Results from Desk Research and Focus Groups

1.1 Status-Quo Analysis

of the automotive industry, educational contents and technical infrastructure in participating countries

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Content

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Introduction

First a short profile of each participating HEI was exported from the desk research reports and summarized into the main facts. These facts include for each partner: no. of researchers at the participating institute, no. of business subjects taught, mandatory internships (scope/h), testing bays and structure, existing collaborations with companies and main fields of interest.

In the next section the national automotive industries are shortly presented. The information given from the desk research reports are used here as well. At the end the reader will have a short overview of strengths and weaknesses of national industries in the automotive sector.

After that, an ease overview of the main issues brought up during definition of the focus groups is presented for a better understanding of the topic in general.

Summary of ASCENT HEIs profiles

All non-European ASCENT countries are production-based. It is important to the automotive industry in ASCENT to analyse aspects from the point of view of a producer of parts.

In the following some hard-facts concerning participating institutions are collected. Thereby we mention the number of available researchers in the field, the business subjects that are already taught at the HEIs, information concerning hands-on training for students, the testing bay structures and the main areas of interest that the partners would like to cover in the future.

Argentina	
UNS (mechanical engineering: 280 students)	10 researchers in mechanical engineering, one business subject (planning and control of the fabrication), supervised professional practice in company 7 testing bays with 12 engineers and 6 technicians, already cooperating with industry Main areas of interest: aerodynamic studies, metallurgical and forming process of automotive parts studies, dynamics behaviors, active suspension systems, stability control systems, noise control
UNLP (mechanical engineering: 650 students)	20 researchers in mechanical engineering (teachers who must do research concomitant with teaching activities according to UNLP rules), 1 business related subject in engineering degree (Economics and industrial organization), 200hrs of professional practice before graduating needed 3 testing bays with 5 engineers, already cooperating with industry in testing bays research. Testing bays means exclusively internal combustion engine test dynamometers Main areas of interest/seek to cover: improve student's skills of engine testing

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Mexico	
ITESM (mechanical engineering: 150 students)	1 researcher, 3 business related subjects (Economics, Entrepreneurship, Communication), industry internship foreseen Different testing bays distributed over several campuses: automobile testing bay facilities (Campus Toluca), manufacturing labs equipped with CNC machines (Campus Querétaro), Electronics and IT (Campus Guadalajara), labs for general engineering training as well as research (Campus Monterrey) ITESM is cooperating with major automotive companies Main areas of interest/seek to cover: multilingual, autotronics/virtual and augmented reality for automotive and transport applications, a center connecting the academic community and the industrial sector.
IBERO (mechanical engineering: 136 students)	2 researchers, no business related subjects, professional practice for at least 100 hrs 2 testing bays available (wheel alignment bay with four post lift, general inspection bay with two post lift) Main areas of interest/seek to cover: Hybrid and electric engines, vibrations and fatigue.
Brazil	
USP (mechanical engineering: 350 students)	50 faculty members (mechanical engineering; academic + research), 3 business related subjects (Principles of Business Administration / Design Methodology I+II), internship of 120 hrs Main areas of interest are: Automotive Engineering, Analysis of the automatic transmission in comparison to the double clutch transmission, the future of transport systems (in South America), Center of Automation and Design Technology – CAETEC. A laboratory is installed in an independent two-story building with 120 square meters. It is currently equipped with machines and tools for manual construction of prototypes, computers, engineering workstations, printers, data exchange network and measuring equipment. A library with both classic and state-of-the-art texts on relevant subjects as well as the most widely used computer programs for product development (CAD/CAE systems) and project management (PLM) are available.
UFRJ (mechanical engineering: 1080 students)	35 professors, 10 engineers and 20 technicians, 2 mandatories and 7 optional elective business related subjects, a 160 hrs mandatory internship is required 7 testing bays, including both chassis and bench dynamometers for naval (500kw and 800kw), diesel (350kw) and gasoline (160kw) engines; a torsional stiffness and a braking test benches for student competition prototypes Main areas of interest: Specific knowledge and abilities needed to develop electric vehicles. Powertrain future trends (electric and hybrid).

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Austria	
FHJ (automotive engineering: 259 students)	20 researchers (automotive engineering), 6 business related subjects (3 bachelor, 3 master): business admin., law, quality mgmt., HR Mgmt. Leadership and Intercultural Business Practices, Strategic Mgmt., compulsory internship of min. 450 hrs 15 testing bays with 6 engineers and 4 technicians for R&D, student´s work and cooperation with companies Main areas of interest/seek to cover: e-mobility, fuel reduction, light weight design, flexible with respect to whatever industry needs (see automotive industry, future global trends)
Spain	
UAB (electronic engineering: 140 students)	52 researchers (academic & research), 3 business related subjects: Organization and Business Mgmt., Project Mgmt. and Legislation; Quality mgmt. No testing bays available. Main areas of interest/seek to cover: This partner is well experienced in engineering hot topics and future trends, even though having their focus on telecommunication and engineering their input is essential to bring also content from new job roles, emerging from current into the ASCENT training.
Germany	
HSD (mechanical engineering: 40 students)	22 researchers in mechanical and process engineering, 6 business subjects (in bachelor: basics of business administration, statistics, production planning and control; in master: life cycle and services management, international technical sales management, methods of quality management), 1 soft skill subject (engineering conferences), 1 internship semester and other internships Testing bays: Air monitoring, simulation system for factory planning and logistics, CFD software, gearbox test bay, laboratory of fluid mechanics, vibration engineering and acoustics, planning desk with eyetrackers, PPS/ERP, “Ring project”, E-traxx. Main areas of interest/ seek to cover: environmental measurement technology, product development and innovation, modeling and simulation, energy systems, fluid mechanics and acoustic, services and life cycle management, automation engineering and learning systems

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National Automotive Industries

Concerning the national **automotive industries** and **related efforts** in each country, the following highlights have been collected through the country based reports:

Strengths of the **Austrian** automotive industry are the long history in development, highly qualified engineers, a good combination of suppliers, developers and manufacturers in the market place as well as the geographical proximity to OEMs in Germany and Italy which facilitates trade and transfer immensely. Current weaknesses and threats include that new mobility requires more software engineers and means fewer vehicles, which is why mechanical engineers are needed less. Further education in the automotive sector must be harmonized and updated.

The automotive industry in **Spain** is characterized by a long tradition in car manufacturing and competitive auxiliary industries. It is the 2nd largest car manufacturer in Europe after Germany. SEAT is the sole active Spanish brand with a mass production potential and capability of developing its own models in-house. Spain is recognized to be the best European platform for doing business with Latin America. Consequently, many agreements are necessary to avoid double taxation or to protect investment.

The automotive sector is the backbone industry in **Germany**, and the German automotive industry is a global leader. No other industry is investing more money in R&D (22 billion€ in 2017). Germany is also one of the strongest countries in the world when it comes to high-tech automotive products, including autonomous driving technology. The automotive industry in Germany is very reputable because of its long history, its high quality in development and production, its highly qualified engineers and its well-known makes of car. In addition, the geographical location of Germany in the middle of Europe makes trade and transfer a lot easier. The German automotive industry generated nearly 405 billion Euros in sales in 2016. Of these, 37 percent were implemented domestically. As a result, the share of sales generated abroad was approximately 63 percent. The majority of exports went to Europe in recent years, but also Asia and North / South America were buyers of a variety of cars from Germany.

The German universities educate their students on a high level. Furthermore, the universities have good connections to the automotive industry. Industry-related challenges are the CO2-reduction, more development in e-mobility, autonomous driving and car sharing models.

In **Argentina** enterprises offer summer programs to students. Many of these students continue as employees in those companies afterwards.

The industry in Argentina is described as: attractive, many areas of expertise and systems, vanguard of production industry, skilled professionals are needed, constant improvement and advances in the industry, reference for other industries, cars are deeply linked to Argentinian culture; easy to find interested new professionals (new engineers seek for immediate results – they cannot find them in the automotive industry), further part-time jobs or homeworking is not easily found in that industry.

In **Mexico** current improvement in material pressing technologies and use of lightweight materials might open new opportunities in the industry. The cooperation between governmental and educational institutions is challenging. Still participating institutions outline that qualified workforce is available.

Manufacturing costs and duties in Mexico are low, and experience and infrastructure for manufacturing are strengths in the automotive industry. However, the low manufacturing costs (low salaries) should also be seen as a disadvantage because it hinders development in general.

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This makes Mexico an attractive place to produce cars/parts. However, Mexico faces a lack of national providers, R&D centers and educational services which are aligned with the industry needs. The NAFTA agreement is probably a threat to the national industry.

Brazil, the "B" in the BRIC acronym, showed consistent economic growth between 2011 and 2013. Brazil's gross domestic product per capita exceeded the significant 10,000 U.S. dollar benchmark in 2010, but fell to around 8,700 in 2016. Most parts of Latin America have entered a recession and it is projected that Brazil's per capita gross domestic product will stay below 12,000 U.S. dollars until at least 2021. In light of Brazil's increasing affluence, automakers have begun to focus on this growing market in recent years. In terms of market share, Brazil's automotive market is dominated by Fiat Chrysler Automobiles, General Motors and Volkswagen. Market protection in the form of tariffs and quotas on imports has prompted companies to open or expand automotive production facilities within Brazil, which helped stimulate the local economy. Some of the most recent protections went into effect in 2012, including putting a quota on imports from Mexico. Brazil produced about 2.3 million passenger cars in 2017, a slight resurgence for a market that has declined significantly over the previous few years.

The main trend regarding further developments for the lightweight vehicles industry in Brazil is hybrid cars. For example, the Toyota Prius showed a 506% sales growth from 2016 to 2017. The main trend for the heavy trucks industry in Brazil is biodiesel. The parliament is currently discussing passing a law banning the production of new combustion vehicles for 2030.

The main challenges faced by the automotive industry in Brazil are the political and financial instability and the insufficiency of qualified labor. The state of Rio de Janeiro has 4 factories (Nissan, Land Rover, MAN "VWCO" and PSA Peugeot-Citroën), meanwhile São Paulo has 15 and Amazonas has 13 factories. São Paulo attracts more plants because of a better infrastructure and proximity to the most consuming states, and Amazonas offers tax advantages. The factories in Amazonas are most CKD

The **Focus Group Interviews** displayed that they are very interested in enlarging the cooperation between university and industry research. Competence Centre with different specialisations according to the needs of the surrounding automotive industry are seen as a useful addition for educating students but also for using them to train their employees on new matters. The focus group interviews showed that despite the knowledge in certain hard- or software a training in soft skills such as team work, intercultural competences and project management and leadership are needed.

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ARGENTINA

Country Report

June 2018

The National Automotive Industry at a Glance

Automotive Industry in ARGENTINA	
Automotive industry structure in your country	85 % producing industry 15 % developing industry
Main current industry-related challenges in your country	Stability of the global economy. Rather hard relation between companies and Unions of employees. Small market size Low percentage of national parts incorporated in the final products Low average salaries of the people. http://eppa.com.ar/el-precio-de-los-autos-en-relacion-a-los-ingresos-desde-2001-hasta-hoy/ shows that an economic car (approx. U$S13.000) costs in average approx. 10 to 11 average salaries Taxes have a high impact on the final price. Today, the production of a car in Argentina is 25% more expensive than in Brazil and 65% more expensive than in Mexico
Other regional challenges which are also relevant / might become relevant / development not sure	MERCOSUR – has to evolve for better product interchange conditions; has to create new agreements with other regional blocks in the world (European Union, for example)
Future global trends in the automotive industry which are relevant to your country	Electric transportation is starting to be implemented in big cities. Electric cars are starting to be commercialized. Biofuels are being produced and incorporated to the internal fuel distribution.
What are main channels and approaches used for sales in the automotive industry	Direct sales from companies' subsidiaries and from selling points. Offering of financing part of the value of the vehicles by the producing companies
Government	
Governmental efforts related to the automotive industry	Government regulates the taxes applied to the car market. Taxes are adjusted based on a tradeoff between incentives and tax collection objectives

