Building Our No. 1).

Although moral and having overcome a relatively low reliability, however, Dacia was and remained the most popular and most widely owned Romanian car, first because of its price, simplicity of construction, availability of spare parts and the availability of large networks repair. Since its establishment until 1989 the company produced the 1.4 million of Dacia, and to date has achieved a cumulative production of over 2 million cars, of which about 32% were exported.

After 1990, the plant became SCAutomobile Dacia Pitesti and held talks with several car manufacturers, in trying to find a strategic partner to enable upgrade technology and models. In 1997 SC Automobile Dacia SA signed a cooperation agreement with Hyundai Motor Company for providing the assembly in Pitesti, of the Hyundai Accent, alongside the production of Dacia, starting with 1999. Due to the economic crisis occurring in Southeast Asia, Hyundai was forced to revise its strategy and to denounce the agreement. With a collapse in exports and a fall in domestic sales, business survival depended on finding a strong investor. In 1999, Renault bought 51% stake in SC Automobile Dacia S.A. and agreed to keep Dacia trademark and to make investments worth 219.7 million.

S.C. Oltcit S.A., Craiova

In the second half of 1970 state party leaders decided to produce in Romania a small car and affordable for young people. In 1977 started the collaboration with the French manufacturer Citroen, being established a joint venture Oltcit. (Oltenia Citroen). It was

looking to achie a two-door car derived from the Citroen Visa, equipped with air-cooled boxer engine, with engine capacity of 652 cm3 op (Oltcit Special), 1129 cm3 (Oltcit Club), 1299 cm3 (Citroen Axel exclusively produce for export).

Location of the new plant was decided by Nicolae Ceauşescu in 1977, in Zero series are produced in 1980 and in 1981 the two models for the domestic market are presented at Bucharest International Fair - TIB "81.Series production began in 1982. In order to reduce imports, the leadership of party and state has imposed significant construction changes, the adaptation of components from Dacia models. The resulted modeles (Oltcit 11 RT, RM and RL) were not accepted by the French and were marketed under the name Oltena. Anul 1989 marked the completion of a four-door model, introduced in TIB "89 but has not entered into production. The manufacturing never obtained profit, on contrary from each car fit resulted a loss of about 1300USD. În 1989 were produced only 30,511 cars were even the profit level was at about 80,000 pcs / year.

After 1990 in Romania were sold the Oltenia Club 12 model (s) and a pick-up (truck) model. The complex manufacturing process of the engine, air cooling, high fuel consumption, body with only two doors and price comparable to that of Dacia have made Oltcitul not succeed on the Romanian market Overall the there have been produced over 200,000 units, some of which were delivered for export.

Company car in Timisoara (IAT)

Some attempt was made also for very small car segment. The design activity began in 1980, by 1984 were accomplished several prototypes and the approval took place 1985. For producing this car was built a factory in Timisoara, where Zero series was done that was certified in 1987. In January 1989 was shipped the first batch of Dacia 500 Lăstun. The year 1989 was the only year of production of this model. The model of inspiration for the body was the Lancia Y 10 (Autobianchi) but made of polyester reinforced fiberglass, poorly dressed and leak-proved. The two cylinder in line motor, air cooled (499 cm3/22 PA), obtained by cutting an Oltcit Club engine, was a failure.

After 1990 production was stopped and have not been executed even spare parts. The company even split in four companies that produced equipment for agriculture. There were produced and sold a total of 3584 pieces the business generated a loss of 300,000 million lei in in 1990 value.

Daewoo Automobile Romania

The company Daewoo Automobile Romania was founded in 1994 as a joint venture between Daewoo group, represented by Daewoo Heavy Industry - which owned 51% of the shares, and the Romanian state, represented by Automobile Craiova, with 49% of the shares.

Daewoo Automobile Romania has produced city cars Tico and Matiz, small family cars Cielo and Nubira and large family cars Espero and Leganza.

General Motors and other partners took over in 2002 a part of Korean company Daewoo Motor assets, bankrupt, but not counted among the assets and business in Craiova.

In 2004, Daewoo Motor has proposed to the Romanian Government selling stock that they held in Daewoo Automobile Romania, Romanian company debt conversion that they have to Daewoo group companies and selling the package resulting from the conversion.

In 2006 the Romanian authorities started to search for buyers for Daewoo Automobile Craiova, after the state took over the stake of South Korean group in the Romanian company.

Romanian Automotive Industry in the last decade

Romania's automotive industry has grown rapidly since 2000, with sales of 180,927 units in 2004, up from 84,170 units in 2000. The passenger car industry is the most important segment of the market, with 80% of total sales in 2004.

Vehicles manufactured in Romania accounted for 67.5% of total sales in 2004 (down from 92.9% in 2000). Romania's top vehicle maker was Dacia, owned by Renault of France, with 44.2% share of total sales in 2004, followed by Daewoo Automobile Romania (15.1%), owned by Daewoo of the Republic of Korea. Relatively low labor costs, and unimpeded access to the European automotive market are some of the main reasons for the relatively high penetration of foreign firms into Romania's automotive subsector, including autoparts.

Romania was a net importer of automotive products: exports amounted to US$751.5 million in 2004 (US$197 million in 2000), while imports reached US$2.5 billion in 2004, up from US$430.8 million in 2000. The auto industry employed 3.5% of workers in the manufacturing sector.

MFN tariffs on motor vehicles average 21.5%, with rates ranging up to 30%. In addition to customs duties, motor vehicles are subject to: an excise duty between 0 and 9% for new vehicles, and between 1.5% and 27% for used vehicles; VAT at 19%; and a road tax of 5%. In principle, the excise duty, VAT, and road tax apply to domestically produced and imported vehicles. Romania has different customs valuation rules for new and used motor vehicles, including cars, all-terrain vehicles, trucks, motorcycles, and trailers.

Romania has revitalized its automotive industry, mainly by attracting foreign direct investment, through *inter alia*, incentive schemes, including state aid granted to Dacia and lately Ford. Some other companies, such as Daewoo, became eligible for exemption of customs duties, and tax holidays on profits, by investing at least US$50 million in the industry, producing with a Romanian content of at least 50%, and exporting a minimum 50% of annual production. These incentives were eliminated in 2002.

In addition, Daimler is planning to establish a manufacturing venture in Romania, also in the mini- and small car segment. Given these developments, the Romanian car industry will witness a major boost over the next year.

As production was moving towards East Europe countries Romania's role in automotive industry has steadily increased. This was possible based on the following factors:

- Romania had and still has one of the lowest production costs in Europe
- Investment in production facilities in Romania leads to a stronger market presence in Europe for non European companies and presence in East Europe and proximity of ex Soviet Countries for European and non European companies

Opening car production and automotive parts in Romania increased competition and lead to continuous price reduction in the small and medium car segment. Renault continuous process of cutting costs (through Dacia models) increased the operation in Romania in order to stay competitive.

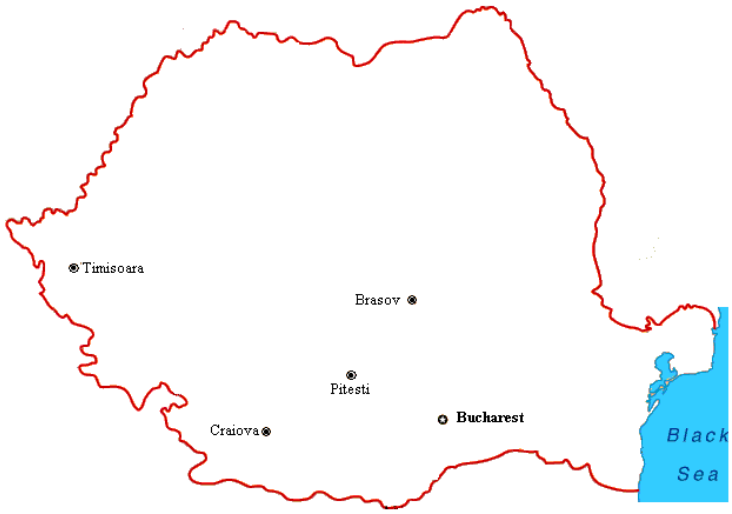
A big amount of R&D is outsourced by foreign companies to local subsidiaries opened in Romania. Dacia has started to outsource some of its R&D activities to suppliers and many foreign suppliers have established R&D and production activities in Romania in order to meet Dacia's demand.

In the commercial vehicle industry sector there was no globalization of the vehicle production though some attempts were made to sign strategic collaborations with important foreign companies. The present Romanian production of commercial vehicles is low and strictly oriented to the local market.

Increased competition from abroad has reduced significantly the sales of Romanian commercial vehicles. Large commercial vehicle producers were considering the possibility to

open production facilities in Romani. Exploring the possibilities to find suppliers in Romania, these initiatives provide opportunities for T1 suppliers to start operations in the country.

Automotive Clusters in Romania

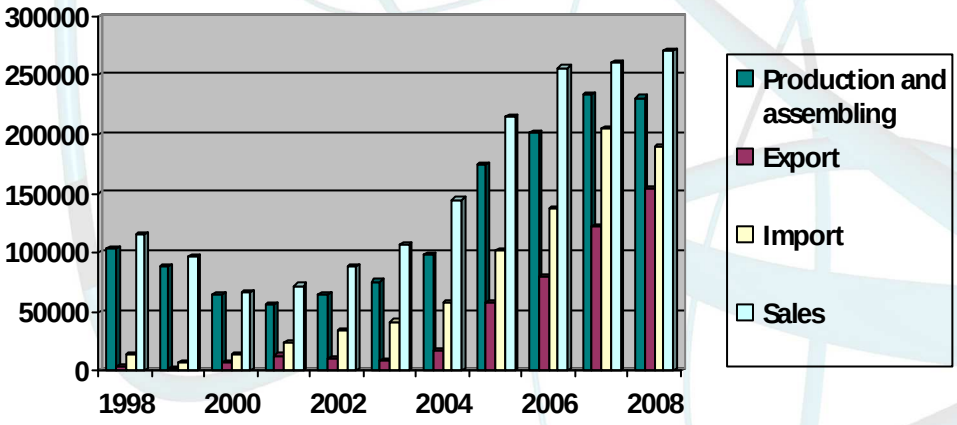


Pic. 2.12: Map of automotive clusters in Romania

Romanian Automotive statistics

Tab.2.9: Data for car production, assembling, export, import and sales.

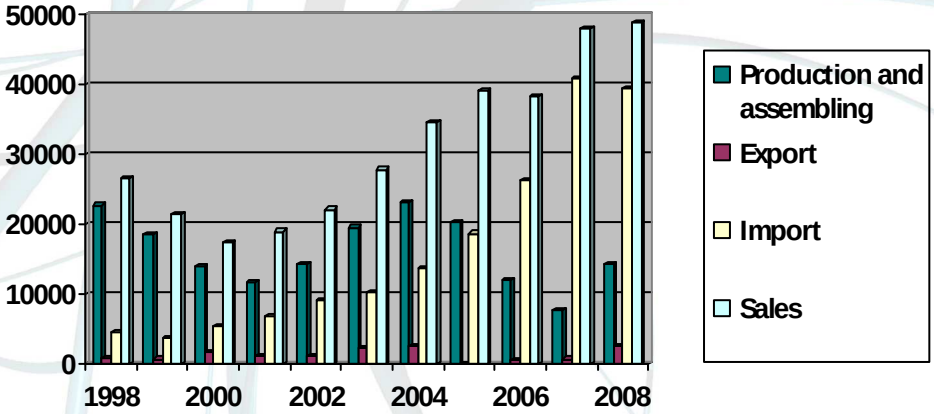
Cars	Production and assembling	Export	Import	Sales
1998	103,931	3,817	13,530	115,833
1999	88,313	2,053	6,764	97,144
2000	64,181	7,772	14,430	66,276
2001	56,774	13,257	23,828	72,157
2002	65,266	11,008	34,277	88,804
2003	75,706	9,230	42,145	106,763
2004	98,997	16,985	58,165	145,120
2005	174,538	58,653	102,043	215,532
2006	201,663	80,032	137,252	256,364
2007	234,103	121,866	204,719	260,621
2008	231,056	153,595	189,050	270,995



Pic. 2.13: Evolution of car production, assembling, export, import and sales

Tab.2.10: Data for commercial vehicles production, assembling, export, import and sales.

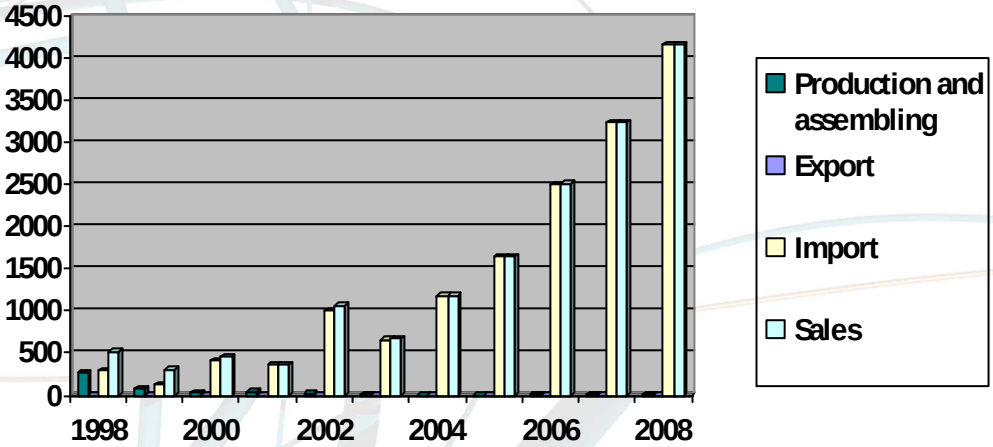
Commercial vehicles	Production and assembling	Export	Import	Sales
1998	22,706	827	4,547	26,582
1999	18,506	684	3,695	21,468
2000	13,948	1,596	5,324	17,440
2001	11,611	1,025	6,854	19,005
2002	14,172	1,063	9,165	22,135
2003	19,540	2,189	10,297	27,873
2004	23,188	2,449	13,809	34,623
2005	20,264	75	18,700	39,235
2006	11,926	446	26,369	38,285
2007	7,599	685	40,963	47,961
2008	14,241	2,503	39,352	48,920



Pic. 2.14: Evolution of commercial car production, assembling, export, import and sales

Tab. 2.11: Data for buses production, assembling, export, import and sales.

Buses	Production and assembling	Export	Import	Sales
1998	267	0	291	520
1999	78	0	123	305
2000	36	0	417	454
2001	40	0	358	358
2002	18	0	998	1,061
2003	6	0	663	669
2004	0	0	1,184	1,184
2005	0	0	1,647	1,647
2006	8	0	2,506	2,513
2007	10	0	3,227	3,237
2008	11	0	4,153	4,165



Pic. 2.15: Evolution of buses production, assembling, export, import and sales. Data based on "Buletin statistic auto Apia"

Romanian Automotive industry in 2009

In 2009 Romanian auto industry and the market dropped by half compared to 2008 which had a notable influence on the car production.

Dacia suspended activity during January 26 to February 8, following the dramatic and continuing decline of auto market, particularly that of Romania. After production stop, Dacia has restart car manufacturing particularly because of good sells in Germany. Therefore it was forced to take the new measures to grow production from 1085 to 1200 cars a day. Sells rose also on Romania market after the quotas allocated in the "Rabla" program were approved. Number of machines available was supplemented to 60,000, and the first to dispose of and it increased to 3,800 lei. Due to increase demand of cars on internal and foreign market, Dacia ecruited another 500 people as of June 15. In July Dacia celebrated 10th anniversary of collaboration with Renault. In November, Dacia has presented the name and model of competing lines Duster. The car piloted by Alain Prost was launched in the Andros Trophy.

In March, Dacia has presented the first time in Romania the company's first concept car which was later launched in Generva Motor Show. Duster is an MPV (Multi Purpose Vehicle) with high figure (1.49 m), generous wheelbase (2.80 m) and compact dimensions (4.25 m long, 1.64 m wide). Another model, Stepway Sandro which was started to be sold on the Romanian market in the second half of June 2009, was presented in Barcelona

Ford Romania received Senate approval in early February for the allocation of State aid necessary for investment in car production which will worth 143 million euros by 2012.

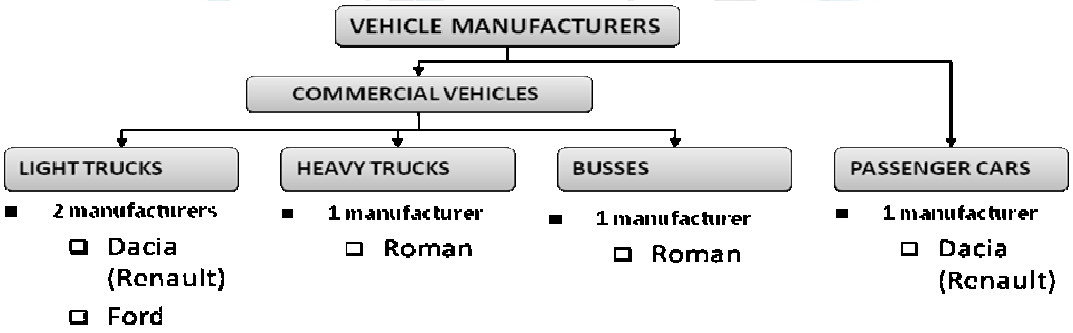
In September Ford launched it first model manufactured in its factory in Craiova after in May was approved the 400 million loan from the European Investment Bank. The same bank approved Renault a loan of 83 million Euros for the project Renault Technologie Roumanie (RTR) in Titu where a Research and Development Center is being built for testing and refinement of Renault technologies.

Germany's PREH GmbH in Bad Neustadt / Saale started production of multifunctional steering wheel switches and adjustable air conditioning systems. in March in a new factory, located in Brasov. Here are products The plant S.C.. PREH Romania SRL employed 95 people with the plan to increase staff by 250 persons. The plant currently operates on a work surface 4700 meters, with a planned gradual expansion to 11,000 meters.

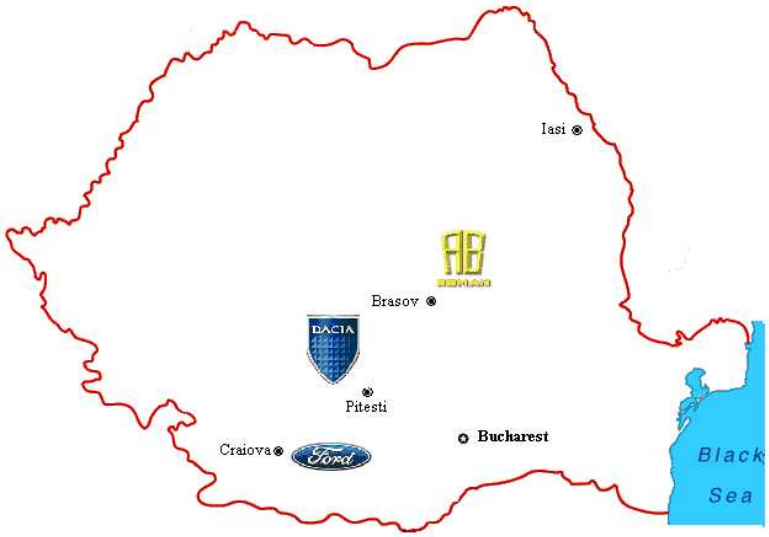
Romanian manufacturers

At the moment in Romania are 3 manufacturers which produce automotive vehicles in four categories:

- ***passenger cars***
- ***light trucks***
- ***heavy trucks***
- ***buses***



Pic. 2.16: Diagram of vehicle manufacturers in Romania



Pic. 2.17: Map of vehicle maufacturers locations in Romania

Tab. 2.12: Vehicle manufacturers in Romania and their characteristics

DACIA	Dacia became one of Renault Group's brands on 2nd July 1999, under the privatization contract, having as its main mission to sustain the Group's development on emerging markets. In 2004, Dacia launches the Dacia Logan, with its two 1.4 and 1.6 petrol versions. The CKD (ILN) Exports Centre is inaugurated in 2005, at the same time as the third Logan model – the 1.5 dCi version. In 2005, the Logan lead Dacia to beat all its production (172,000 units) and sales (164,000 units) records. Dacia product range consists of Logan Sedan, Logan MCV, Logan Van, Logan Pick-Up, Dacian Sandero and Dacia Sandero Stepway. The Dacia Duster will be lauched in 2010. **Employees** around 13,000 **Capacity and products** 350,000 units a year