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	Recently, a reduction was done in some taxes applied to middle and high end cars which positively impacted on sales.
List most important governmental initiatives (based on impact, relevance and € invested)	Government is seeking for agreements between manufacturers, unions and automotive parts producers to obtain about U$S 5.000 millons of investment, 1 millon cars per year, and extra 30.000 new employees before 2023 (Buenos Aires, Santa Fe, Córdoba, SMATA, ASIMRA, UOM, ADEFA, AFAC and ADIMRA) Autoparts Law 27263: oriented to incorporate more national produced parts in the vehicle production
Companies	
Total volume of the automotive industry in your country in €	About 14.000 MEuro
Total volume of the producing/manufacturing industry in your country in € (parts and vehicles)	About 11.900 MEuro
Total volume of the development industry in your country in € (design, innovation, research)	About 2.100 MEuro
Number of producing companies operating in the automotive industry	11
Number of developing companies operating in the field of automotive engineering	To our knowledge, there are no companies fully dedicated to development. All do some development, but not as principal activity.
Ancillary industries (No.) name major 3 in terms (TIER 1)	More than 200 major companies (from AFAC) Major: Eaton(clutch, transmission), Fric Rot (dampers), Wobron (clutches)
Producing industries (No.) name major 3 (OEMs)	11 major OEM (automotive, not including motorcycles) Major: Volkswagen (some 6500 employees), Toyota (some 5000), Ford (some 4000)
Is your university/faculty currently cooperating with one of the major 3 companies?	UNS: ---- But DI cooperates with Ternium for high speed tin sheet stamping UNLP: The Faculty of Engineering of the UNLP provides services to PSA Peugeot Citroen
Associations	
Relevant clusters, associations, governmental bodies related to the automotive industry	ADEFA AFAC ACARA …
Does you university cooperate with associations etc.?	UNS: ---- UNLP: ACTC Tourism Car Racers Association

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SWOT Analysis of the National Automotive Industry

Strengths	Weaknesses
1. Long tradition of car manufacturing in the country 2. Number and versatility of companies in the market represents an important offer of products 3. Number of suppliers available in the sector 4. MERCOSUR- Efficiency of the workforce. Good offer of trained professionals	1. High gas prices 2. Argentina is not a technologically leading country in this industry 3. High state taxes on the car prices 4. Average salaries of the population are low related to car prices (cars cost twice as in Europe and salaries are 1/3
Opportunities	**Threats**
1. Latin American market is one of those greatest growth in the world (OICA) 2. Sustained economic growth of most countries in the region 3. Expected growth of exports	1. Industry and products depends principally on fossil fuels 2. New technologies are adopted after a great lag from their popularization in the world. 3. Fluctuacting exchange rates 4. Infaltion, that generates loss of regional competitiveness and uncertainty.

Universidad Nacional del Sur - Automotive Engineering & Sales Management at Higher Education Institutions

Automotive Engineering & Sales Management at HEIs	
Please indicate the degree program you are referring to in this analysis	**O automotive engineering** **X mechanical engineering** **X other: Electronic Engineering and Electrical Engineering**
If your refer to different degrees for Bachelor / Master, please indicate:	
Bachelor	**Electronic Engineering** **Electrical Engineering** **Mechanical Engineering**
Master	**Master in electrical Engineering** **Doctorate in Electrical Engineering** **Master in Engineering** **Doctorate in Engineering** **Master in Control Systems** **Doctorate in Control Systems**

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PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	Mechanical engineering: approx: 280 Electronic Engineering: approx. 260 Electrical Engineering: approx 130
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	Electronic + Electrical Engineering: Full time: 23 Part time: 100 Mechanical Engineering: Full time:20 Part time:55
No. of researchers at automotive engineering and/or mechanical engineering institute	**Electrical and Electronics Engineering**: Only at Department of electrical Engineering and computers (DIEC): 6 researchers In both: Instituto de Investigaciones en Ingeniería Eléctrica (IIIE) and DIEC: 36 researchers (many different areas of knowledge) **Mechanical Engineering**: 10 researchers
CURRICULA	
Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	Explanation (give a short overview of contents treated in each subject) There are presented the lectures which may have closer relation to the topics needed in automotive engineering.
Technical Subject 1/Bachelor	Electromechanic energy conversion (6th semester): fundamentals aspects on electromechanic conversion Fundamentals of control systems (7th semester): basics on linear control theory. Modern control (9th semester): State-space control theory for linear systems Robotics (elective 10th semester): kinematics, dynamics and control of manipulators Telecommunication systems and services(elective 10th semester): basics on telecommunications Power electronics (elective 10th semester): components, power converters and aplications Wilreless communications and antennas (elective 10th semester): Basic design

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	techniques of antennas and communication systems Analysis and design of digital circuits (elective10th semester): Introduction to the design of CMOS integrated circuits. Fundamentals of data networks (9th semester): basic theory on communication networks Digital signal processing (8th semester): theory and algorithms for processing of one-dimensional digital signals. Digital computers (7th semester): architectures and basic technologies of digital general purpose processors
Technical Subject 2/Bachelor	Electric machines (7th semester): basic theory and technologies of different kinds of electric machines
Technical Subject 3/Bachelor	Assisted Mechanical Design: CAD/CAM design Strength of materials: behavior of solid objects subject to stresses and strains. Engineering materials: basic knowledge of material composition and testing . Rational Mechanics: mathematical description of movement sequences. Thermodynamics: relationship between heat and other forms of energy. Dynamic of mechanical systems: Mechanical vibrations and predictive maintenance. Metallic materials: Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy. Fluid mechanics: the study of forces and flow within fluids. Machine elements: relation between elements to conform mechanism and machines. Mechanical Technology: A branch of mechanical process to develop a piece.

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	Hydraulics Machines: Study of different systems to convert energy from fluids. Thermal Machines: Study of engines, gas turbines, steam turbines, etc. Metal forming: Forming processes which cause plastic deformation of the materials to produce required shapes.
Technical Subject 1/Master	
Technical Subject 2/Master	
Technical Subject 3/Master	
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Explanation (give a short overview of contents treated in each subject)
Business subject 1 / Bachelor **Electronic engineering:** approx. 120 hs./semester each	Basic Economy for companies (10th semester)
Business subject 2 / Bachelor **Electrical engineering:** approx. 120 hs./semester each	Basic Economy for companies (10th semester)
Business subject 3 / Bachelor **Mechanical engineering:** approx. 120 hs./semester each	PLANIFICACION Y CONTROL DE LA FABRICACION: concepts of economy, market and production.
Business subject 4/ Bachelor **Management**	Marketing Market research Costs and decisions Decisions and financial strategies Logistics Production management International business management Investment project management
Business subject 5 / Bachelor **Accountancy**	Corporate finance Marketing Investment project management
Business subject 1 / Master **Master in Administration**	Information technology Marketing and business management International commerce Advanced market research
Business subject 2 / Master **Master In Business Financial**	Working capital Investment projects and risk analysis Firm valuation
Business subject 3: **PhD in Administration sciences**	Strategic marketing Financial theory Information systems for decision making
TESTING BAYS	

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Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff)	Available Labs in Engineering department at UNS Laboratory of Mechanical vibrations. Laboratory of Metallurgy. Laboratory of Materials and Tribology. Laboratory of Primary Machines. Laboratory of Mechanical Technology. Laboratory of Fluid Mechanicals. Laboratory of Hydraulics Machines. Equipped with instruments and specific systems for the main activity of each Lab. Purpose: X student´s project work X cooperation with companies X universities´ R&D X other, please indicate staff in No.: academic staff: 10 professors/researches engineers: 12 other: 6 technicians Available Labs in DIEC and IIIE at UNS Laboratory of Power Electronics Laboratory of Electronics Laboratory of Microelectronics Laboratory of Electric machines Laboratory of Control and robotics Laboratory of Communications Equipped with instruments and specific systems for the main activity of each Lab. Purpose: X Student´s project work X Cooperation with companies X Universities´ R&D X Teaching In whole: academic staff: 30 Professors/researchers engineers: 14 other: 1

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	Some staff belongs to more than a single Lab. Activities are coordinated in a collaborative structure among Labs. Tecnópolis del Sur http://www.tecnopolisdelsur.com.ar/ Consortium involving academic institutions and companies for research and development of technological solutions and products based on electronics. Purpose: O cooperation with companies O universities´ R&D
Which field does your university seek to cover in the future through testing bay and laboratory:	Main interests at Engineering department: • Aerodynamics studies. • Metallurgical and forming process of automotive parts studies. • Dynamics behaviors. • Active suspension systems. • Stability control systems. • Noise control. Main interests at DIEC/IIIE: • Electric traction and energy storage systems • Automotive electronics, microelectronics and lightning • Power electronics • Active suspension systems • Stability control systems • Energy management systems
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	At Engineering Department: test bay for engines Test bay for chamber compression Test bay for higher and lower calorific values of fuel At IIIE and DIEC: There is no specific Lab or test bay oriented to automotive engineering. All activities are related to electronics (from micro- to power-), signal processing, modeling and control systems and are developed in the available labs.
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	Some Electronic Engineering and Electrical Engineering students do their professional practice at technology based companies. Most of them focus their final project on the design of an electronic device or system, guided by their tutor.

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	Some final projects are motivated on needs of the local industry, and/or are focused on the design and development of their own idea oriented to the possible commercialization of their own product.
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	Electronic and mechanical engineering: in the last year of the curricula: Specific lecture, and a supervised professional practice done in private companies.
Which other channels do you use when it comes to cooperating with companies?	Joint research, technology transfer, external services. Tecnópolis del Sur
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	DIEC and IIIE cooperate with elecronics technological companies in general. The focus is not specific to the automotive industry.

Universidad Nacional de La Plata - Automotive Engineering & Sales Management at Higher Education Institutions

Automotive Engineering & Sales Management at HEIs	
Please indicate the degree program you are referring to in this analysis	**O automotive engineering** **X mechanical engineering** **O … (other, please indicate)**
If your refer to different degrees for Bachelor / Master, please indicate:	
Bachelor	**X**
Master	
PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	Active students: 650 Graduated 2017/18: 35 Students who applied for 2018: 142
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	40 belonging to ME Department 30 belonging to basic sciences (mathematics, physics, chemistry) 10 belonging to other departments of the Faculty Total 80
No. of researchers at automotive engineering and/or mechanical engineering institute	20

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CURRICULA	
Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	Explanation (give a short overview of contents treated in each subject)
Technical Subject 1/Bachelor	Máquinas Alternativas (Reciprocating machines); 8th semester; 80 hours/ semester; 20 about problems and laboratory; Otto an Diesel Cycles; engine design; engines bench test
Technical Subject 2/Bachelor	Dinámica de Sistemas (Dynamics of systems) 8th semester; 80 hours/ semester; 20 about problems and laboratory; modelization
Technical Subject 3/Bachelor	Automatización I (Automation I); 8th semester ; 64 hours/ semester; 43 about problems and laboratory; principles of automation
Technical Subject 4/Bachelor	Proyecto de Máquinas (Machine Project) 8th; semester; 80 hours/ semester; 64 about problems and laboratory: process of machine design
Technical Subject 5/Bachelor	Automotores y Máquinas Agrícolas (Automotive and Agricultural Machines); 10th semester; 64 hours/semester; 20 about problems and laboratory; constitutive parts of cars and agricultural machines; dynamics
Technical Subject 6/Bachelor	Tecnología de Unión de Materiales (Technology of Joining Materials) 10th semester; 80 hours/ semester; 43 about problems and laboratory; welding and adhesives
Technical Subject 1/Master	
Technical Subject 2/Master	
Technical Subject 3/Master	
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Explanation (give a short overview of contents treated in each subject)
Business subject 1 / Bachelor	Economía para Ingenieros y Organización Industrial (Economics for engineers and industrial organization) ; 9th semester; 48 hours/ semester; principles of economics and industrial organization
Business subject 2 / Bachelor	
Business subject 3 / Bachelor	

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Business subject 1 / Master	
Business subject 2 / Master	
Business subject 3 / Master	
TESTING BAYS	
Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff)	X available O not available Scope: describe technical equipment and foci 1 Eddy current bench 1 Rol vehicle test bench Several hydraulic brakes Froude and Taylor type Purpose: X student´s project work X cooperation with companies X universities´ R&D O other, please indicate staff in No.: academic staff: 6 engineers: 5 other: 7
Which field does your university seek to cover in the future through testing bay and laboratory:	Improve the student´s skills of engine testing
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	Mechanical Department where Mechanical Engineering degree program is located, has a new building of 4000 m^2which is about to be finished. 20% of its surface is dedicated to test benchs. An older building was replaced by this new one but, since the 1940 Mechanical Engineering at La Plata University has had several hydraulic benches.
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	Bench test of an Otto engine cycle. Bench test of a Diesel engine cycle. Bench test of a gas turbine. The tests are carried out following a national standard.
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	Students must perform 200 hours of professional practice before graduate. Several of them develop their practices in business departments of big enterprises. 8th semester

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Which other channels do you use when it comes to cooperating with companies?	Some big enterprises offer summer programs for students that are about to graduate. Many of them continue as employees after the graduation.
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	Mechanical Department has an agreemet of cooperation with the ACTC (an association of car racers). The faculty is a services provider for automotive builders in Argentina

Labour Market – Bahia Blanca (UNS)

Labour Market ***(where HEIs graduates and companies meet)***	
% of immediately employed graduates (within 3 months after graduating)	70%
Main fields of occupations after graduating from automotive or mechanical engineering	**Mechanical engineering:** Petroleum, Energy, Steel Industry **Electronic engineering**: Energy, electronic industry, general industrial processes, Petroleum
Efforts to support students employability as a university	The University facilitates the relationship between students and recent graduates, and companies.
Key success factors for graduates to be employed (in your country)	Strong preparation in basic sciences and applied technologies
Expected future needs/skills of engineers *(this question will be able to be answered in more detail during the expert interviews)* – here we seek for universities point of view	The mechatronic approach to engineering. Interdiisciplinary and transdisciplinary abilities. Computational Simulation of solid and fluid problems

Labour Market – La Plata (UNLP)

Labour Market ***(where HEIs graduates and companies meet)***	
% of immediately employed graduates (within 3 months after graduating)	80%
Main fields of occupations after graduating from automotive or mechanical engineering	90% in related activities in the industry such as steel, petroleum, manufacturing. Mainly in the areas of maintenance, production and quality
Efforts to support students employability as a university	The Supervised Professional Practice (PPS), mandatory before obtaining the degree, (introduced from the 2002 study plans) has given excellent results by putting the students in the real productive field.