	6 car models gasoline, diesel and LPG engines **Plant Size** site: 310,000 m2 **Investment amount** Euro 1.5 billion
Ford	Ford company bought in 2007 72,4 million EUR the Automobile Craiova company (owned by Romanian Government after it has bought it form South-Korean Daewoo). After several talk rounds and fixing problems raised by the EU (which claimed the return of illegal state aids provided by Romanian government), Ford company started to renew technology of the production units. Now owing 90% of the company, Ford foresees an investment of 800 million EUR, a production of 200,000 units per year starting with 2012 **Employees** around 3,900 **Capacity and products** 1,000 units (September-december) 2009 1 car model (Ford Transit) **Plant Size** site: 109 ha **Investment amount** Euro 1.2 billion Euro
AB ROMAN	**Employees** around 4,500 **Capacity and products** 1 bus model 3 truck models >20 special heavy vehicles for civil utilitarian, military, oil transport and special uses **Plant Size** site: 100 ha **Investment amount** Euro 50 million Euro

Supplier sector

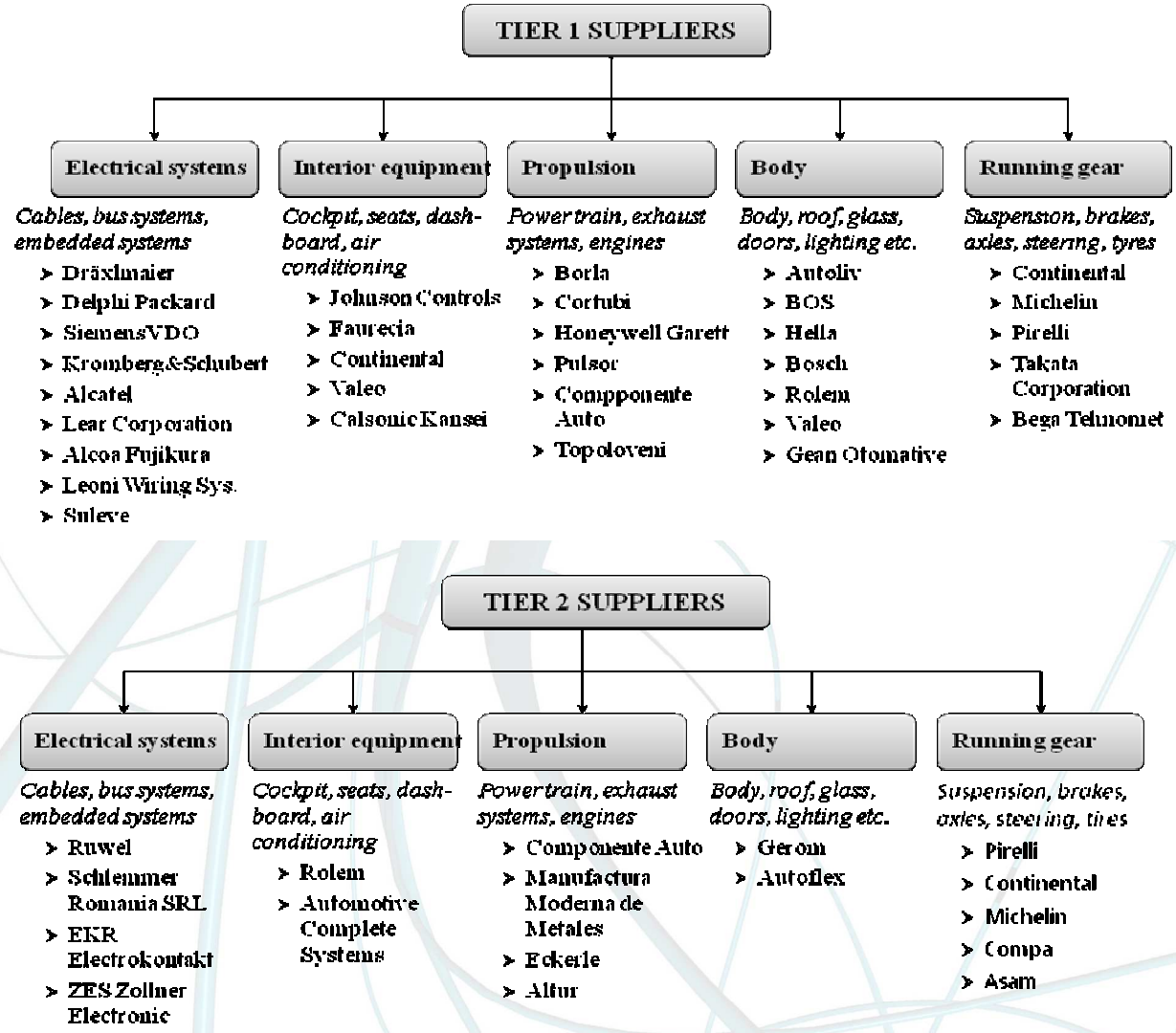
The Romanian car parts industry has experienced rapid expansion over the last five years as several large foreign parts producers established production plants in the country. The automotive industry in Romania had until recently two large foreign vehicle makers, Daewoo and Renault. Numerous parts production plants have opened in to support these facilities. 58% of the spare parts used by Daewoo were domestically produced and Daewoo co-operated with 226 Romanian producers who supply more than 1,000 parts.

The Romanian automotive supplier sector has followed the evolution of the car producer in Romania. The major car production facilities located in Pitesti, Craiova, Braşov and Bucureşti has concentrated most of the supplier companies. These companies had to face the changes car producer went through.

Before 1990 all suppliers were producing for national car producers in Pitesti, Craiova, Brasov, Bucuresti, Campulung and Timisoara. When Romania started to open to foreign investors, a lot of Western European and international automotive suppliers have open subsidiaries in Romania based on the existence of a relatively skillful but cheap working force.

The current situation provides excellent opportunities for suppliers of all tiers. Ford is partly looking for a new supplier network and Daimler will also be looking for low-cost but good quality suppliers to support their strategy. Currently, the Romanian automotive industry consists of a limited number of players (as compared for example with Poland).

Structure of supply chain is composed by 1-Tier, 2-Tier, 3-Tier suppliers and other small and medium enterprises.



Pic. 2.18: Tier 1 and Tier 2 suppliers in Romania

Strengths and Weakness of Automotive Industry in Romania

Strengths:

- Strategic location between West, Central Europe and Ex Soviet countries which are markets with great development potential (Russia, Ukraine, Belarus, Moldova)
- Piteşti is near the country capital and the biggest airport. First (oldest) highway between Piteşti and Bucharest
- Stable macroeconomic environment
- Strong mechanical engineering tradition
- Traditionally quality technical education and built domestic R&D network
- Presence of two world-class car producers and suppliers

- Good quantity of local sub-suppliers
- Growing cooperation activities between industry and universities with a industry more willing to invest in universities
- Cheap and relatively high qualified labour force
- Government open to foreign investments in automotive industry. Facilities offered for strategic investors.
- Long tradition for the cooperation between Dacia and Renault
- Paired manufacturing and R&D centre developed by Renault

Weaknesses:

- Educational system suffering from insufficient financing, insufficient involvement of private financing
- R&D potential of universities and R&D institutions not in the nearby of assembling facilities is not efficiently used.
- Sub financing of Universities and R&D institutes.

Opportunities:

- New supplier opportunities due to relocation of global automotive and electronics R&D towards East-Europe countries
- Support for the innovative environment in the automotive industry
- Development of Autoclusters (only one cluster for the moment, in Timisoara)
- Strengthening cooperation between car producers, sub-suppliers, engineering companies and universities as well as the openness of universities towards cooperation with industries
- Opportunities for the creation of new high innovative small to medium size companies
- More efficient use of research networks under national and EU framework programs and their results

Threats:

- Unbalanced external dependency of the automotive sector
- Car manufacturing and thus product suppliers are concentrated in the southern part of Romania

Automotive industry in Bulgaria

History

The Automotive industry is outcome and assembly of almost all industry branches. It starts with the design, and then comes everything else: metallurgy – chassis and engines, electrical wiring, electronics, rubber and plastic - sealing profiles, hoses, and etc.

In the early 20th century Bulgaria was rapidly industrialized and in the end of the twenties prototypes of the first Bulgarian buses and trucks based on chassis of Fiat, Chevrolet and Mercedes were manufactured.

After World War II the whole industry was controlled by the government therefore, there were several unsuccessful attempts to start mass production of licensed western Europe car models such as Fiat 124, Renault 8 /10, Alpine. A few car prototypes were also built by the state enterprise Balkancar. Finally Moskvitch prevailed as in 1966 began import of parts and assembly of the Moskvitch 408 and 412 from USSR. In 1985 40% of the parts were manufactured in Bulgaria. In Bulgaria were produced also public transport buses, coaches and trucks in collaboration with MAN, Shkoda, GAZ and others.

During the communist period most of Bulgarian automotive industry was merged under the name Balkancar. Balkancar was pride of its forklift trucks powered by electrical engines. They were exported not only in the countries of the former Eastern Europe, but in Japan. A project still attractive today is the Balkancar universal hybrid car, introduced in September 1988 and designed as an original design with easy to replace (or combination of) driving force - muscle power and electric motor powered by batteries and solar energy.

Helioscar by Balcancar.

Automotive industry today

The complete economic reconstruction in Bulgaria ruined the whole status of the industry. There were 2 - 3 automotive plants left producing some spare parts. But after 2002, clear expectations were set for Bulgarian membership in the European Union. Since then, in Bulgaria were invested about 1 billion euro in companies supplying components to automobile manufacturers in Europe.

French automotive parts maker Montupet has selected Bulgaria for investments of 50 million for a euro project. The plant will produce aluminum parts for engines, braking systems, and chassis. The car parts that will be produced in Rousse town will be used in Renault, Peugeot, Audi, and Ford. The expected exports volumes in the first year are worth 20 million euro.

For some years now, Bulgaria's automotive pride during presentations abroad - a subsidiary of Belgian EPIQ, the Botevgrad-based auto electronics plant now exports production for some 50 million euro a year. Among the companies which have built their own production facilities are the UK William Hughes, Japan Yazaki Corporation and Sumitomo Electric Bordnetze.

There has been strong interest in recent times, but rather in greenfield investments than in cooperation with the old Bulgarian factories. The latest example is the intention of Swedish Consilium which invested more than five million euro in the site Iliyantsi, near Sofia.
Bulgaria has become also an attractive place for Turkish investments. The first companies which turned their eyes toward Bulgaria were Arkomat and Nursan Automotive.
World economic crisis further reinforced the position of Bulgaria, because of the lower production costs in Bulgaria.

Recent investments still under construction:
A positive element in the automobile industry in Bulgaria are the plans of the Chinese company Great Wall Motor ltd for complete assembly of automobiles around Lovech town – the Coolbear minivans and other models suitable for Bulgaria, for which more than 6 million dollars have been already invested. The representatives of the Chinese auto corporation and their partners from Litex Motors promise that the car will be available on the market by the end of 2010. Coolbear has a 1.5 l motor with 103 h.p. corresponding to the Euro 5 and the design of the car looks very much like Toyota Scion xD, but it will be much cheaper. The manufacturing also of other Great Wall models is planned – Florid sedan, Wingle pickup and the Hover 5 crossover as the annual production of cars will be around 50 000.
The first production line for automotive glass in Bulgaria starts in April this year. Then is expected the inauguration of a new factory of the Turkish company Sisecam in Targovishte. The facilities are installed and test series are made. Annual plant capacity will be 300 thousand sets of complete automotive glass equipment. Production will be exported to the factories of Ford, Toyota, Volkswagen and Dacia.

Automotive parts suppliers and R&D centers
Bulgaria currently produces automotive electronics equipment, wire harness, parts for chassis and engines systems, interior details, etc. Below are listed R&D centers and companies that suppliy components for the automotive industry divided in three groups: **Electrical Engineering, Metal Engineering and all the rest**.

Electrical Engineering
ZMDI Eastern Europe EOOD - Varna
ZDMI started its R&D center in 2008. The small enterprise is nearly 20 people, but is involved with state of the art green technologies. It has laboratories for integrated circuits development and testing. Products developed in ZMDI centers in Varna are used as interface between sensors and microprocessor. Other research area is battery charge management on one Chip for the automotive industry.

Belchev Motors - Stara Zagora, R&D
The role of the centre is developing Bulgaria's first electricity-powered automobile of the XCAR type, because this type of car has many advantages - absence of air pollution, a low level of noise, high reliability and durability, low cost of operation. Equipment – computers, laboratory, lathe, cutter, specially equipped hall for assembling electromobile. Main activities are diagnostic and repairing engine, suspension, electrics.

Epiq Electronic Assembly Ltd - Botevgrad
Founded in 1997, it is an electronic subcontracting company. Cutting edge production facilities in Epiq Electronic Assembly benefit from three main production sites in Bulgaria. The first covers 4000m2, the second an impressive 8000m2, and the company has recently inaugurated a 14,000m2 site featuring state-of-the-art facilities. EPIQ is specializing in the manual and automated assembly of electronic components on PCB, including SMD and automated insertion processing. Other key activities include board function testing, module

assembly – attaching the circuit board to other parts such as plastic housing and final function testing. Core services also feature plastic injection moulding, chip-on-board assembly, and the development and manufacture of plastic injection moulds and factory automation equipment.

Melexis Bulgaria Ltd - Sofia
In 2006 Melexis opened 12000 m² site including one of the largest clean rooms in Bulgaria. This 1000 m² wafer probing area meets class 10 000 requirements of the US FED STD 209E clean room standards and is equipped with 25 new wafer probing machines and has a total capacity of 100 machines. Over 50 new test cells for final testing are in place currently. The current work force is 200 people. Melexis create, manufacture and deliver for the automotive electronics market various products such as advanced Mixed Signal semiconductors, sensor ICs, and programmable sensor IC systems. Melexis is developing industry leading innovation in programmable sensors, sensor interface devices and microcontrollers that provides competitive advantage in system cost, capability and flexibility.

Johnson Controls Electronics Bulgaria EOOD – Sofia
Currently Johnson Controls Bulgaria has 52,000 square feet office area that space the team of about 500 employees (incl. 460 engineers). It provides project support and delivery of automotive software development and validation, hardware solutions design and prototyping, mechanical engineering services and global IT support in close collaboration with Johnson Controls teams located in France, Germany and USA. 10% of the Johnson Controls Bulgaria employees are students. In Bulgaria are constructed multifunctional displays for all cars series of Renault Clio. JCS Bulgaria is developing the board control systems for Nissan Micra, Citrooen C6, Daimler Chrysler. In Sofia is produced the entertainment software that controls the rear seats integrated multimedia consoles of Mercedes S Class.

Tremol SMD Ltd - Veliko Tarnovo
Tremol SMD Ltd is a contract electronic manufacturing company founded in April 2006 as part of Tremol Group Bulgaria. The company owns building of 2400 square meters with 1500 square meters of production space and 900 square meters administrative and engineering facilities, together with an additional PTH assembly department in the town of Svishtov. It has 86 employees and its electronics engineers are experienced in R&D, electronic design, electronic testing, moulds and plastic parts design, plastic injection, mechanical parts design and production, etc. Tremol Ltd has additional production department for manual soldering and manual assembly.

Hybrid Integrated Circuits Ltd - Sofia
Hybrid Integrated Circuits Ltd.(HIC) was established in December 1996 on the bases of the Hybrid Microelectronics Department of the "Institute of Microelectronics" (IME – Sofia). HIC and its predecessor have more than 30 years of experience in the field of thick and thin -film technologies, and SMD assembly. Its highly qualified design engineers utilize up-to-date software tools. The production is export orientated — more than 90% of our products are exported to Western Europe. HIC manufactures Custom hybrid IC's, resistor networks, high-voltage resistors, PCB assemblies.

BRSP Autoelectronica - Plovdiv
BRSP “Autoelectronica” is a joint company, established in Plovdiv in 1986, as the only producer of automotive electronic modules and microprocessor systems for the former Eastern markets. Today BRSP “Autoelectronica” is orientated towards the high technologies for production of competitive products for Bulgarian market and export as well. The Engineers and the highly-skilled personnel together with external partners are carrying out

the design and the production of new products. Today BRSP “Autoelectronica” has at its disposal several specialized production workshops, a vast area, equipment and all the specific conditions for batch production of electronic products, tools, plastic parts and Wire-O systems for binding.

Bulgaria SE Bordnetze - Bulgaria E00D - Karnobat, Mezdra
The company was originally founded back in 2002 as a logistics center of Volkswagen Elektrik Sistemleri A.S. - Cerkezkoy, Turkey in Kazanlak. In 2004 the company expanded and moved to Karnobat and built a plant with area of 8984m^2 and total staff of 1009. Volkswagen Bordnetze GmbH was sold to Sumitomo Corporation in 2006. Since then the company is autonomous and it operates under the new name "Sumitomo Electric Bordnetze - Bulgaria" EOOD. 2008 the company expanded further and founded a new plant in Mezdra with area of 7600m^2 and 373 employees. Currently they have 2 production locations in Bulgaria and 3 more owned by subcontractors Arkomat EOOD and Ates EOOD. “Sumitomo Electric Bordnetze - Bulgaria" EOOD supplies for variety of automobile platforms of Volkswagen, Audi and Skoda. The basic steps to complete a wire harness are as follows: cutting, crimping, welding, twisting, forming and testing. The most important step is the forming of the wire harness. On the form-tables the wires are bundled together to the exact technical specifications given by the customer.

Nursan Otomotiv EOOD – Bourgas
Nursan Otomotiv EOOD has been established in 2002 as a wiring harness manufacturing company specialized in assembly operations and direct deliveries to European countries. The company acts today as a subcontactor to Nursan Elektrik Donanim and provides a wide range of products to passenger cars, trucks, LCV’s and SUV’s, i.e dashboard, engine, doors, roof, tailgate, ABS and airbag harness families. On the other hand, the company holds a big potential to expand its activities and capacity to manufacture white goods wiring harnesses and other products. Nursan Otomotiv EOOD employs 240 employees over 2500 sqm closed area and is expected to achieve total sales of $14 million by the end of 2004

Yazaki Bulgaria EOOD - Yambol
Yazaki Corporation invested 25 million euro in Its Bulgarian plant with area of 25000 square meters. Yazaki Bulgaria EOOD employs 1800 workers and it plans to extend its work force to 2900 workers. Yazaki produces all kinds of automotive Electrical Distribution equipment. Current projects are wiring harness for Renault Megan and Renault Scenic.

Arkomat Bulgaria EOOD - Kazanlak
Arkomat is an international subcontractor company which manufactures wire harnesses for Volkswagen Electrical Systems Inc. Arkomat has been one of the leading companies in the wire harness industry with its 750 people employed in Bulgaria since 1999.

AMK Drives and Controls Ltd. - Gabrovo
The centre has a key role in the structure of AMK “Drives and controls” Ltd. There The staffs assigned to the center is highly qualified in the specific fields of AMK equipment and its application, drives and controls, building automation machines, laser technologies and etc. The centre is managed by a professional who established certain working manner, which secures the most effective and efficient functionality of R&D centre. So, the principles of team work and partnerships with a number of representatives of different bodies – privately owned companies, Universities, R&D centers and others are strongly applied in the everyday work.

MONBAT - Mezdra

MONBAT Plc. is a fast developing company which manufactures lead-acid batteries for various applications. Its products have been present on the international market for more than 50 years. The company's wide product range includes starter batteries, stationary batteries, leisure, solar, marine batteries, special batteries for military applications (designed to meet both Russian and NATO standards), and locomotive batteries. Monbat production facilities are located in the North-West Bulgarian town of Montana. The company employees a team of highly qualified experts, which along with the latest technologies and equipment, as well as the constant introduction of resulting innovations, makes it highly competitive on both the local and international markets.

Metal Engineering

Consilium components AD - Sofia

Consilium is a Swedish company and it established its Bulgarian branch in 2004. Consilium Components is one of Europe's leading companies as concerns tool production and component manufacturing within the fine blanking area. The company has 400 employees globally and in Bulgaria about 60. Fine blanking is a technology through which one can produce extremely high precision components. Consilium Components use very complicated CAD/CAM systems and high-tech tools and matrices. In Bulgaria it works mainly for the automotive industry, producing parts for Volvo, Getrag, Husqvarna, Valeo, etc.

MAGNETIC MEDIA AUTOMOTIVE LTD - Pazardzik

Magnetic Media automotive Ltd. was founded in 2000, as an independent company on the territory of the former factory Magnetic Media co. It is situated near a major motorway, in Dragor, municipality of Pazardzhik. MM automotive is situated on 450 square meters all-out area and has its own buildings, machines and equipment. The company is specialized in production of automobile spare parts for different automobile trademarks, for example ball joints, tie rod ends, centre rods, stabilizing links axial joints and etc. All employees and workers in MM automotive ltd. are highly qualified with high and technical education and have at least 5 years working experience in this branch. It has production capacity of 20000 pcs. per month. MM automotive could start production of new parts per given samples or the customer's technical documentation. The company has capability of designing production technology and working out the relative technical documentation.