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	There is a database for graduates interested in joining and that allows them to contact them with companies interested in the incorporation of engineers.
Key success factors for graduates to be employed (in your country)	Ability to face tasks and solve problems of various disciplines, not only those specific to mechanical engineering training but also those related to management, economics and human resource management.
Expected future needs/skills of engineers *(this question will be able to be answered in more detail during the expert interviews)* – here we seek for universities point of view	It will be necessary to reinforce the soft skills

Focus Group Output

Short Description of the Focus Group Participants
Who participated in the focus groups, what are their positions, which level of influence do they have in the automotive industry or higher education sector? **UNS** Due to impossibility of attending the meeting in Bahia Blanca, the industry representatives were interviewed previously using a predefined questionnaire. The results were used as input to the focus group meeting performed at UNS on Monday 18th of June 2018. The conclusions of the discussion of the different topics are included below in the final report The persons who attended the meeting were authorities and professors at UNS, mainly from the Department of Engineering and one from the Department of Electrical Engineering. *Detailed information about the participants are only available to internal staff.* **UNLP** Date and place of the focus group: 19th of June 2018 Number of participants: 2 industry representatives from national companies operating in the automotive industry, 2 UNLP teachers in the area of engines and automotive. Other 2 industry representatives from multinational automotive engineering companies were interviewed by the board manager and their opinions are contained in this report. Language of the focus group: Spanish *Detailed information about the participants are only available to internal staff.*
Topic I: Trends in Automotive Industry
The automotive industry underlies constantly new developments. Nowadays these developments are as evident as never before with the current upcoming of topics such as e-mobility and autonomous driving, …). Within this section it is interesting to identify on the one hand side the

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current trends and developments in your national country and the impact of them on the national automotive industry. Content that should be covered within the section: national trends and developments in automotive engineering and the impacts on the industry, future need for engineers, skills of engineers and keeping up with new developments, increase of importance of the automotive industry on a national and international level
About national trends or developments currently upcoming in Argentina: **In Argentina the focus is mainly oriented to production of Pickups, utility and SUV vehicles**, **although it is foreseen a tendency to include new hybrid high end vehicles, electric and hybrid vehicles including new technologies in batteries, electronics, etc.** It is seen in some cases the adoption of global platforms where to develop different kind of vehicles. **All participants agree that Argentina is a production place**. There is none or very little development of new products since al big companies do the R&D in central countries. Even though, **Argentina's market is growing slowly.** There is some improvement in material pressing technologies and use of lightweight materials as Aluminum. About the way that these new trends impact the Argentinean Automotive industry: Those new trends will require the adoption of new equipment and service facilities, incorporating also new capacitation programs. Will require new technological developments, including modern fast pressing systems. The impact may be positive although someone disagrees and thinks that this will have negative impact. Companies may start new production lines, creating new jobs and requiring more production from the local parts providers. There may be a positive impact on the increase of local parts production from 30% to 50%. Global platforms will lead to specialized production segments and new developments. **There is a general opinion that Argentina will keep the focus on manufacturing and assembly, although some of the participants believe that there will also be an increase of R&D.** Others think that in the local industry the main companies even do not allow to make changes to the products, and the main work would be focused on documentation and minor adaptation of products. Also there is a general opinion that **the number of engineers necessary for this industry will increase**. The needed areas of expertise are identified as Mechanical, electromechanical, electronic, chemical, and software engineering. Someone thinks that Argentina will need at most 1500 more engineers in this industry. Others believe that there will be a 10% to 20% increase on the demand of engineers. Other one thinks that there will be no change in number, but some changes in abilities. The areas where they could be required are identified as Production, maintenance, Quality, Engineering, assembly, service, and some participants think that also in R&D. The participants mainly believe that the engineers are skilled enough to face these new developments. With respect to educational measures that the automotive industry implements to increase the knowledge of engineers on the future developments, the following were mentioned:

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- Capacitation lectures and courses, either specific or on a periodic basis, about vehicles and products, "On the job" training (OJT), training on "six sigma", soft skills: leadership, team work, problem solving, management, specific training on specific areas.
- Clear definition of the strategy for the future: conferences, polls, Workshops, coaching towards innovation, learning and management as basement for the future.

For the parts makers industry, training is focused on electronics, automation and robotics.

Focusing *on **the skills needed by engineers*** **in order to face new developments**, the conclusions are: **It is needed more training on reasoning for applying technical knowledge**. The engineers should be skilled to find concrete, applicable solutions.

Soft skills:

Improvement of processes, "kaizen" (continuous improvement in all aspects) in each position. Innovation abilities, empowerment, communication abilities with colleagues, clients and providers, Benchmarking. Creativity, technological prospective, Willingness to accept changes and paradigms.

Management of human resources – Universities does not fulfill this requirement. Leadership. Negotiation ability, particularly regarding the relationship with unions of workers considering their strength.

Abilities on management to interact with all different areas. New engineers believe that they will work 90% in engineering and 10% in management, but reality shows that they will work 90% in management and 10% in engineering.

Technical skills in automotive industry for production: specific knowledge about engines, product electricity/electronics, new technologies. More practical knowledge. Theory is not enough.

Operative knowledge of software tools, keeping a strong connection with the physical world.

Mainly, knowledge on management of production, abilities oriented to maximum productivity. Skills on productivity measurement tools. Logistics. Abilities for the quality control sector, quality management. Abilities for aftermarket services. Abilities (in lower priority) for development. Error proofing techniques, lean manufacturing, applied statistics for decision making based on data, etc.

Regarding the new paradigm for transportation based on electric energy, it would be needed to increase the effort for giving knowledge about vehicle engineering, hybrid-electric engines and energy storage systems. This should be considered from the academic viewpoint, from R&D in universities an in joint effort with the industry**. Mechanical engineers must increase the knowledge and understanding of electronic systems involved in traction systems**.

Regarding the level of importance of the automotive industry at international level, the principal opinions are focused on the impressive change motivated by alternative power systems (electric, hydrogen, hybrid), that will lead a complex and demanding process of innovation in all aspects of the industry considering more exigent ambient standards and user demand of more efficient and ecological systems, form R&D to production, maintenance, user experience, service, energy recharging systems connected to the smartgrid or to hydrogen refueling systems, autonomous driving systems, interfaces IoT, etc. The new paradigm would include rental systems for cars, which would perhaps lead to a reduction of sells in developed countries although the future automotive market may temporally increase in developing countries since all new products and processes are in general adopted later.

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At national level, Argentina is becoming a neat producer of utility wagons, pick-ups and SUV where quality will impose new and more exigent standards over all processes, including parts makers.

A special situation appears respect to parts makers: Their problems and requirements are quite different respect to the automotive main companies.
There it would be necessary more engineers who could lead the necessary changes to increase quality, and product diversification needed by the sector to keep alive among international competitors, regarding new materials, new technologies, affordable and competitive costs. For example, compared with Thailand, the costs in personnel are 3 times higher in Argentina. Argentina imports most of the parts, there is no industry for plastic molding for interiors of doors, there is no production of wiper washers and /or crystal lifters, the quality of the parts in some cases are not as high as found in other countries.

Topic II: Employment in the automotive industry and cooperation with higher education institutions

This section serves to get more information on the automotive industry as an employer and to identify possible future collaboration between universities and industry. Further, it is an aim to identify why the reputation of the automotive industry is not very well and which measures need to be implemented in order to improve this current situation.
Issues that should be covered within this section are: the automotive industry as an attractive place to work, skills required from graduates in engineering when entering a workplace in the automotive industry, educational facilities for high class education such as labs, university-business cooperation in general and through ASCENT competence centres.

The general opinion is that the automotive industry is an attractive industry to work for, due to the following reasons:
It includes many attractive areas of expertise and systems.
It is at the vanguard of the production industry. Quality, production, delivery, all aspects need skilled professionals. There is constant improvement and advances. It is a reference for other industries (E.G, lean manufacturing originated in Toyota and migrated to many other industries).
Cars are deeply linked to Argentine culture, and that attracts new students permanently (in particular IC engines, so it is worth thinking about the hybrid-electric future)
The participants *believe that necessary skills and knowledge necessary for engineers* to work at the automotive industry are the following:
Soft skills: Conflict management – Foreign languages – English. Clear understanding of the 5S concept ("Sort", "Set In Order", "Shine", "Standardize" and "Sustain“). Team working abilities.
Technical skills:

- Theoretical knowledge and real experience with vehicles. Knowledge in general of a car, from how the mechanical component works to the interior of it.
- Specific technical knowledge of engineering. For example: hydraulic, pneumatic, mechanical, Electricity, electronics, automation, quality management, logistics, statistics for decision making, systems modeling to predict responses to certain input parameters (DOE, or models in Matlab)

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- Production systems, manufacturing technology, materials, quality systems, industrial safety, maintenance etc.
- Lean Manufacturing - Assembly processes - Costs - Knowledge of the Automotive Market and suppliers - Segments
- In production centers, the needed skills are more likely oriented to industrial engineering, processes, resource optimization.
- In R&D centers, it is required all the basic physical knowledge mathematical and applied mechanics, coupled to the cad-cam simulation technology of design and machining, assemblies, robotization of operations.

The current perception of competence/capability of current graduates **with regards to these skills is that there is lack of abilities in these aspects:** Experience with real systems: tests, mounting and dismounting, etc.; knowledge in vehicle engineering; Knowledge on alternative power sources and simulation platforms

Some participants believe that the university does not bring enough knowledge to the students: there should appear new lectures and/or there should appear new careers related directly to automotive industry.

The actual attitude of the new engineers is to seek for immediate results, but automotive industry does not offer such kind of results. It is actually problematic to find interested new professionals willing to work there. Part time work, home working, are not easily found in automotive industry.

The participants believe that *universities should be able to provide the following skills* in order to educate the resp. capabilities:

More practical activity. They should have workshops where they can see all the topics that can be found in a factory. Universities should create agreements with different automotive companies and that from the first years of training the engineering students carry out various real activities in the industry. More connection with companies in practical examples, invite practicing professionals to participate in the classes, be attentive to the latest trends and how they are evidenced in practice (learn to use the same types of software used in practice).

Train teachers in the aforementioned areas and organize seminars with engineering personnel of the automotive sector companies. Specific and practical courses, visits to companies, internships, etc.

Some participants believe that it is necessary to increase the hours per week of academic activity.

Others think that if the automotive industry needs special skills, it should help the universities to implement lectures, special training and laboratories accordingly.

Some topics where there should be special training for the engineering students at the universities could be:

Soft skills: English and other languages.

Specific Technical skills: Suspensions, platforms, engines, transmissions, brakes, electronics applied in those systems.