Balkancar Record Co - Plovdiv

Balkancar Record Co. was established in Plovdiv in the middle of the fifties of the 20th century. It was a part of the BALKANCAR HOLDING COMPANY, which established and upheld the traditions of Bulgarian industrial truck production. Today, Balkancar Record Co. is one of the leading manufacturers of engine-powered forklift trucks in Bulgaria. The company's product range includes electric forklift trucks, diesel and LPG engine-powered industrial trucks, tow tractors of the RECORD family. Depending on the modifications, the capacity is from 1250 up to 8000 kg, the lifting height load from 2800 up to 6400 mm, and the drawbar pull is 15 to 20 kN.

Metal Technology Group - Sofia, Metal Engineering

Metal Technology Group incorporates leading Bulgarian companies specialized in production of aluminium castings, grey and ductile cast iron castings, steel and alloyed steel castings, centrifugal castings. The headway achieved by the company is due to: constant development and improvement of the technologies and equipment distinguished by many international awards; construction of complex manufacturing installations for sophisticated products, covering the entire production process from research and design to casting, machining and assembly; possessing complex and modern control equipment; always providing solutions and meeting complicated customer requirements; automation of technological and

production processes by using the latest achievements in the field of microprocessor engineering; complying with the highest standards for labour safety and environment protection. It incorporates three production plants: Alucom – Pleven, Ossom – Lovech, Centromet – Vratza, Arma - Loznitza

Madara Group - Shumen, Metal Engineering

MADARA has more than 50 years of experience in the production of heavy duty vehicles, rear and front driving truck axles, agricultural and road construction machines, gears and shafts, castings and forgings, springs and stamps, tools and tooling equipment.

Oskar Ruegg Bulgaria EOOD - Stara Zagora

The automotive field is extremely demanding. It is characterized by an incredible variety of ideas, requirements and demands. Oskar Ruegg provides faster perfect solutions in all of the following segments: infotainment, lighting, interior solutions, connectors/shieldings, motor management. Oskar Rüegg has a solution for your needs, fast and perfect. Many of the parts produced by the “Automotive – Infotainment” division are designed to meet the highest safety standards. Oskar Rüegg AG counts on many years of experience in producing even the most complex parts using high-strength stainless steel. The parts are capable of enduring extreme environmental stresses – such as temperature fluctuations, vibrations and humidity – without being damaged. Even the packaging requirements are high and varied.

DF Bulgaria EOOD - Dragoman

In 2005 DF Bulgaria was founded in Dragoman. Its tasks comprise manufacturing perforated plates and processed products made of perforated plate as well as ensuring the logistics and the distribution perforated plates in Southeast Europe. At present, DF Bulgaria employs 40 people and, with modern production equipment, manufactures perforated tubes, punched parts, drawn parts and welded parts according to German standards. In order to achieve synergy effects in the Group, all Group companies work closely together concerning distribution and manufacturing issues.

MONTUPET EOOD - Russe, Metal Engineering

Montupe invested 100 mln euro in 3 production lines for alluminium details. The Rousse plant is producing aluminum parts for engines, braking systems, and chassis, alloy wheels. About 3,000 cars are fitted daily with parts "made in Russe".

William Hughes Bulgaria - Plovdiv

William Hughes Bulgaria opened the factory for production in November 2004. They employ around 100. The factory is currently 3,000 square meters with land for expansion. The factory is located near Plovdiv, Bulgaria's second city, just 1 hour 15 minute drive down the motorway from the international airport of Sofia. Current manufacturing facilities include 15 CNC wire bending machines capable of bending wire from 0.4mm - 12mm. For assembly work there are spot welders, automatic welding cabinets and 6-axis CNC welding robots. For finishing parts there are 2 nylon plastic coating lines and a paint line.

Other automotive parts

Aspect III - Dobrich, Everything Else

Aspect III is found in 1990 year in Dobrich town. The company is specialized in production of Air, Oil, Fuel and Hydraulic filter elements for cars and commercial vehicles such as buses, trucks, excavators, loading machine, tractors, combines, locomotives, ship and etc.

Grammer AD - Trudovetz, Everything Else

The Grammer brand stands for mobile comfort and safety. As a partner to the vehicle manufacturing industry, the Grammer are specialized in innovative developing and producing

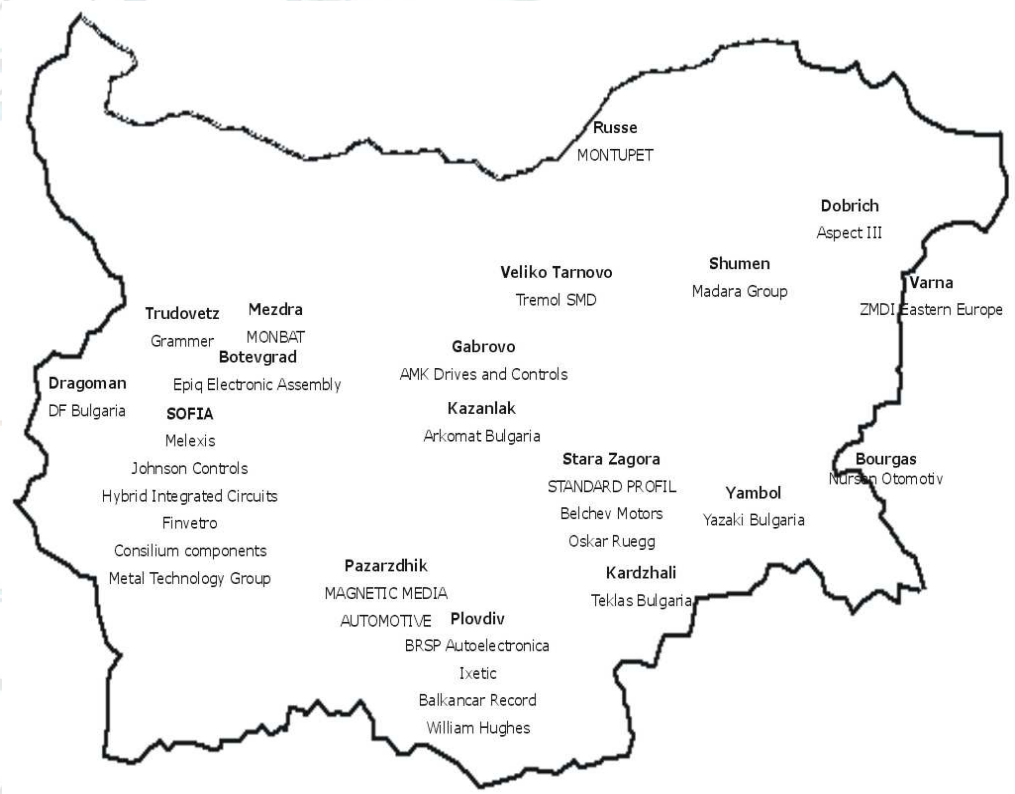
driver and passenger seats as well as components and systems for automobile interiors. Grammer AD bought production facilities of former bus plant Chavdar in 1997 and in 2008 it invested in new second production plant. Grammer is hiring about 700 people.

Finvetro - Sofia, Everything Else
The Finvetro Group established joint company with Bulgarian glass producers in 2004. The glass production of Finverto varies from lenses for automobile headlights to components for household appliances and lighting. The outstanding quality of the products is guaranteed by the use of the best raw materials, high precision moulds and finishing, which is totally designed and created by Finvetro and its group members. The whole process is constantly monitored, allowing it to reach standards of the highest quality through the perfect combination of the resources used and the services provided.

Teklas Bulgaria AD - Kardzhali, Rubber
Teklas is the first manufacture of automotive rubber products in Bulgaria. Teklas started its production line in 2006 on area of 6400 sq.m. with work force of 200 people. Teklas export all kind of fluid system hoses and engine sealing parts needed in car production to Volkswagen and Opel.

Ixetic Plovdiv EOOD - Plovdiv, Engineering
Ixetic is a partner and supplier to all well known car and commercial vehicle manufacturers, and sets standards worldwide in engineering, quality and customer orientation. Ixetic develop and produce a wide portfolio of hydraulic and vacuum pumps, transmission components, as well as air-conditioning compressors with CO2 technology and adjustable lubricating oil pumps. Our product spectrum is rounded off with electrical pumps and special solutions for a wide range of applications.

STANDARD PROFIL BULGARIA AD - Stara Zagora, Rubber Products
SP Bulgaria Plants has been started on January 2006. This plant has got 50525 m2 open area including 9720 m2 plant area, 670 m2 management plant and totaly 10390 m2 closed area. It has 110 workers at the begining of March 2006. 83 workers have been working on the production department, the rest of them working on quality, maintenance, logistic and finance departments. It has been estimated that at the end of 2006 They'll approach to 250 people. Standard Profil is a supplier enterprise producing sealing profiles for Turkish and European automotive manufacturers.



Pic. 2.19: Situation of Bulgarian automobile companies on the Bulgarian territory

Automotive industry in Croatia

Tradition, Quality-engineering, Well-known Customers

Automotive components production in Croatia developed as a part of the automotive vehicle production in ex-Yugoslavia (Zagreb Bus Factory in Croatia, IMV (Renault) and Maribor Truck Factory (TAM) in Slovenia, Zastava and Automobile Factory Priboj (FAP) in Serbia, and TAS (Volkswagen) in Bosnia). It's development was based on the expertise and a strong tradition in relating sectors such as metal processing, welding, plastics, construction and agricultural machinery building. Croatian automotive components companies have a strong tradition in high precision and zero defect tolerance in manufacturing and their main advantage is the excellent quality level of their products. Most of them have both general standards like ISO 9001 and industry specific standards such as TS 16949.

Beside groups of companies in Zagreb, Nova Gradiška, Slavonski Brod and Split with a long experience in this industry, recently there have also been positive examples of several new local companies that achieved complete integration into international chains of part suppliers for world well-known car producers (PSA, GM, Fiat, BMW, Audi, Ford, Renault, Toyota, Volvo, Daimler Chrysler, etc.). This is emblematic of Croatia's entrepreneurial culture and marketing mindset, as well as the availability of locally produced management talent and the underlying competitiveness of cost/quality/engineering skills combination in certain niches of the automotive components industry.

"Croatian component suppliers seem well positioned to respond to the challenge of strengthening collaboration with their customers. Many have successfully developed a new product line or service, or upgraded existing ones in the past three years. The use of AutoCAD and other software for the design and development of components is relatively widespread compared with the situation in other Western Balkan economies. Based on the results of the RCS and company interviews, many Croatian part suppliersalready collaborate with their customers in areas that require a deep, stable and medium- to long-term business relation, such as product development, product design and production planning. They do so at a level which remains virtually unmatched elsewhere in the region. All these elements point to the existence of relatively deep and strong relationship between local suppliers and international customers." OECD, Recommendation for Regional Investment Strategy, 2009.

Industry Track Records

Croatian automotive parts producers have proven their high standards and quality as they deliver products to some of the most known upper-market car producers such as *Bentley*, *Ferrari*, *Mercedes*, *Alfa Romeo*, *McLaren*, *Lamborghini* and *Aston Martin*.

Small But Croative Companies

In 2007 there were 74 vehicle parts production market players. 68 of them were small companies: mostly small enterprises specialized in metal processing, plastic processing and electronic parts production. Small enterprise structure enables higher flexibility, better responsiveness to client's needs, possibility to enter market niches and adapt to new products and technologies.

Croatian spare parts manufacturers deliver more complex and high value added products (instead of competing in mass production like car assembly) which requires higher technical skills, innovation, flexibility and design.

Growing Interest For Cooperation From Big Automotive Suppliers
MAGNA Croatian Cooperation Day for Automotive Suppliers
A conference and cooperation meetings were organized in November 2008 by APIU, Magna International Inc. and Croatian Automotive Cluster. More than 40 Croatian companies participated.
"We don't expect to immediately sign a contract with MAGNA, but, since the people from Magna Europe Purchasing Initiative are present, we hope to establish valuable contacts that are crucial for future businesses. We are glad to be one of the seven companies in which Magna has shown major interest. We believe to have competitive quality and prices as we have proved in our cooperation with Bosch, Continental and Zetor." Damir Ištvanić, owner of Eloda
"We have been working with Magna in Russia and Austria and our customer portfolio includes Renault, Peugeot, Citroen, Ford, BMW, Opel and GM. We supply them with finished products based on the plastic and thermoplastic materials processing for the interior and the exterior of cars. Now we are expecting an expansion in our cooperation with Magna, especially on the Russian market. We are trying to respond to the current crisis with flexibility of prices and the use of new technologies." Boris Mišić, AD Plastik Program Manager

INDUSTRY PLAYERS

Top Automotive Suppliers in Croatia

AD PLASTIK
AD Plastik d.d. is a company engaged in the manufacture of plastic products, mainly for the automotive industry. Its car products are divided into two groups: interior products, comprised of instrument boards, roofs, door paneling, panel pockets, thermally formed carpets, central console, backseat shelf, column paneling, steering column paneling, window handles, door handles, arm rests, hand brake paneling, ashtrays, ceiling light fixtures, and roof handles, and exterior products, comprised of front and back painted bumpers, fog lights fixtures and covers, decorative profiles, front air intake, fender lining and fuel tank lining.
The Company also offers other plastic products, including household products, packaging materials, injection and extruded products, products for the electric industry, seats for stadiums and garden products. It has three subsidiaries, in Russia, Slovenia and Romania. Its customers include Revoz Novo Mesto, Volkswagen, BMW, Renault, Peugeot, Citroen, Ford, Opel, SM, and many others.
- 1000 employees
- More than 90% of all production is exported
- Total income: 92 million EUR (2008)
- Own Product development and design
- Factories in Russia, Romania and Slovenia
- Certificates: ISO 9001, ISO TS 16949, ISO 14001, Q1

ELODA
A supplier of hydraulic brake light switches – hydraulic, pneumatic and mechanical, oil pressure switches, radiator fan switches, temperature sensors, reverse light switches, push buttons.
- 50 Employees
- More than 95% of all production is exported
- 78% EU customers
- Own Product development, testing facilities
- Certificates: : ISO 9001:2000, ISO/TS 16949:2002, ISO 14001:2004

▪ Main clients: Bosch, WABCO, Herth+Buss, Continental, Teves, Zetor, Tractors, Beru, Pro car, FAE

AVL - AST

AVL is the world's largest privately owned company for development, simulation and testing technology of powertrains (combustion engines, transmissions, hybrids, electric drive, batteries and software) for passenger cars, trucks and large engines.
Croatia is the center for software development (simulation software and automation software for test beds) as well as an active partner in projects for automotive OEM-s (Daimler, Audi, PSA, Renault, Suzuki, Nissan, Toyota...) contributing in the area of computer simulations of complex physical processes in engines and powertrains.

▪ Founded in 1996
▪ 80 employees, mostly high qualified engineers
▪ 100% of all products is exported
▪ Turnover is 3.1 million EUR (2008)
▪ Software development and advanced numerical simulations (FEM, MBS, CFD)

DIV

DIV group has more than 120 years of tradition. Currently it is one of the leading screw production factories in Europe. It is present in six countries, and has more than 750 employees.
Company headquarters are in Samobor, along with a production facility specialized in hot and cold forging methods. Its largest production facility is in Knin.
The company is constantly aiming to grow and utilize newest technologies.

HSTEC

A company founded in 1997 develops, designs, and produces precision high-speed electromotors. It develops various high precision techniques for engineering, design and automatization of specialized autoindustry production machinery.
HSTEC has developed a vast number of electromotors that power working cylinders on auto-part processing machinery, along with numerous modern components for automatic auto-part processing systems.
HSTEC is a licensed user of AAB robotic systems.

Foreign Players in Croatia

Owing to the recent trend that saw the biggest automotive producers in the world investing in automotive vehicle production in Central and Eastern Europe, Croatia is witnessing a growing interest of big multinationals to invest on its territory. The Croatian Government has recognized this trend and has started many initiatives in order to support it.

EPCOS

The biggest European and the second biggest world developer and producer of passive electronic. Their Croatian company SELK is a dominant producer of Piezo Actors using nanotechnology.

▪ 72 mil. EUR investment
▪ 1.400 employees
▪ 16,3 mil. EUR/year turnover

What attracted EPCOS to invest:

▪ Quality of production and production cycle organization
▪ Quality of workforce
▪ Modern machinery (7,5 mil EUR investment by SELK)

BOXMARK LEATHER
Austrian company, worldwide leading supplier of high quality chrome free surface leather and finished leather components.
- 50 mil. EUR investment
- 3.000 employees
- Clients: Audi, Porsche,..

CIMOS
A joint-venture between the Slovenian CIMOS and the Croatian company P.P.C. BUZET – supplier of engine parts (engine components, break system components, gearshift mechanism components, car body components).
- 650 employees
- Own product development and design
- Certificates: ISO/TS 16949;2002, ISO 14001, OHSAS 18001
- Clients: PSA, HTT, Ford, BMW

Tradition in automotive industry is a guaranty of high quality products, competent workforce and a continuous innovation. High standards of quality are also visible in delivery deadlines and competitive prices.

YAZAKI
A global Japanese automotive corporation, manufacturer of Electrical/ Electronic Distribution System (EEDS) with 87 manufacturing operations in 38 countries on six continents. Designs and develops an innovative range of products for automotive industry. In Croatia, the company employs top skill professionals engaged in research and development of electronic parts for vehicles.
- Top design & prototype center in Zagreb
- Certificates: QS-9000, ISO-17025, ISO/TS 16949, ISO 9001
- Clients: DaimlerChrysler, GM, Honda, Toyota and others

SAINT JEAN INDUSTRIES
A worldwide established innovative corporation, specialized in the development and manufacturing of high integrity/critical safety aluminum components and sub-assemblies for the automotive, truck, motorcycle and industrial markets.
- Certificates: QS-9000, ISO-17025, ISO/TS 16949, ISO 9001
- Clients: leading European and world's brands: Peugeot, Citroen, Volkswagen, GM, Volvo, Hyundai.
- 118 employees

Alstom
A worldwide leader in equipment and services for power generation and rail transport. In Croatia, the company works on design, production and assembling of steam turbines.
- 680 employees
- Design and product development in Karlovac
- Certificates: QS-9000, ISO-17025, ISO/TS 16949

Eurozappa
Italian company, one of the world's largest companies manufacturing hand tools and components for machinery and automotive industry. TANG, their company in Croatia, is involved in forging products and tools, machine and vehicle parts and components.
- 1,5 million EUR Investment
- 100 employees

INNOVATIVE PRODUCTS AND INVESTMENT OPPORTUNITIES
Automotive Components Industry

Reduce your costs while maintaining quality
▪ Short distance to markets and car production plants in Western and Eastern Europe
▪ Transportation and storage costs reduction (potential in logistics)
▪ Possibility of just in time delivery thanks to modern transport infrastructure
▪ Croatia's proximity to strong auto parts manufacturers in the region (Austria, Italy, Slovakia…)
▪ Tremendous shipping costs savings possible, especially for Asian and Middle east manufacturers (Sea ports of Rijeka and Ploče)
▪ Motivated, qualified and productive workforce at competitive costs
▪ Quality that meets European standards:
▪ Local companies achieved complete integration into the international chain of part suppliers for world well-known car producers
▪ Certificates + export figures (growth and ratio) prove quality and growth potential

Strenghten your business through cooperations in Croatia
Wide range of automotive suppliers from Tier1 to Tier3 with development potential and free capacity available.
Small supplier structure allows flexibility and fast reaction to your needs.
Use local and regional expertise from Croatian manufacturers.

Expand in growing markets of SEE
Take advantage of the Free Trade Agreement between Croatia and EU/CEFTA
Use Croatia as your business platform to expand in the region of SEE (sales & marketing).
Possibility to expand in Croatian traditional markets (ex-Yugoslavian countries, CEFTA, Russia).

Next steps for Croatia:
▪ Greenfield / Brownfield investments / Cooperation (trade, joint-ventures)
▪ Investments in new production processes ("New Equipment")
▪ Find quality suppliers in Croatia and build your network with Croatian government and local institutions
▪ Use our expertise and the expertise of local managers for a successful expansion in regional SEE markets
▪ Use the Croatian investment incentives and the favorable taxation of company profits and income from capital
The Croatian automotive industry has a strong basis and potential for future development of higher value added niche segments such as automotive components industry, design and R&D.

Concepts and Innovative Products

ELECTRIC CAR
Thanks to their extensive experience in vehicle production and huge R&D efforts made in several years DOK-ING will soon include a new creation in their range of products - an electrical engine city car. The whole project has been thought of and developed exclusively by this company.
Electric car advantages are lesser pollution and cheaper fuel as well as a rather long usage without any need for servicing. They are especially important for the improvement of city

driving: quiet operation, exhaust gas elimination and easier steering. This auto industry branch will continue developing alongside the new generation batteries.
The DOK-ING's three seats car has been designed primarily as an ecologically acceptable vehicle to be used for city driving. The warrant period for the car, excluding the battery, is 5 years and will cost around 10.000 EUR. The first test drive is expected in 2010.
The start of production requires tremendous costs and the company is currently searching for investors.