General technical skills: Electricity, electronics, automation, quality management, logistics, statistics For making decisions, modeling systems to predict responses to certain input parameters

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(DOE, or models in matlab). Incorporate in the curriculum subjects related to vehicle engineering, design and computer-aided manufacturing (CAD-CAM), calculation of machine elements by FEA, Interpretation of the car as a complex machine both in the development and assembly.
Lean Manufacturing. Assembly process. Analysis of statistical data- Analysis of problems and search of root cause.
The actual business-university collaboration is evaluated as poor. Some participants think that the collaboration is slowly growing and others even think that it is adequate. Actually, this topic should be stressed and leaded mainly by the universities, who must be creative to increase their presence showing to the society their abilities and capacities.

Collaboration could be increased doing some of the following actions, among others:

- Making agreements and rented internships for the students so that the development of the student is also practical within the industry.
- Involving practicing professionals in different subjects to show how knowledge of the subject is used in companies. Also that the professors have experience in companies.
- Through agreements with companies and projects that can link them.
- Through proposals and joint developments aimed at understanding mutual needs and capacities.
- Creation of programs of visits to companies, talks, workshops, specific courses.
- With more interaction, more search for ways to work with companies from the universities. Achieving that education incorporates more practical experience.
- Collaborate with the industry in the training of collaborators for the industry with better levels.

To increase university-business collaboration, it would be useful if the universities and companies could understand the way of working of each other. From the companies point of view, Universities should be open to dialogue and understand the moments the company is going through. Who should lead the process is the university and the company should provide support at the management levels but not so much time. But from the university point of view, companies should get more involved in joint developments, in particular when the project is of special interest for the company, balancing the efforts done on the respective areas of expertise.
It is a common concept from the industry side that universities should make an effort to reconcile the educational need with that of concrete and usually short-term results of the private company. In many occasions the timing does not help to work issues together and it seems necessary improving the adaptation to the industrial reality and the speed of response.
But it is also known that universities are not private companies with focus on production. The ability of the university is having time and experts to think about the problems seeking for new solutions. Sometimes also universities have adequate equipment to support R&D in some aspects. It is a common conceptual mistake from the industry side when they came asking for quick solutions that can be also found in the private market, and a mistake from the universities when they go to the industry to offer standard services also available in the market.

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The interviewed colleagues all showed interested to collaborate in training activities (theory and on-hand trainings) with universities´ staff. By the time of the interviews, they were also mainly interested at this first stage to implement projects together with the ASCENT competence centre.
Topic III: Training Topics for the ASCENT Competence Centres and Testing Bays
During the ASCENT kick-off meeting possible training topics for the competence centres have been identified. The training topics which got roughly identified are the following: 1. Automotive trends: Technological and business trends 2. Soft skills for engineering graduates focusing on skill- and self-selling 3. Testing bays: Installment including purchase proceedings, technical operation and its importance for university-business cooperation 4. Train the trainer of competence centres Further, within this section also the importance and relevance of testing bays at higher education institutions needs to be clarified and it needs to be identified which facilities these testing bays need to offer in order to be interesting for companies for industry and educational purposes. Please therefore summarize the information gathered about training topics identified. Are the training topics reflecting the needs of the industry or is there a need for adaptation? If yes, how should the adaptation look like? Further, please also include the relevant information about the competence centres – testing bays for educational purposes with industry.
All participants believe that those topics are relevant and beneficial for the implementation of the ASCENT competence centres and are relevant also for the industry. Possible subtopics for each topic, mentioned by the participants were: 1) Training in global trends, Error proofing, Equipment, devices and measurement of pollutant emissions from combustion engines, robotics 2) Quality management with the use of statistics, six sigma, MANAGEMENT CONTROL METHODS Lean Manufacturing- Benchmarking - Innovation management - Languages 3) Test benches and tests, motors, automation systems and feedback control. Internships in companies. Design of the rooms for test bays. 4) None was mentioned. It might be not possible to advance until the competence centres could be well defined, but a possibility could be to create internship programs and postgraduate students within the automotive industries. It is stressed that the part-makers industry has more needs for training tan big automotive companies. Additionally, the participants mention the following topics as interesting to add to the competence centres: • **Bench tests and performance tests: Road Test.**

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- **Industrial maintenance**
- **Training for suppliers**
- **Hybrid Vehicle technology**
- Programming in different CNC languages, and simulation of machining in Numerical Control centers, for simple and complex surfaces.
- Process management - Information flow from the areas based on a TIMEPLAN. Where each area participates, with what functions and responsibilities it has within a project from its conception phase as the idea of a vehicle to the SOP (Start of Production)

The industry representatives , when asked about the possibility of hiring assistant trainers (students and graduates) of the ASCENT competence centres with the skills already given answered affirmatively although some said that they were not in position to hire personnel. The main reasons for their willingness of hiring were because:

- It is the way to transmit experiences.
- An institution helps to give credibility to the person, seriousness of their services.
- The employee would already have a lot of knowledge that should not be necessary to be taught in companies.

About the **types of test benches that could be more useful for training, the answers were:**

- **Test bench for engines, suspension and crash tests.**
- **Test bench for motors, multimedia interface.**
- **Eddy current Dynamometers for testing engines, and rollers for testing vehicles**.

The possible impact of the test bays at the universities in general would positive and important due to several reasons:

- Would improve the relationship with industry,
- Would attract more students,
- Would be used to train students in new skills,
- Would produce a money income due to services,
- **If the test bay were certified under international standards for some tests, it would give reference results.** There are cases in Argentina where the companies have to send parts for testing to universities of Brazil.
- It could be used also for R&D.

To serve industry and educational purposes the interviewed experts from industry consider that these testing bays need to offer certain basic capacities, such as:

- **Adequate building and infrastructure, designed and built accordingly to international standards, updated equipment and software.**
- **Capacity to perform test cycles and measurement of parameters according to European or American standards.**
- **Must have certifications from authorized institutions.**
- **Full automated and programmable dynamometers.**

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One of the experts believes that the ideal structure to create should be Institutes for automotive management where the students interact with professors, technology and companies following German universities as benchmark.

Regarding the kind of services to offer to the industry, in order to increase university-business cooperation, the experts from industry consider:

- As in previous points, internships for students and leased graduates and payment of fees for testing in test benches.
- Conduct courses and seminars on current trends in the automotive industry and testing of vehicles under standards.
- Workshops, books, technology to visualize information, data, graphics, virtual platforms.
- The services should adapt to the methodologies and times of the industry.

To answer it is necessary to carry out a survey of the current needs of the industry and see what it is possible to complement.

Additional Comments:

Regarding the possible test bays for the competence centre, it is a general opinion that the test bays which could offer services to the automotive industry must be certified accordingly to international standards.
The process of certification is complex and expensive, and requires the design, specification, mounting, calibration and use of equipment according to the required standards and specified procedures. Also the basic infrastructure where the test bay is mounted must be designed, equipped and used according to the standards.
When considering the actual budget allocated in this project for equipment, and considering the available infrastructure at UNS, **it seems quite complex to be able to create a competence centre with a certified test bay**.
Certified test bays must only be used for the specific tests, and must keep updated certification, updated software and procedures, and specific trained personnel.

It seems simpler and possible to create competence centes just for training students and personnel of the automotive industry on specific aspects aligned with some of the topics mentioned above.

Identified GAPs during the Desk Research Phase and the Focus Groups

Within this final section it is important to name GAPs in different areas which already got identified during the desk research phase and focus groups. These GAPs might be subjective to the authors of this report but support in getting a basic understanding for the GAP report.

- **Educational GAPs (skills and competences of graduates):**

Need of more practical training related to the industry requirements
More emphasis on soft skills

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- **Infrastructure GAPs:**

The need of certified installations to offer service to the industry may become a big obstacle since at the university in general the infrastructure is used for academic and research objectives, and certified installations must be kept under permanent supervision to satisfy the standards

- **University-Business Collaboration GAPs:**

Different perception between university and industry of the role of each part in a collaboration scheme.

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BRAZIL

Country Report

USP – Universidade de São Paulo

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August 2018

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This section contains the results of the desk researches done by University of São Paulo and Universidade Federal do Rio de Janeiro.

The Automotive Industry in Brazil at a Glance

Automotive industry structure in your country	
Main current industry-related challenges in your country	Economical and political stability, Legal issues, Improvements in education, Taxes, Transport infra-structure, Interest rates
Other regional challenges which are also relevant / might become relevant / development not sure	Rio de Janeiro is strongly connected to the oil industry although having significant automotive industry. Nevertheless the regional government lacks of articulated industrial policy. The states of São Paulo and Amazonas attract more automotive factories than Rio de Janeiro, because São Paulo has a better infrastructure and proximity to the most consuming states and Amazonas offers tax advantages.
Future global trends in the automotive industry which are relevant to your country	Technological change to the hybrid and electric vehicles. Qualified HR. Biodiesel.
What are main channels and approaches used for sales in the automotive industry	Traditional marketing in broadcast and specialized magazines.
Government	
Governmental efforts related to the automotive industry	Mainly related to import/export taxes. Coupling of taxation and investment in R&D.
List most important governmental initiatives (based on impact, relevance and € invested)	INOVAR-AUTO, Financing initiatives through BNDES.
Companies	
Total volume of the automotive industry in your country in €	40.000 mi€
Ancillary industries (No.) name major 3 in terms (TIER 1)	BOSCH, Magnetti-Marelli, ZF, Mahle, Cummins, MWM, Perkins, DENSO VALEO, DELCO...
Producing industries (No.) name major 3 (OEMs)	FIAT, Volkswagen, FORD, GM, Toyota, Honda, Renault, Peugeot Citroën (PSA), KIA, Hyunday, Daimler-Benz, Volvo, Scania... (31)
Is your university/faculty currently cooperating with one of the major 3 companies?	Not at the moment. Conversations being made with MAN(VW-Trucks)
Associations	
Relevant clusters, associations, governmental bodies related to the automotive industry	ANFAVEA, ABIPEÇAS, SINDIPEÇAS, SAE.
Does you university cooperate with associations etc.?	On individual basis.

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SWOT analysis

"Automotive industry in our country": for assessing automotive industry in your country in comparison to others

Nowadays the Brazilian market is overcoming a financial crisis, in that context, the automotive industry is still recovering from a substantial decrease in sales and revenue income. Consequently, the number of job positions and vehicles produced were significantly reduced. Recently, the sales have risen and the companies are hiring, however it has not still reached its former 2013 high numbers.

The predictions indicate the economy will keep growing. Therefore, companies have today an opportunity to stand out from its competitors and fill a market gap. For the recent university graduate, this is the chance to work inside a company that is doing its best to improve its product, costs, appeal, technology and policies. This process means that the companies are investing in new ideas and are open to the point of view of the new generation.

Even though the economic situation is optimistic, the students and university newly-graduates feel that there is a huge competition among highly-qualified workforce to occupy the available positions. The crisis left skilled professionals without an occupation and now the new job openings cannot absorb them. In order to get a job at an automotive company people have to have a previous specialization course and an extensive knowledge of the field. With this in mind, it is noticeable that the students have become more reluctant about the prospect of working in the automotive industry.

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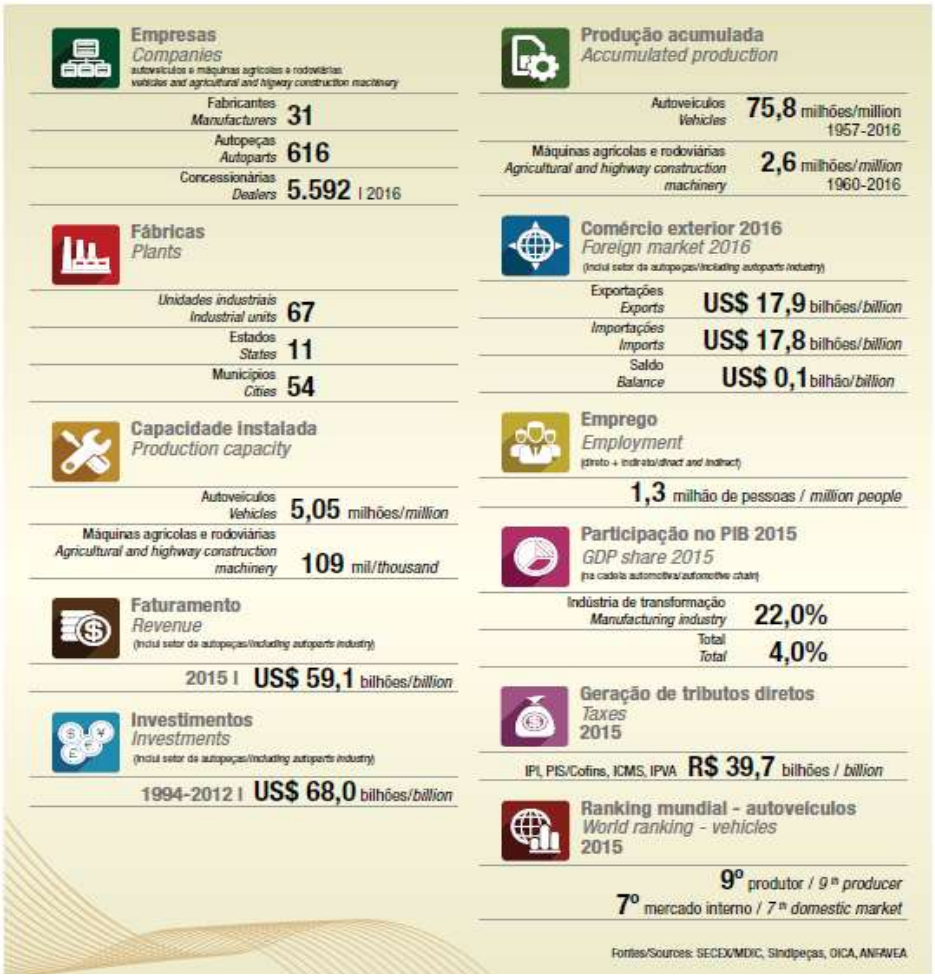
Graph 1: anfavea.com.br; number of autmotive manufacturing factories in Brazil



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Universidade Federal do Rio de Janeiro - Automotive Engineering & Sales Management at Higher Education Institutions

Please indicate the degree program you are referring to in this analysis	Mechanical Engineering
If you refer to different degrees for Bachelor / Master, please indicate:	
Bachelor	Mechanical Engineering
Master	M.Sc. Mechanical Engineering
PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	850 Undergraduate / Bachelor 160 Master of Science 110 Ph.D.
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	30 Full time (Ph.D.) Professors 1 Part time (M.Sc.) Lecturer (Mech. Eng. Progr. only)
No. of researchers at automotive engineering and/or mechanical engineering institute	x-x-x
CURRICULA	
Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	Please look at general overview
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Please look at general overview at the bottom of the document. There are 7 business related electives that students can attend to.
Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff)	1 Chassis Dynamometer 4 Hydraulic Dynamometer 2 Inertial Platforms 10 Accelerometers 60 Microphones 1 Binaural Headset Planar Microphone Array Spherical Microphone Array Small Scale Wind Tunnel 1 small torsional stiffness test bench 1 small braking test bench Purpose: All equipment is available to teaching purposes as well as to R&D activities. Either undergraduate and graduate students have access to them. Mostly used in research

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	activities and industry collaborations, in which undergraduate students are often involved. staff in No.: 19 academic staff: 10 Full time Ph.D. Prof. Engineers: 4 Engineers other: 5 Technicians
Which field does your university seek to cover in the future through testing bay and laboratory:	Rotordynamics, Electrical and Hybrid Power Trains, Driving assistance.
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	Besides the research laboratories in the different fields of mechanical engineering there are dedicated facilities to student teams related to the automotive industry, especially FORMULA SAE and mini Baja Teams.
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	Encouragement and advice of the different SAE student competition teams, FORMULA SAE, FORMULA SAE Electric and Mini-Baja.
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	Yes, through support activities of student Teams and through the participation on the Jr.Consulting Cia.
Which other channels do you use when it comes to cooperating with companies?	Cooperation is coordinated through the support foundation, COPPETEC Foundation, under supervision of the academic staff.
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	No.

Labour Market	
% of immediately employed graduates (within 3 months after graduating)	Dependable on the economical situation. 2008-12 >90%, 2015-17 >??%
Main fields of occupations after graduating from automotive or mechanical engineering	Oil industry.
Efforts to support student's employability as a university	The university is in close contact with the industry and promote internship contacts. The oil industry in Rio de Janeiro is the main target of the students after graduation.
Key success factors for graduates to be employed (in your country)	Solid technical formation, language skills, teamwork capabilities. Knowledge of Finite element analysis (FEA), numerical analysis, CAD and thermal simulation software.
Expected future needs/skills of engineers *(this question will be able to be answered in more detail*	Business and management insight, multi-discipline technical studies. Oral presentation skills.

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during the expert interviews) – here we seek for universities point of view	

Universidade de Sao Paulo - Automotive Engineering & Sales Management at Higher Education Institutions

Automotive Engineering & Sales Management at HEIs	
Please indicate the degree program you are referring to in this analysis	**O automotive engineering** **X mechanical engineering** **O … (other, please indicate)**
If your refer to different degrees for Bachelor / Master, please indicate:	**Engineering degree in Brazil lasts 5 years. We do not follow Bologna format (Bachelor + master)**
Bachelor	
Master	
PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	70 new undergraduatestudents enroll every year Aprox. 350 students total
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	50 faculty members
No. of researchers at automotive engineering and/or mechanical engineering institute	50 faculty + 200 graduate and research students
CURRICULA	
Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	After 4 years students have to choose a package of disciplines to form their last year in school. One of such packages is in Automotive engineering
Technical Subject 1	Automotive Engineering 1 https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3540&codcur=3044&codhab=5010 *Introduction Automobile history - Vehicle systems Longitudinal movement of rigid vehicle Road loads: Aerodynamics Road loads: Rolling resistance Aceleration / traction - Motor and mechanical transmission Aceleration / traction - Fluid coupling Aceleration / traction - Limits Breaking performance Passing (overtaking) Vehicle requirements Ride Applications*
Technical Subject 2	Vehicle Transmission Systems

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	https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3542&codcur=3044&codhab=5010 *Design parameters of automotive transmissions Clutches (friction) Torque Converters Manual Shift Gearboxes Automatic shift gearboxes Differentials Transfer gearboxes Final Drives Bearings and constant velocity joints Tyres and wheels Design criteria for automotive gears Design criteria for synchromesh rings*
Technical Subject 3	Automotive Electronics https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PSI3561&codcur=3044&codhab=5010 *Internal combustion engine operation. Actuators, sensors and electronic components of the Otto cycle Engine Management Unit. ECU programming strategies. Design methods of automotive embedded systems. Data communication networks*
Technical Subject 4	**Automotive Engineering II** **https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3541&codcur=3044&codhab=5010** *Suspension components, tires, springs, absorbers; suspensions; steering system; vertical movement of rigid vehicle; lateral movement of rigid vehicle; mathematical models and analysis; simulation and stability; non linearity and modeling*
Technical Subject 5	Mechanical and Vehicular Structures https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3543&codcur=3044&codhab=5010 *Introduction – Body of a passenger car; New concepts- Body components; Stress analysis – Failure criteria; Matricial method – Finite elements method; Dynamic stiffness; Elastic buckling; Nonlinear analysis; Doors and roof smashing and seats and security belts anchoring; Collision performance ("crash"); Pedestrian protection*
Technical Subject 6	Intelligent Vehicles https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PSI3562&codcur=3044&codhab=5010 *To provide a functional description of intelligent vehicles, types of services, including technological components. Analysis of the behavior of intelligent vehicles and evaluate its the impacts on transpor network efficiency, safety, fuel consumption, and emissions*
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Explanation (give a short overview of contents treated in each subject)
Business subject 1 / Bachelor	Principles of Business administration https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PRO3213&codcur=3044&codhab=3000 *Business Management. Human Resouces Management. Accounting, Costs and Corporate Finance. Engineering Economics*
Business subject 2 / Bachelor	Design Methodology https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3320&codcur=3044&codhab=3000 *Engineering Design. Production and Consumption Cycle. Value Analysis in Design. Techniques for Generating Ideas. Feasibility Study. Basic Design. Simulation and Optimization. Executive Design*

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Business subject 3 / Bachelor	Design Methodology II https://uspdigital.usp.br/jupiterweb/obterDisciplina?sgldis=PME3421&codcur=3044&codhab=3000 *Provide integration of knowledge presented to the students in disciplines concurrent and previous to this providing the necessary tools to develop a plan for implementation, delivery and marketing of the product whose basic design (product design, including market, technical and economic studies) was developed in the Design Methodology I*
Business subject 1 / Master	
Business subject 2 / Master	
Business subject 3 / Master	
TESTING BAYS	
Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff)	O available O not available Scope: describe technical equipment and foci Purpose: O student´s project work O cooperation with companies O universities´ R&D O other, please indicate staff in No.: academic staff: engineers: other:
Which field does your university seek to cover in the future through testing bay and laboratory:	Student Projects
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	Current facilities are used on research project with proper budget
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	Mandatory internship in Industry Participation in Automotive competitions Internship work on research laboratories.
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	Students need at least one internship (120 hours work minimum) in order to get their degrees

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Which other channels do you use when it comes to cooperating with companies?	Research projects funded by companies and research agencies
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	Yes. Faculty cooperates at the Brazilian Association of Automotive Engineering

SWOT analysis

"Studying automotive engineering (AE)": for assessing our automotive engineering course in comparison to offers of other universities

The curricular basis of most mechanical engineering courses in Brazil is similar. It is composed of basically the same subjects such as mathematics (calculus, algebra, statistics), programming, technical drawing, physics and other basic engineering disciplines. The main differences are on the eligible subjects available to the students, university infrastructure and on the quality of research. The nature of the university laboratories and the variety of extension programs play a great role on determining University's quality.

The Federal University of Rio de Janeiro is the oldest and largest Federal University of Brazil. It is widely known for its excellence in laboratories, large industrial Technology Park, high-quality education and high-end technology research (Maglev / LabOceano), being considered one of the centers of excellence in research and education in Latin America.

The Mechanical Engineering course at UFRJ has multiple extension activities. There are three stablished SAE competition teams: Icarus, Minerva Baja and Minerva E-Racing. The first being a combustion engine formula type race vehicle, the second an off-road race vehicle and the last an electrical formula type race vehicle. Besides that, there are numerous laboratories dedicated to the studies of subjects closely related to the Mechanical Engineering course, like acoustics, thermodynamics, tribology and many others.

At other Universities in Brazil there are also SAE competition teams as well and laboratories with similar or equal study focuses like the ones at UFRJ. The quality of education at certain Universities is comparable to UFRJ, those being ranked similarly at the National Universities Ranking. (USP/Unicamp/UFSC). Considering other centers of excellence in Brazil and that some Universities offer the Automotive Engineering course, it is possible to affirm that in some aspects these courses can sometimes be better equipped than UFRJ to prepare those students who wish to begin the career in the automotive sector.

During the Mechanical Engineering courses provided by Brazilian Universities there are many opportunities for the students to develop automotive knowledge. Those come from various sources, such as, mandatory subjects, eligible subjects and competition teams (SAE).

The Brazilian engineering curriculum provides a solid basis for the mechanical engineering students. This enables the students to develop better projects in less time, since they have a good understanding of dynamics, material properties, thermodynamics and other vital theoretical subjects. Predicting,

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identifying and solving problems is also an essential feature learned throughout the course. This knowledge is crucial in any branch of the engineer's field of work.

As a member of a SAE competition team the students have the opportunity to obtain numerous indispensable capabilities for the automotive engineer. They will develop various projects as well as enhance their social skills and teamwork. In order to achieve a high-quality project, the students make use of various simulation software alongside experimental tests. Because of that these students have a better understanding of such validation methods. Another important factor for the success of a team is the ability to work as a group, to create an organizational structure and to follow it. Furthermore, in these teams the students have their first contact with fabrication methods and machinery handling.

Another form of contact between the students and the automotive world is the mandatory internship period at the end of the bachelor course. This consists of a one semester experience during which the student must exercise a trainee position at a company. This demand leads to a tighter relationship between the companies and the Universities in Brazil. If the student wishes to extend his knowledge about the automotive industry, he may search for a company from this field to apply for an internship. During their time at the company, the students may be able to extend their internship period, so that they may gather more professional experience before entering the market. Alongside that, the student could become a full-time employee after graduating, if presented with the chance to do so.

With this deeper automotive understanding, students can choose their path in this area of expertise, whether it is a masters on this field, a technology developer or a management position at a big company.