BATTERY
A choice between two types of batteries will be possible: a lead battery with lesser autonomy and a new generation lithium-iron-phosphate (LiFeP04) battery that is light, ecologically acceptable and non-combustible. Following two hours charging, the car will have 250 km driving autonomy. It will also be equipped with the regenerative brake system enabling it to recharge during braking.

MOTOR
Two permanent 50 kW/65 HP new generation electro motors, controlled by the DOK-ING manufactured electronics and produced by an another Croatian company Tema, will be mounted on front wheels. 300 Nm torque will guarantee exceptional acceleration while the maximum 130 km/h as optimal speed will allow effortless driving over longer distances on the motorways.
Expected Features (final features may vary)
- 2-hour battery charging
- 250 km autonomy
- Recharging during breaking
- 130 km/h as optimal speed maximum speed
- 5-year warranty
- A roadster planned

DESIGN
Te industrial designer Igor Jurić, with a long experience working for Opel, Porsche and Mercedes, signs the car design and is exclusively responsible for the car image.
The car will have modern rounded lines giving it a sporty look, while the rear lights will be rather unusually X shaped. The roof will be entirely covered in glass. The interior still hasn't been completely defined, but an innovation will certainly be the steering mechanism that can be moved from left to right and even kept in the middle. The seats will provide for a touch of glamour.

AUTOCLUSTER CROATIA

Founded in 2006 with headquarters in Zagreb
- Cluster members – producing, engineering & developing companies in the automotive sector
- Cluster's Total Employment: 2.000+ Employees
- Cluster's Total Turnover 2007: 105 Mio. EUR
- Exports – 90% to the Western European countries/regions

VISON
Croatian Automotive Cluster, as a supplier and partner of the global automotive industry, will offer complete and innovative solutions to the development of products and services of high added value, using own professionalism, specialization, multidisciplinarity and flexibility and

by taking into account wishes and needs of the customers as well as the current technological and ecological trends.

STRATEGIC GOALS

- Market Research
- Development of new products and services
- Financing
- Improvement of internal processes

TRADE AND INVESTMENT PROMOTION AGENCY

National Agency of the Republic of Croatia Central point of contact for investors and exporters

At Your Disposal

Information about economic and regulative issues
Visits and selection of industrial sites (according to your needs)
Database of available industrial land
Database of Croatian automotive suppliers and cooperation candidates
Organization of matchmaking conferences

Consulting Offered

Before, during and after the completion of your project
Fast proceeding of all necessary permits
Support in investment incentives application
Contact with Croatian automotive supplier

Automotive industry in Serbia

History

The automotive industry in Serbia dates back to 1939 when the first trucks came off the assembly lines in the city of Kragujevac. After the Second World War, this factory was renamed Zastava and it started producing motor vehicles under the licence and quality standards of FIAT. This was a booming period for automotive suppliers in Serbia, as many component manufacturers were needed to support the growing new industry. High quality production enabled them to work for other western car manufacturers. Soon, companies like Mercedes, Ford, PSA and Opel were sourcing automotive components from Serbian companies. The high point of this industry came in 1989 when Zastava produced roughly 250,000 cars. Zastava cars were exported to 70 countries all over the world, including the UK and USA. The political problems and economic sanctions imposed on Serbia during the 1990s halted the development of this export oriented sector. The break-up of former Yugoslavia had a big impact on Zastava's existing supply chain, and economic sanctions left it with a severely depleted market. Serbian suppliers faced the same problems: The industry was confined to more or less serving only the Serbian market and reduced profits prevented companies from investing in the development of technologies. Since 2000, the Serbian automotive industry has rapidly re-emerged due to the privatization process, a strong influx of foreign capital, and government support.

OEM's in Serbia

In 2009, the automotive industry in Serbia consists of six companies manufacturing motor vehicles and around 70 component suppliers. The largest vehicle manufacturer is former Zastava Automobili or, as it is known now, the FIAT Serbia company. The production range of Serbian vehicle manufacturers consists of passenger and commercial cars; and light, medium and heavy trucks and buses. Serbia also has companies that produce trailers, semi trailers or vehicle superstructures. A detailed analysis ofthese companies can be found in the component supplier section of this brochure. The six motor vehicle manufacturers in Serbia employed around 7,000 workers in 2008.

Tab. 2.13: VEHICLE MANUFACTURERS IN SERBIA 2008

Company name	Location	No. of Workers	Product
FIAT Serbia	Kragujevac	3400	Passenger Cars
Zastava Special Vehicles	Sombor	260	Commercial Cars
Zastava Trucks	Kragujevac	850	Vans, Trucks
FAP	Priboj	1600	Trucks, buses
Ikarbus	Belgrade	760	Buses
Neobus	Novi Sad	210	Buses

FIAT Serbia

At the end of the 1990s, the cornerstone of Serbian automotive industry, Zastava Automobili, was in serious trouble. There was almost no technical development, its market had shrunk severely, and annual production had fallen from more than 200,000 vehicles to around 20,000.

The democratic changes in Serbia in 2000 initiated the privatization process of all state-owned companies. Zastava's strategy was to find a strategic partner among the leading global vehicle manufacturers.

In 2005, the FIAT Group and Zastava signed a cooperation contract to assemble SKD cars in Zastava. To this end, the state invested around €10 million in a modern assembly line, where the FIAT Punto 2 was to be produced under the name of "Zastava 10." By successfully

producing around 10,000 Zastava 10 vehicles per year while abiding by FIAT's strict standards, Zastava indicated to FIAT that it could be transformed into a modern car manufacturing plant. Finally, in September 2008, the FIAT Group and the Serbian Government signed a contract forming a new joint venture company, FIAT Serbia. The FIAT Group invested €700 million in FIAT Serbia, while the Republic of Serbia contributed the Zastava Automobile plant along with an additional investment of €200 million. The ownership structure of the company gives the FIAT Group a 67% stake and the Republic of Serbia a 33% stake. The FIAT Serbia company will produce FIAT A and B segment passenger cars, and will reach production capacity of 300,000 vehicles a year by the end of 2012.

FAP

Fabrika Automobila Priboj, or FAP, was established in 1952 in the town of Priboj in western Serbia. A year later, FAP introduced its first heavyduty vehicles upon acquiring a licence to manufacture under the Saurer- Werke brand. In 1970 FAP signed a new licensing agreement with Daimler-Benz and its products have been based on this cooperation ever since. Further developments continued during the 1980s with the introduction of a new processing plant for pressed parts and components, a production line for wheels with a capacity of 70,000 units per year, and a machining facility for the production of gears, pinions, rings, and universal joint shafts. One section of FAP's manufacturing capacity was adapted for the production of 15,000 vehicles per year. FAP's core activity today is the production of heavy-duty vehicles with gross weight capacities ranging from 10 t to 32 t. These vehicles are powered by various engines that are able to generate from 88 to 279 kW with power systems manufactured by Mercedes- Benz, Cummins and MAN and with different drive line configurations: 4x2, 4x4, 6x2, 6x6, 8x2, 8x4 and 8x8. FAP's basic production programme consists of: Open trucks, tug trucks, dump trucks, special vehicles, buses, trailers and covered-trailers.

NEOBUS

The oldest bus manufacturer in Serbia, Neobus from Novi Sad was established in 1952. Since then, Neobus has produced over 15,000 buses and special vehicles, using their own chassis or those of renowned manufacturers. Neobus is an example of a successful privatization in Serbia. It was privatized in 2004 by a private entity from Saudi Arabia, and this marked the beginning of a new era for the company as it entered a strategic partnership with Volvo and implemented of the ISO 9001 standard. Today, the company employs over 200 people and has a production capacity of some 600 buses per year. Besides the strategic partnership with Volvo, Neobus also cooperates with other renowned manufacturers such as: Mercedes, Raba, MAN, DAF, Cummins, Allison etc. Neobus buses are exported to countries across the world such as Germany, Denmark, Poland, Hungary, Saudi Arabia, Ghana, Russia, Iraq, Syria, Morocco, Turkey and South Africa.

ZASTAVA TRUCKS

The larger of two subsidiaries of the former Zastava Automobili, Zastava Trucks is located in Kragujevac. This is where the first motor vehicles were produced in Serbia in 1939 with the assembly of Chevrolet trucks. Today, it is the only manufacturer of light and medium commercial vehicles (total weight 2.5 – 12.5 t) in Serbia and the entire South-East Europe (SEE) region. Zastava Trucks' production capacity is 7,000 vehicles per year and it employs a workforce of 850. Its technology competences range from a press shop, welding, surface protection and painting, machining, heat treatment and assembly. The factory covers a total area of 10.5 ha with 34,500 m2 of production halls.

The production range consists of:

- Light commercial vehicle – Rival (2.5 – 6.5 t)
- Medium commercial vehicle – Euro Zeta (6.5 – 12.5 t)
- Off-road Transport Vehicles "ZK"

• Front and rear axles (OEM supply)
• Spare parts

Along with signing a contract to form FIAT Serbia, the FIAT Group and the Serbian Government have signed a Memorandum of Understanding (MoU) to form a similar joint venture between Iveco and Zastava Trucks. This MoU involves the investment of €240 million by Iveco in a new company focused on bus production that will produce 2,200 vehicles by the end of 2012.

ZASTAVA SPECIAL VEHICLES

Formed in 1969 as a Zastava Automobili subsidiary for the production of mini-vans and pick-ups, Zastava Special Vehicles is located in Sombor in northern Serbia. Today, this state-owned company employs 262 people, though it employed 850 at its peak in 1989. That year, Zastava Special Vehicles produced 9,000 cars, while the factory's maximum capacity was 10,000 vehicles. The company is still state-owned and the Republic of Serbia is looking for a strategic partner to buy a controlling stake.

IKARBUS

Serbia's first airplane, car and engine manufacturer was founded in 1923. The company specialized in the manufacture of airplanes until 1954, when its first bus was produced under the Austrian "Sauer" license. Gradually, the company altered its focus from airplane to bus production. The company has cooperated with brands such as MAN, Mercedes and DAF. Today, Ikarbus' production range consists of: city buses, intercity buses, tourist buses and medical vehicles

Tab. 2.14: Leading Foreign Investors in Serbian Automotive Industry

Company	Country of Origin	Investment Type	Euro mn
Fiat	Italy	Privatization	700
Cimos	Slovenia	Privatization	100
Michelin	France	Joint Venture	44
Brikel	Bulgaria	Privatization	37
Galaxy Tire	USA	Privatization	22
Albon	Great Britain	Greenfield	18
Leoni	Germany	Brownfield	15
Draexlmaier	Germany	Greenfield	10
Lohr	France	Brownfield	7
Streit Group	France	Greenfield	7
Tesnila	Slovenia	Greenfield	6
Grammer	Germany	Greenfield	4
Bauerhin	Germany	Greenfield	2

COMPONENT SUPLLIERS

Today, ca. 100 companies with 25.000 employees are producing parts and systems for motor vehicles in Serbia.

PRODUCT GROUPS

Engine & engine component manufacturing is the most popular activity within the automotive component production industry in Serbia. These products encompass valves, camshafts, crankshafts, connecting rods, flywheels etc. Production of complete engines has dropped with the drop in production of Zastava cars and the industry is now focused on components rather than assembly. However these engine components are mostly produced for foreign OEMs with a smaller percentage destined for the spare parts market, suggesting high product quality. Vehicle plastic and rubber parts are the second most popular after engine

components in automotive component production in Serbia. Rubber components include chiefly hoses, rubber brackets and weather seals, while plastic is used in a wide range of interior and exterior parts. It should be noted that the survey did not include tyres within the plastic and rubber product group, but as part of chassis systems. There is little foreign capital present in plastic & rubber production, making it a favourite product group for domestic companies. Electrical, electronic & power supply production is also very significant. These products include car batteries, electric motors and wire harnesses. It is worth noting that the majority of wire harness producers are foreign-owned companies founded in the last three years. Production of braking system parts is very diverse and covers brake discs and drums, brake pads, hydraulic systems for braking systems, hydraulic brake hoses etc. Production of brake discs and drums is most popular, and foreign capital is strongly present there. These parts are produced by casting and machining, which, together with wire harness production, is technology that has seen the most foreign investment in the Serbian automotive sector in the past three years.

TURNOOVER AND EXPORTS

As stated earlier, 10 new companies have entered the automotive component production sector in Serbia since 2005. All of these companies are foreign investors and their establishment has led to rapid growth in sector turnover, especially in 2008. Total turnover rose from €360 million in 2006 to €460 million in 2007, and €830 million in 2008, which is the largest growth that this sector has ever recorded in Serbia (80%).

Domestic companies' turnover is also constantly growing, but not as rapidly as with foreign-owned companies. Very little domestic capital was invested in new companies and the majority of domestic companies' turnover growth is down to the increase in existing production.

Parallel to the turnover, the level of exports is steadily rising. Foreign- owned companies are main leaders in this category, especially since almost all of them have invested in Serbia for exporting purposes. The reason for this lies in the excellent export conditions that Serbia offers, due to its convenient location and free trade agreements with all European countries and Russia. The survey demonstrates that more than 90% of foreign companies' production is exported, while domestic companies export around 45%. Domestic companies clearly focus more on local demand, while foreign-owned companies focus on exports.

FIAT's arrival in Serbia, with production plans for 300,000 vehicles a year, will certainly shift foreign investors' interest from predominantly export production to supplying local vehicle production as well. With export of €120 million, the biggest exporter in 2008 was Tigar Tyres, owned by French Michelin. Tigar Tyres exports 90% to the European Union.

The primary export destination for automotive parts produced in Serbia is the European Union, and the survey shows that 90% of companies export to the EU. The European Union is a very large market for automotive parts, and Serbia has the advantage of geographically bordering three EU countries and having exceptional trade measures, enabling the export of all products originating from Serbia to enter EU without customs or other fees.

The second largest export destination, with 60% of automotive companies exporting there, are the countries of former Yugoslavia. The export to these countries is predominantly based on the spare parts market. The strong presence of Serbian parts in these markets is due to the fact that many vehicles driven there originate from Serbian vehicle manufacturers. Although many producers export to these countries, the real volume of export is not that large. Under the free trade agreement, automotive parts and systems can be exported from Serbia to Russia duty free, although Russia comes only fourth as an export destination, with 31% of companies exporting there.

COMPANY SIZE AND STRUCTURE

48% of companies in the sector are large companies. Medium-sized companies form 38% of the sector and small companies only 14%. Foreign Greenfield investments play a big part in medium-sized companies, suggesting that this is the preferred scheme when Greenfield FDI is at stake. Large companies are those that tend to have been around for longer and have been privatized or are in the process of privatization.

The majority of companies in the sector are domestically owned, with an ownership ratio of 66% for the domestically-owned companies and 34% for the foreign ones. Slovenian companies are the biggest foreign investors in the Serbian automotive components sector, with a 10% presence on the market. German companies are next with a 7% ownership, followed by French companies with a 6%.

WORKFORCE

The establishment of ten new companies within the three year period has had a major impact on both the total number of workers and total turnover in the sector. This impact was not immediate, since the normal time for investment project development is approximately three years. However, in 2008, the impact of these investments became apparent. The survey shows that in 2008, the sector employed around 25,000 workers – down from the 28,000 workers reported in 2005. However, this figure constitutes an increase from 2007, and this is the first year since the 80s that the number of workers in the sector has risen.

EDUCATION

Every year, around 13,000 students graduate from universities in Serbia, where one-third comes from technical universities. Blue collar workers come from various technical secondary schools. In total there are 71 of such schools in Serbia, offering a number of specializations. These workers also receive specific know-how and hands-on experience related to technology and quality standards in the automotive industry.

Tab. 2.15: FACULTIES

Faculties of Mechanical Engineering	4
Faculties of Technical Sciences	3
Faculties of Electrical and Electronic Engineering	2
Faculty of Traffic and Transport Engineering	1
Faculty of Technology and Metallurgy	1

Tab. 2.16: TECHNICAL SCHOOLS

General technical schools	47
Electro-technical schools	10
Mechanical technical schools	9
Railway technical schools	2
Traffic technical schools	2
Aviation technical schools	1

3. RECOMMENDATIONS

Based on our analysis of automotive R&D area in PPs countries/regions we have determined important trends and challenges for automotive industry in SEE. In our analysis we have identified several information sources from prestigious firms: Deloitte, KPMG, Roland Berger, Booz & Company, IBM, Oliver Wyman, ale German automotive association VDA, ACEA, EUCAR, OICA and other publications from car producers and scientific books. The most and main important pillar for setting up recommendations was results of our research in automotive R&D capacities in PPs countries/regions of SEE. Based on this all relevant information, we have built four basic groups of recommendation for next intensive development of automotive industry in SEE in terms of R&D activities:

1. Cooperation

- building innovation networks and innovation clusters in SEE (our R&D database is the 1st step of creating connetions, cooperations and partnerships between OEM, SMEs, universities, R&D institutes, innovation centres and others in SEE),
- need for more participation of SEE R&D capacities in top European projects in automotive industry – building close cooperation with western R&D organizations,
- looking for industrial areas with unique special orientation of R&D capacities in SEE (countries will need to look for own specific focus in which country is excellent and could to contribute to development of automotive industry),
- contribution to desiging of new types of R&D&D centres in close cooperation with western countries in terms of green cars,
- development of partnerships with focus on business, education, new technologies, networking, new industrial sectors,
- contribution to development of new supplier chains in terms of green cars,
- contribution to development of integration new technologies into present systems,
- contribution to development of new aftermarket services and manufacturing of spare parts industry,
- distribution of new competencies and responsibilities between OEM and suppliers in terms of green cars,
- contribution to development of new business models,
- contribution to development of new automotive platforms, modules and systems,
- contribution to harmonization and standardization,
- contribution do development of new production and assembly capacities with focus on green cars and R&D activities,
- national governments need to provide appropriate market incentives in terms of green cars
- need to build strong clusters and cluster networks such as tool for preparing phase for SMEs to entrance to the global automotive supplier networks and such as tool for building own R&D departments and centres – actual strong trend is that global automotive networks consists from car producers and suppliers plants in all regions in the world, automotive suppliers are following car producers

2. Focus on highly perspective research and development industrial sectors

- focus on materials research – plastics, lighweight materials, magnesium, aluminium, high-strenght steel, fiber-reinforced materials, composites, nanomaterials and others,
- contribution to development of ultra low cost cars and low cost cars,
- contribution to development of vehicle aerodynamics,
- development of car electronics and ICT,

- development of safety and comfort standards
- contribution to development of new car design
- complete vehicle and component development and prototyping servicess (full range of automotive engineering services, virtual simulations)
- designing of local and regional automotive R&D laboratories and testing centres
- R&D with focus on process improvement in manufacturing technologies – innovation of processes (research in welding, pressing, assembly, painting technologies, robotics and automation)

3. Education

- knowledge development in designing of R&D laboratories and testing centres regarding world automotive firms and other related industrial sectors,
- looking for new ways for more intensive cooperation between universities, R&D institutions and industrial firms in area of process improvement, innovation of processes, manufacturing productivity and efficiency, development of innovation thinking and creativity, R&D activities, project activities…,
- education and information about specific characteristics of the new technologies,
- building new study program in terms of green cars, new structural changes, challenges and actual worldwide trends in automotive,
- building learning networks – shared learning could help with some of the barries to learning that individual firms might face – this type of networks has primary purpose of increasing knowledge with characteristics (*Tidd, J. – Bessant, J., 2009*):
    - They are formally establihed and defined
    - They have primary learning target (specific knowledge)
    - others

4. Energy and Environment

- create stronger environmental orientation of R&D capacities in SEE (need for increasing R&D activities in environmental area)
- preparing activities for using of green cars (research in traffic and transport system as a whole, reaearch in environmental technologies, alternative fuels and innovation in powertrain, market implementation of innovation and other related areas)
- contribution to R&D in hybrid cars, electric cars, and other alternative powertrain
- contribution to development of recharging infrastructure, developmet of country infrastructure for electric cars
- contribution to development of battery systems and recycling processes
- contribution to development of ecological manufacturing processes (green painting processes, green manufacturing of vehicles and sub-systems, digital manufacturing, virtual engineering
- energy companies need to contribute to the R&D in renewable energy sources with aim zero-emission transportation

Presentation Proposals for Educational Seminars:

1. Presentation of R&D capacities in SEE
2. Quo Vadis automotive industry
3. Importance of building of networks and international partnerships
4. Trends in automotive industry – new challenges, opportunities, innovations
5. Trends in material research activities for automotive industry
6. Trends in process improvement activities (Lean Principles, Kaizen, ...)
7. Presentation of electric cars iniciatives in the world

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