Focus Group Analysis

Date and place of the focus group: 01st of June 2018
Language of the focus group: Portuguese

Topic I: Trends in Automotive Industry (Opening)
Main remarks: Fleet electrification is still far away from the Brazilian market including personal and commercial vehicles. Ethanol and Bio-diesel are still two main alternatives to be used in IC engines and new oil reserves have been found offshore of the Brazilian coast. National Market is closed and local industry is focuses on the internal market and on the neighbouring countries (mostly Argentina). To some of the participants the main thing to be done is to recover from the crisis that started in 2015. Country economical situation is still faltering and prospects of full recover are still far in the future.
• **What national trends or developments are currently upcoming in your countries?** - Economic recovery - Bio-fuels - New mobility businesses (Car sharing) - Survival of the local industry - De-investment - ROTA 2030 (This is a Brazilian government industrial policy to the automotive sector announced last may but still to be implemented. It will demand that R&D investments to be

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done in Brazil in exchange for some tax reduction. However, final implementation may be different. Electric and hybrid vehicle development are some of the main programs that may benefit from such policy)

- The Brazilian national trends are aligned with the worldwide megatrends: electrification, autonomous driving and connectivity

- **How do these trends impact your national automotive industry?**

- Current economic situation as well as the political situation (general election in October) is keeping the whole country in expectation. New investments are halted until after the general election and after the country knows what sort of government will be formed and when its policies are announced. The automotive industry is in waiting. However, during the last couple of years development capabilities were reduced by some manufacturers with hundreds of technical and engineering jobs being terminated or with relocation of some engineering professionals to the companie's HQs outside Brazil (Mostly to the USA).

  - **Do you think that the automotive industry in your country will focus more on R&D given the current developments and in order to stay competitive or will the automotive industry in your country always focus more on manufacturing and assembly?**

Given the current trend of global standardization of the vehicles with global product platforms most of the development is being centralized at the manufacturer country of origin. Brazil has no native car manufacturer. Apart from adaptation to local conditions, most of the R&D will be done outside Brazil unless the country can provide excellent engineering with a very competitive cost. If the current trend carries on then the focus will be on manufacturing and assembly.

Brazilian markets is more focused on manufacturing due to the main characteristic of adopting worldwide standards a bit later than developed countries (e.g. European Union and USA). But when we talk about the megatrends there is a possibility that the country will develop the R&D competence.

- **Will the need for engineers increase in the future?**

Not for R&D if the current trend is not reversed. However for manufacturing and production engineering the demand will increase. It was reminded that the whole manufacturing is being transformed (industry 4.0) and a new group of engineers will be needed just to deal with the new technologies**.**

- **How many more engineers do you think the automotive industry needs in the next 5-10 years with which skills?**

  I don´t know the exact numbers. But there is an increasing need. And the knowledge level must also be increased. Today we receive engineers with lack of theory formation.

  The development of these technologies will demand much deep know how than what is shown today.

- **Are engineers skilled enough to face these new developments?**

The general perception is that the engineers do not have the skills specially in manufacturing and on topics related to industry 4.0.

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- **Which educational measures did the automotive industry implement to increase the knowledge of engineers on the future developments?**
  Basic mechanical design know-how, structural analysis, complex systems integration, numerical modeling
- **Which educational measures did the automotive industry implement to increase the knowledge of engineers on the future developments?**
  Artificial intelligence, connectivity, complex systems integration

- **How do you think that the importance of the automotive industry will increase on a national and international basis?**

Without a local major car manufacturer, the industry may lose some relevance at the national GDP. Automotive industry was always an important technology drive of any country and is responsible for millions of jobs worldwide. Besides that, it is always related to value creation for its customers which will increase with the adoption of the megatrend technologies.

Topic II: Employment in the automotive industry and cooperation with higher education institutions

- **Why do you think that the automotive industry is an attractive industry to work for?**

The general comment was that the industry is not attractive as it was 10-15 years ago. One of the participants had actually left the industry recently and changed their career to the academia**.** However, it was remarked that to some engineers it still may present an opportunity of an international careers mostly in R&D.

It allows very good opportunities in terms of professional improvements and the automotive industries are among the best places to work worldwide.

- **What kind of skills / knowledge are required from graduates in engineering, if they want to work in the automotive industry?**

Foreign languages – English plus the native language of your employer (German, French, Italian, Japanese, Korean…)

To be a generalist and then able to work in different field and areas of knowledge then being able to learn quickly about them.

To be pro-active to find solution to existing problems.

Entrepreneurship; negotiation skills; resilience; problem solving habilities. On the top of a good engineering formation.

- **How do you perceive the competence/capability of current graduates with regards to these skills? What should universities provide in order to educate the resp. capabilities?**

Knowledge of foreign language is common but only basic English. Fluency or even knowledge of another language is still uncommon.

The generalist is difficult to find because they prefer to work at better paying sectors such as finance and banking. Higher skilled engineers are trying to start their careers abroad.

Pro-activity is not a skill demanded in most universities and recent graduates lack such skill.

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The level of the graduates is decreasing in comparison to previous years (decades). The diagnose of what shall be done must be carried out by the universities, once they believe their duty is to prepare better engineers in the future.

- **How do you see university-business collaborations in your country?**

Currently is not significant. Research universities are focused on basic science or in research that can be published in journals. Low levels of R&D do not demand the knowledge developed at the universities**.**

  - **How could they be improved or deepened in the future?**

  Only if R&D levels and complexity is increased locally. Another option is to collaborate in other areas such as people re-training and re-qualification. The objective of the university is not aligned with the industry objective.

  - **Which prerequisites need to be provided by universities in order to increase university-business collaboration?**

  To investigate and learn about industry needs. University should not try to replicate what industry already does (for instance there is no point to qualify as research the development of an electric car). Universities must be aligned with the industry objectives. They need to propose solutions for the industry problems.

  - **Would you be interests to collaborate in training activities (theory and on-hand trainings) with universities' staff?**

  For sure yes. But this need to be organized with the Human resources of the company.

  - **Would you be interests to implement projects together with the ASCENT competence center?**

  I do not have enough knowledge to answer this. It will be required more deep information over the Ascent competence center and its goals

Topic III: Training Topics for the ASCENT Competence Centres and Testing Bays

The following topics were considered the most important

- Automotive trends: Technological and business trends
- Soft skills for engineering graduates focusing on skill- and self-selling

The testing bays were considered important but there were questions on how the universities in Brazil would keep such facilities running without a constant flow of resources from the industry.

- **Which impact would testing bays make at universities?**

There is a deep lack of testing facilities in South America. To implement a testing center at fair prices will be well recognized.

- **Which facilities need these testing bays offer to serve industry and educational purposes? Please name some examples which can be of interest**

Every kind of testing is lacking of facilities in South America. Examples: Hydro pulse for structural tests; crash tests; Electromagnetic interference, among others.

- **Which services do they need to offer in order to increase university-business cooperation?**

Testing capacity at fair prices within the industry timeframe.

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Identified GAPs during the Desk Research Phase and the Focus Groups

- **Educational GAPs**
  Need of more practical training related to industry requirements and more emphasis on soft skills.
- **Infrastructure GAPs**
  New up to date equipment for corporations and future teamwork is needed but the money is lacking. The need of certified installation to offer service to the industry.
- **University-business collaboration GAPs:** University-business collaboration needs to be enhanced by establishing framework and formal structure.

MEXICO

Country Report

ITESM

Jorge Avendaño

Horacio Ahuett

Joel Castillo

Ana Laura Vazquez

IBERO

Jorge Andrés Martínez Alarcón

José Emiliano Martínez Ordaz

José Antonio Barrientos Morales

August 2018

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The National Automotive Industry at a Glance

Automotive Industry in your country	
Automotive industry structure in your country	• 90% Producing industry • 10% developing industry
Main current industry-related challenges in your country	• A reliable supply of highly qualified talent to meet the stringent quality standards demanded • Innovation, • Design and development capacities • Cooperation and coordination between corporations, educational and government institutions
Other regional challenges which are also relevant / might become relevant / development not sure	Saltillo Region: • Qualified talent • Develop national suppliers
Future global trends in the automotive industry which are relevant to your country	• Strategic alliances • A greater share of the production market for emerging countries • Environmentally-friendly and energy-efficient vehicles • Autonomous automobiles • Mergers and acquisitions in the auto parts sector • Production platforms shared with Tier 1 companies
What are main channels and approaches used for sales in the automotive industry	The main channel for sales in Mexico is the distribution Agencies. There are more than 1800 distribution agencies in 210 most important Mexican cities. Every state has an Association of distribution agencies. Sales through internet is very low.
Government	
Governmental efforts related to the automotive industry	AERIS It is a CONACYT (R&D agency) mechanism designed to help companies plan and build alliances and innovation networks with their peers and academic institutions. Its goal is to position Mexico as a viable global option for R&D in the automotive industry, promote the development and application of new products and technologies and contribute to the technical know-how of Mexican engineers. The network's strategic research lines include: • New materials: ultra-light plastics.

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	• Nanotechnology applied to automotive systems. • Development of mathematical simulation models (CAD, CAE, CAM). • Innovation in fuel economy and alternative fuels (electric hybrids). • Adaptation of vehicles to the specific characteristics of Mexico. • Research and development in electrical systems and components. • Development of technology for HVAC air conditioning. • New applied manufacturing technologies. PROSEC AUTOMOTIVE Sectorial Promotion Programs (PROSEC) enable manufacturers to import their inputs at preferential tariffs, so as to ensure they remain competitive, especially in globalized industries like the automotive business. AUTOMOTIVE DECREE A decree to "foster the competitiveness of the terminal automotive industry and the development of the domestic automotive market" was published in the Official Gazette on December 31, 2003 with a view to promoting investment in the production of light vehicles in Mexico by offering registered manufacturers the four important benefits EIGHTH RULE This mechanism is linked to the PROSEC Automotive programs and allows companies to import materials, inputs, parts and components under tariff code 9802.00.19 of the Mexican Import and Export Tariff (TIGIE) at a zero rate, provided the provisions of the Eighth Rule of the applicable complementary regulations have been met. Manufacturing Industry, Maquila and Export Services INMEX Simplifies the requirements and procedures to the maquila regime for companies that already have a structured trade plan. It allows to temporarily import goods or services used in industrial processes whose purpose is the manufacture, processing or repair of imported goods of foreign origin. IMPORT TAX REFUNDS FOR EXPORTERS

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	Under this mechanism, exporters can claim refunds on the general import tax paid on goods incorporated into export merchandise and merchandise that is returned in the same state or that has been repaired or altered in some way
List most important governmental initiatives (based on impact, relevance and € invested)	1. INMEX 2. IMPORT TAX REFUNDS FOR EXPORTERS 3. PROSEC AUTOMOTIVE 4. EIGTH RULE 5. AUTOMOTIVE DECREE 6. AERIS
Companies	
Total volume of the automotive industry in your country in €	3.6 millions (units) SALES $82 billions (usd) per year (2015)
Total volume of the producing/manufacturing industry in your country in € (parts and vehicles)	90% (estimated)
Total volume of the development industry in your country in € (design, innovation, research)	10% (estimated)
Number of producing companies operating in the automotive industry	21 complex (OEM)
Number of developing companies operating in the field of automotive engineering	28 DESIGN CENTERS 30 TESTING LABS
Ancillary industries (No.) name major 3 in terms (TIER 1)	Magna Delphi Mahle Nemak Bocar Rassini 300 Tier 1.
Producing industries (No.) name major 3 (OEMs)	Volkswagen Nissan General Motors
Is your university/faculty currently cooperating with one of the major 3 companies?	Tec de Monterrey: YES IBERO: NO
Associations	
Relevant clusters, associations, governmental bodies related to the automotive industry	• The Mexican Automotive Industry Association (AMIA) • The National Association of Bus, Truck and Tractor-trailer Producers (ANPACT) • The National Auto Parts Industry (INA) • Nuevo León Auto Cluster (CLAUT) • The Guanajuato Auto Cluster • Estado de México Auto Cluster • Chihuahua Auto Cluster • CLAUT Saltillo Cluster (NEW)

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Does you university cooperate with associations etc.?	Tec de Monterrey: Low IBERO: Low

SWOT Analysis of the National Automotive Industry

Strengths	Weaknesses
• Infrastructure • Manufacturing costs • Low duties • Manufacturing Experience	• Lack of national providers • Missing of R&D centers • Missing of design centers • Missing of educational centers
Opportunities	**Threats**
• A lot international companies, OEMs with financial opportunities • Already some coopeations of university and industriy which need to be enlarged and specialized • Need for engineers in the automotive industry is increasing (advantage of lower wages and still relativly high qualification)	• Nafta agreement elimination • Nafta agreement reduction • Development of automotive industry as well political decisions of participating countries

Automotive Engineering & Sales Management at Higher Education Institutions

ITESM: Automotive Engineering & Sales Management at HEIs	
Please indicate the degree program you are referring to in this analysis [1]	**O automotive engineering** **O mechanical engineering** **O … (other: MECHATRONICS- ITESM SALTILLO**
If your refer to different degrees for Bachelor / Master, please indicate:	
Bachelor	**X**

[1] *If your institution offers a degree specific for automotive engineering please focus on this course for the following questions. If not, please indicate on which degree you are focusing on (the one that has the most automotive aspects, e.g. mechanical engineering)*

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Master	
PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	150 ITESM SALTILLO 2800 TOTAL ITESM
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	ITESM SALTILLO 3 FULL TIME (JOEL, ROBERTO, 15 PART TIME
No. of researchers at automotive engineering and/or mechanical engineering institute	1 SALTILLO 32 TOTAL ITESM
CURRICULA	
Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	Explanation (give a short overview of contents treated in each subject). At ITESM there are 4 different programs that produce engineers for the automotive industry: IDA (AUTOMOTIVE DESIGN), IMA (Mechanical-Industrial Engineering), IME (Electro Mechanical Engineering), IMT (Mechatronics Engineering). Common curricular areas are shown below. Other relevant programs are IIS (Industrial Engineering) and LDI (Industrial Design). Their curricula varies.
Technical Subject 1/Bachelor	Mechanical Design On completing the course the student will be able to select and apply mechanical design methodologies to the design of products and processes based on the identification of a need.
Technical Subject 2/Bachelor	Manufacturing and Materials students will be able to understand the interrelation between the structure, properties and processing of materials; use materials appropriately in specific applications; select materials based on the Ashby method. omprehend the diverse manufacturing processes, select the machinery and specify the ideal tools and operating parameters for manufacturing mechatronic products, considering both the economic and environmental impacts; generate a machine prototype for manufacturing a specific product.
Technical Subject 3/Bachelor	Mechatronics / Autotronics select and apply mechatronic design methodologies to the design of products and processes based on the identification of a need.
Technical Subject 1/Master	Industrial / Logistics / Plant Engineering

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Technical Subject 2/Master	Science Basics (Math, Physics, Chemistry) Foundation on Math, Physics and chemistry applied to an engineering context.
Technical Subject 3/Master	General Skills (Communication –Written , Oral- Ethics, Humanities)
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Explanation (give a short overview of contents treated in each subject)
Business subject 1 / Bachelor	Economy to Business Creation Analyze the environment through the field of economics, thus promoting strategic thinking among entrepreneurs by means of business-oriented economic concepts.
Business subject 2 / Bachelor	Entrepreneurship Enhance their entrepreneurial potential by developing their skills to identify, create and evaluate new feasible business opportunities and business models based on technology and/or innovation, generating the most possible value whilst being socially responsible
Business subject 3 / Bachelor	Verbal Expression in the Workplace students will have developed the necessary skills to express themselves verbally in an appropriate manner for writers and speakers, having completed exercises in argumentation, value judgments, and the use of specialized vocabulary
Business subject 1 / Master	
Business subject 2 / Master	
Business subject 3 / Master	
TESTING BAYS	
Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff)	O available O not available Scope: describe technical equipment and foci Purpose: O student´s project work O cooperation with companies O universities´ R&D O other, please indicate staff in No.: academic staff: engineers:

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	other:
Which field does your university seek to cover in the future through testing bay and laboratory:	Autotronics / Virtual and augmented reality for automotive and transport applications
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	ITESM- SALTILLO: YES, 8 AND 9 SEMESTER
Which other channels do you use when it comes to cooperating with companies?	INDUSTRY INTERNSHIP
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	ITESM SALTILLO-LOW
IBERO: Automotive Engineering & Sales Management at HEIs	
Please indicate the degree program you are referring to in this analysis [2]	**O automotive engineering** **X mechanical engineering** **O … (other, please indicate)**
If your refer to different degrees for Bachelor / Master, please indicate:	
Bachelor	**Mechanical & Electrical Engineering**
Master	
PEOPLE	
No. of students at automotive engineering and/or mechanical engineering degree	136
No. of academic staff at automotive engineering and/or mechanical engineering institute (please indicate separately full time/part time/internal or external lecturers)	7 / 18 / 2
No. of researchers at automotive engineering and/or mechanical engineering institute	2
CURRICULA	

[2] *If your institution offers a degree specific for automotive engineering please focus on this course for the following questions. If not, please indicate on which degree you are focusing on (the one that has the most automotive aspects, e.g. mechanical engineering)*

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Main technical subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline principal contents)	Explanation (give a short overview of contents treated in each subject)
Technical Subject 1/Bachelor (4 h / week, 72 h / semester) Automotive Engineering and Air Pollution (5th. Se)	1. Combustion fundamentals. 2. Hybrid cars. 3. Emission control systems. 4.
Technical Subject 2/Bachelor (4 h / week, 72 h / semester) Automotive Engineering Project (6th. Semester)	1. Suspension & powertrain analysis. 2. Stress analysis. 3. Computer aided assembly.
Technical Subject 3/Bachelor (4 h / week, 72 h / semester) Vehicular Tests in Automobiles (7th. Semester)	1. Car tests. 2. Maintenance. 3. Performance and vibration tests. 4. Noise, buzzes and rumbling tests.
Technical Subject 1/Master	
Technical Subject 2/Master	
Technical Subject 3/Master	
Main economic/business subjects in curricula for automotive/mechanical engineering (in terms of hours per semester and workload; indicate semester and outline major contents)	Explanation (give a short overview of contents treated in each subject)
Business subject 1 / Bachelor	
Business subject 2 / Bachelor	
Business subject 3 / Bachelor	
Business subject 1 / Master	
Business subject 2 / Master	
Business subject 3 / Master	
TESTING BAYS	
Testing bays structure and laboratory equipment at your university (missing/available/scope/purpose/staff) Two (2) testing bays: 1. Four post lift / for wheel alignment	**X** available O not available Scope: describe technical equipment and foci Purpose: O student´s project work O cooperation with companies X universities´ R&D

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2. Two post lift Purpose: automotive tests. Staff: 2 technicians.	O other, please indicate staff in No.: 3 academic staff: 2 engineers: other:
Which field does your university seek to cover in the future through testing bay and laboratory:	Hybrid engines. Vibrations and fatigue laboratory.
Short description how the laboratory/test bay and/or what else is currently used to enhance hands-on training in automotive/mechanical engineering degrees	The program has the objective that the students perform experimental work.
Best practice examples for hands-on training during mechanical or automotive studies at your university (possibly add examples from other HEIs and indicate)	1. Alignment. 2. Emission control. 3. Breaking tests. 4. Spark plugs.
COOPERATION	
Do students have the chance to get in touch with businesses during their studies with your support? If yes, how/which semester/course?	Yes. From the 6th to the 8th semester, via a compulsory ´professional practice' in which the student needs to complete at least 100 hours in activities related to the mechanical and electrical engineering profession.
Which other channels do you use when it comes to cooperating with companies?	Our 'Academic Cooperation' area, which coordinates industrial and business collaboration projects.
Does your faculty cooperate with associations or clusters, governmental bodies or similar related to the automotive industry?	SAE Chapter Mexico

Labour Market

Labour Market ***(where HEIs graduates and companies meet)***	
% of immediately employed graduates (within 3 months after graduating)	ITESM SALTILLO: 98%
Main fields of occupations after graduating from automotive or mechanical engineering	
Efforts to support students employability as a university	ITESM SALTILLO: EMPLOYMENT CENTER

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Key success factors for graduates to be employed (in your country)	ITESM SALTILLO:TECHNICAL COMPETENCE AND ENGLISH LANGUAGE
Expected future needs/skills of engineers *(this question will be able to be answered in more detail during the expert interviews)* – here we seek for universities point of view	ITESM SALTILLO: THREE LANGUAGES, MULTICULTURAL COMPETENCE

Focus Group Output

Within this section it is important to summarize the outcomes generated from the focus groups on a national basis including regional specifics. If the outcomes generated are not comparable with each other then, please feel free to only include information about the different regions analyzed.
Please feel free to repeat some information from section one here.
Please give detailed information within the following sections:

Short Description of the Focus Group Participants

ITESM SALTILLO

Note: A focus group session was held with 15 plant managers from Lear Corporation and two individual sessions: Solistica Company and Yachi-Yo Company.

	1- A	2- B	3- C
Date and place of the focus group:	06/28/2017	05/25/2018	06/27/2018
Number of participants:	15 + 3 moderators	1 + 2 moderators	1+ 2 moderators
Language of the focus group:	Spanish	Spanish	Spanish

IBERO

Session	**1**	**2**
Date and place of the focus group:	April 19, 2018. Universidad Iberoamericana, Mexico City	May 8, 2018. Universidad Iberoamericana, Mexico City
Number of participants:	3 + 2 moderators	3 + 2 moderators
Language of the focus group:	Spanish	Spanish

Topic I: Trends in Automotive Industry

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The automotive industry underlies constantly new developments. Nowadays these developments are as evident as never before with the current upcoming of topics such as e-mobility and autonomous driving, …). Within this section it is interesting to identify on the one hand side the current trends and developments in your national country and the impact of them on the national automotive industry. Content that should be covered within the section: national trends and developments in automotive engineering and the impacts on the industry, future need for engineers, skills of engineers and keeping up with new developments, increase of importance of the automotive industry on a national and international level
ITESM SALTILLO Below are the responses of the 15 managers of A, in brackets the number of mentions is indicated. Trends mentioned: • Everything related to low weight materials, springs are changing from metal to plastic. (5) • Safety First. Carry out Crash tests, simulating the impact of a vehicle and seeing its consequences to take certain preventive actions. (5) • Use of hybrid cars (3) • Laser welding (laser engineers) 3 • Fully automated processes (3) • Electric vehicles (3) • Use of recycled and biodegradable materials (3) • Manufacturing 4.0 (3) • Autonomous vehicles (3) • Vehicles with interactive systems with the user (2) • Process automation and labor reduction (2) • Requirements for control engineers, PLC, mechatronics, ec. To develop automated equipment (2) • X-rays for macographies. Welding analysis (measurement) • Assortment of material electronically and sequencing • Design of programs in applications for robots. • Elimination of paper use, all by screens (IPAD, Iphone, screens, etc.) • Connectivity between vehicles • Small engines with greater power • More technology for greater comfort • Gadgets • Increase in controls and traceability of product safety features • Remote assistance services • Assistance for parking • Reduction of emissions • Apps on consoles to facilitate access to phone and information • Change in customer preference from sedans to SUV / CUV • Vehicles focused on the profile of millennials • Changes of faster models. lead time reduction • Total connectivity: car to car, car to OEM, car to trafic control • Product testing development • Product software development

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• Product hardware development
• Intelligent cars with the use of technology that make them interconnected
• Specific requirements of different customers such as GM, Chrysler, Ford, Masserati, etc.
• Need for at least 3 languages in engineers
• Reduction in fuel consumption
• Acquire more work experience before starting a formal job
• Leadership based on serving the team and establishing business relationships with the client provider

Note 1: The A company is very interested in install a SIMULATOR in Campus Saltillo to train drivers of their logistics process.
Note: 2: Answers of the C Company are showed in other file

IBERO

In general, members of automotive companies, auto parts suppliers and academy visualize that the main topics that the main topics that will be relevant in the short-to-medium term are related to hybrid engines and small internal combustion engines; efficiency will be a must in both cases. Other important tendencies include more 'environmentally friendly' products in different facets and the 'internet' of things" for increasing and upgrading passenger security. Regarding the range of activities that the automotive companies are considering to develop in Mexico in the future, the members of the automotive industry believe that R&D will become more relevant, as the companies expand and spread specialized competence centers around the world, thus requiring more skilled and qualified engineers. At least the American automakers are working in that direction in Mexico, instead of focusing solely in manufacturing and assembly. However, members from auto parts suppliers and academy hold a different opinion. They think that investment in R&D throughout the entire industry will be far more modest and, therefore, demand for engineers with graduate studies will also be limited. Also, the students seem to have the perception that there are more job opportunities in manufacturing, processes and management, even though their professors stress the importance for engineers of a strong scientific background and the knowledge and application of specialized software in scientific or technical endeavors.
Because of the development of competence centers, in recent years some automotive companies have been developing programs to encourage their engineers to undertake postgraduate studies. For X , for example, the main research fields of interest are Finite Element Method (FEM) modeling and analysis, and other methods of virtual analysis of components.
Participants in both sessions coincide that teamwork is an essential skill for graduate students and most of them also concur on the need for high adaptability for changes. Also, more knowledge in electronics and control is required from mechanical engineering graduate students.
Unfortunately, there is also agreement among the participants in the two sessions, that Human Resources (HR) departments does not have whole or full information about profiles and skills needed from graduates. The results of this are clear, they continue to value experience over more specialized studies, thus rejecting more specialized graduates than people with many years of experience within the automotive industry.

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Nowadays the need for engineers in the automotive industry in Mexico is increasing. Most of the participants coincide in the fact that Mexico has an advantage in costs as the salaries of our engineers are lower than those of their American and Canadian colleagues (in a 3 to 1 range), and that will help to maintain a steady demand for this kind of professionals.
There is also consensus in the fact that the automotive industry will continue to be relevant in the foreseeable future because there is a need for transportation and it has the ability for adaptation to new realities and demands. However, the participants also perceive some geopolitical and strategical risks for the industry due to nationalistic and protectionist tendencies in some countries or regions that could affect things such as NAFTA.

Topic II: Employment in the automotive industry and cooperation with higher education institutions

This section serves to get more information on the automotive industry as an employer and to identify possible future collaboration between universities and industry. Further, it is an aim to identify why the reputation of the automotive industry is not very well and which measures need to be implemented in order to improve this current situation.
Issues that should be covered within this section are: the automotive industry as an attractive place to work, skills required from graduates in engineering when entering a workplace in the automotive industry, educational facilities for high class education such as labs, university-business cooperation in general and through ASCENT competence centres

ITESM SALTILLO

1. A

• Qualified workforce and experts in welding application technology
• There is currently no robust system "Win-win" educational system. It is necessary to have an industry that allows the student to get a job befor he graduates.
• This plant is interested in collaborating with projects, University + industry.

2. B

• Speak at least 3 languages
• High preparation in Industrial Engineering, focused on continuous improvement and an approach to efficiency
• High preparation in risk prevention
• Quality in the source
• Interest in collaborating with ASCENT

3. C

• The LEAR company has a lot of opportunity to be linked to universities, very little is done, there should be a model and replicate it, there are 47 plants in Mexico.
• Universities also need to present linking models.
• The learning in mathematics for engineering is needed throughout Mexico.

4. D

• Domain of the English language and with leadership skills

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• Knowledge in: IATF, statistical control, problem solving tools and LEAN Manufacturing.

5. E
• Knowledge in problem solving tools: 80, Ishikawa, 5 Why's, etc.
• It is almost impossible to hire recently graduated due to the lack of knowledge / experiences and the lack of capacity and time of the leaders of the company to train them.

6. F
• The industry is attractive to work in Mexico. Foreign investor s are training personnel, even abroad.
• We are interested in sharing ASCENT training

7. G
• Automotive industry is attractive for work in Mexico
• Apart from technical knowledge, you should focus on having Engineers with the best attitude to perform the necessary tasks
• Provide to the educational institutions the plan of the industries according to the programs to start in the future years so they know the approach of academic programs.

8. H
• The automotive industry is attractive for the new generations, which is an incentive to study and work in engineering in Mexico
• I suggest strengthening the curriculum including soft topics: supervision, engagement, conflict management, presentations and effective meetings, communication and leadership
• Yes, I would be interested in participating in an ASCENT project

9. I
• There is a shortage of electrical, mechanical and industrial engineers in preparation for the development of products or equipment from the point of view of software and hardware. Engineers with knowledge of continuous improvement, bilingual are needed.
• I am very interested in engineering training in product electronics and handling of equipment in this field.

10. J
• Entrepreneurship engineers
• Innovators
• Working as engineers in the automotive industry is attractive because there are many areas of opportunity for growth
• Training is essential to not get obsolete. Innovation is crucial

11. K
• Increased knowledge of the productive area to reach experience in entering the industry
• More courses for personnel management, leadership, emotional intelligence, stress management, etc.

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12. L
• Knowledge in tools of the automotive industry: PLC, LPS, Core tools, audits IATF
• Laboratory tests must be based on the requirements of the clusters of the automotive industry

13. M
• Universities must invite people who currently work in the automotive industry as sponsors of projects to groups of students of the last semesters of the academic programs
• The university must promote meetings with industry leaders of all levels to interact with students
• YES, I would be interested in the implementation of projects in the ASCENT Center

14. N
• Implement programs to gain experience in different areas of the industry
• Experimental activities to know what is going to be faced in the industry

15. O
• Invite the students to the middle of the academic program to participate in the company. Students get experience and continues studying

Note 1: The P company is very interested in installing a simulator in Campus Saltillo to train drivers of their logistics process.
Note: 2: Answers of C Company are showed in other file

IBERO:

The automotive industry has always been a very interesting field for mechanical engineers to work for. In fact, participants from the auto parts suppliers told us that many graduates from mechanical and electrical engineering programs mention that are interested in working with them because of their intimate connection with cars; they see an opportunity to enter the world of cars through them. On the academic side the connection with cars is also quite evident in the undergraduate students of our Mechanical and Electrical Engineering Program. Therefore, it is only natural to develop bonds at different levels between industry and university in this field. Additionally, there is also a growing interest in this field among students of mechatronics engineering, which is also natural due to the growing importance of electronics and computing in cars.
Regarding cooperation between the automotive industry and educational institutions, the participants in the focus groups stressed some particular points that should be considered in order to promote it:
1. Better communication between both sides with an institutional point of view. Many relationships between academy and industry are developed at an individual level, limiting their scope. It would be better to develop relationships among engineering groups on both sides. It is also very important to involve adequately other areas such as management and human resources.

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The goal should be to develop clear communication channels and procedures for developing joint projects and programs.

2. There should be reasonable flexibility and adaptability from both sides in things such as response times and the different resources that each one can provide for the development of particular projects,

3. Develop better schemes for industrial internships and professional training, with clear rules and objectives.

4. The educational institutions should learn to 'sell' better their capabilities, including labs and faculty members, in order to foster the interest of the industry in taking advantage of them with a win-win point of view.

The following list enumerates the main skills required from engineering graduates in order to work successfully in automotive industry companies:

1. Hands-on technical skills.
2. Use of specialized software.
3. In-depth knowledge of theoretical and experimental analysis.
4. Teamwork in multidisciplinary and multicultural environments.
5. Oral and written communication.

It is also important to pinpoint some remarks of the industry participants regarding the use of specialized software. The first is that many times the students or the graduates are not familiarized with the latest version of the software used in industry, causing a steeper learning curve. The second one is that they also tend to focus too much on the tool itself instead of the analyses that can be developed with it.

Topic III: Training Topics for the ASCENT Competence Centres and Testing Bays

ITESM Satillo

During the ASCENT kick-off meeting possible training topics for the competence centres have been identified. The training topics which got roughly identified are the following:

- Automotive trends: Technological and business trends
- Soft skills for engineering graduates focusing on skill- and self-selling
- Testing bays: Installment including purchase proceedings, technical operation and its importance for university-business cooperation
- Train the trainer of competence centres

Further, within this section also the importance and relevance of testing bays at higher education institutions needs to be clarified and it needs to be identified which facilities these testing bays need to offer in order to be interesting for companies for industry and educational purposes.

Please therefore summarize the information gathered about training topics identified. Are the training topics reflecting the needs of the industry or is there a need for adaptation? If yes, how should the adaptation look like? Further, please also include the relevant information about the competence centres – testing bays for educational purposes with industry.

ITESM SALTILLO

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1. A
• Experts in laser welding
• Training in Innovation
• Cutting and measuring welding. Explore international markets to improve these processes
• PLC specialists and robotics

2. B
• Automotive trends: technology
• Train the trainers: multiplying know-how
• Topics of Graz Kick off are relevant
• YES, I will hire people trained in ASCENT Center.

3. C
• Laser welding
• Connectivity between machines-systems
• Innovation as a process
• Leadership
• Injection of plastics
• Metallic stamping

4. D
• Metallurgy
• Material mechanics
• Welding
• Matriceros

5. E
• Trends: autonomy
• Soft skills: leadership, engagement
• Include lean tools / six sigma to improve processes. Actually problems are solved based on expertise not on defined tools

6. F
• Electrical technology
• Lean manufacturing
• YES, if students are competent,I would hire the engineers

7. G
• Automotive trends: yes this topic is necessary, to know what to improve in the future
• Improve communication
• Focus the training on product design
• Improve knowledge of laser welding
• Progressive dice prints (design and repair)

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• Welding certifications in general

8. H
• YES we are OK with the training topics established in Graz, especially the part of soft skills
• Include innovation focused on car-user interaction

9. I
• Testing programming software (cabview, etc.)
• Industrial electronic standard: IPC
• Surface mount tech training
• Vision systems (3D) and X Ray
• It is very important to have this development center. I will be very interested in hiring people from this plan.
Excellent program. As a plant manager I am very interested in having people here in my plant to practice in real environment.

10. J
• Communication (opening)
• Development of talent
• Technology topics
• Engagement training, relationships

11. K
• In order for ASCENT to be more successful, you should invite people form the industry and not just have academic staff. Good combination experience - knowledge
• Use of recycled and biodegradable materials
• Use of materials that help to have a lower fuel consumption (lightweight)
• Smart cars with technology use that make them interconnected
• Greater focus on car security
• Mexico is a manufacturer.

12. L
• Focus on car security
• Car validation tests
• Welding training, MIG, Laser and ICT
• Training in torque boxes and angle of tightening of the screws or nuts

13. M
• Test bays must have the approval of leaders of the automotive industry or a certification of a automotive company
• The certification of the students should go through leaders of the automotive industry and not only of the ASCENT center

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14. N
• Decision making in Real situations
• ASCENT coaches must participate for a period of time in the field to understand actual industry requirements

15. O
• Specific requirements for customers and the automotive industry (BIQ, IATF, 16941, Vda)
• Knowledge in regulations and laws linked to product safety

Note 1: The A is very interested in install a simulator in Campus Saltillo to train drivers of their logistics process.
Note: 2: Answers of the C Company are showed in other file

IBERO
One major challenge to be solved in the coming years and that should be considered for developing design skills and testing capacity is:
i. Efficient cooling systems for two purposes:
a. Small and powerful engines that operate at higher temperatures
b. Battery packs for hybrid and electric engines
Referring to testing bays, many options were mentioned:
1. Emissions laboratory (for air pollution control).
2. Cooling systems for combustion chambers (particularly important for the small but very powerful engines that are one of the current tendencies).
3. See-through engines to view/visualize flows or streams (very innovative idea but kind of difficult to achieve).
4. Testing benches for hybrid and/or electric engines.
5. Testing benches for different fuels (energetic efficiency measurement).
6. Testing benches for crankcase breathing.

Additional Comments:

ITESM SALTILLO
Note 1: The A is very interested in install a simulator in Campus Saltillo to train drivers of their logistics process.

IBERO
In a nutshell, the Ibero team believes that the focus groups demonstrated great interest of the automotive industry in this project. Some words or concepts heard repeatedly during the interviews were: hybrid engines, electric engines, small engines, efficient cooling, alternative fuels, sustainable materials, educated knowledge*.
*More theoretical-experimental knowledge and less pure technical knowledge.

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Note: For scheduling reasons, it was necessary to program two different session with the people that agreed to participate in the focus group activity. Each session was held with three members/experts of the automotive industry and two moderators that were the same for the two sessions, giving a total of eight participants. This report integrates the information from both sessions.

Identified GAPs during the Desk Research Phase and the Focus Groups

Within this final section it is important to name gaps in different areas which already got identified during the desk research phase and focus groups. These GAPs might be subjective to the authors of this report but support in getting a basic understanding for the GAP report.

University-Business Cooperation GAPs

The graduates of the automotive industry must speak three languages, work with different cultures (Germans, Koreans, Japanese, etc). Therefore, a certain amount of soft skills must be part of the curriculum. Likewise, it is considered that the graduates must have more experience in the industry before graduating. There is a lack of engineering students to join the automotive industry upon graduation in order to satisfy the growing demand for engineers.

The automotive industry believes that more proximity is needed with the universities so that they can design their educational programs according to the needs of the industry itself. The selection of university laboratories should be based on an assessment of needs of the automotive industry.

Educational & Infrastructural GAPs

The focus groups demonstrated great interest of the automotive industry in this project. Some words or concepts heard repeatedly during the interviews were: hybrid engines, electric engines, small engines, efficient cooling, alternative fuels, sustainable materials, educated knowledge. The industry is furthermore interested in several future techniques in the car manufacturing. The establishment of competence centers at universities, where employees and students can be trained is a good idea. However, universities never have sufficient financial support to do that.

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