

29. Mühendislik Dekanları Konseyi Toplantısı

Prof.Dr Orhan Alankuş
Okan University
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Fırat Üniversitesi



MÜDEK OTOMOTİV VE BENZERİ ADLI MÜHENDİSLİK PROGRAMLARI PROGRAM ÖLÇÜTLERİ (TASLAK)

- Otomotiv mühendisliği uygulamalarına yönelik türevsel denklemleri de içerecek biçimde ileri matematik bilgisi; istatistik ve lineer cebir konularına aşinalık
- Kimya, matematiğe dayalı fizik, dinamik, yapısal mekanik, malzemelerin yapıları ve özellikleri, akışkanlar mekaniği, ısı transferi
- Üretim süreçleri
- **Elektronik ve kontrol**
- Taşıt tasarımı, taşıt dinamiği, taşıt tahrik ve güç sistemleri, otomotiv alanındaki teknik mevzuat ve taşıt doğrulama testleri konularında bilgi sahibi
- Bu bilgilerin çok disiplinli otomotiv problemlerinin çözümüne yönelik olarak birleştirilmesi ve uygulanması becerisi
- Kuramsal, deneysel ve benzetim yöntemleri ile bilgisayar destekli tasarım tekniklerinin otomotiv mühendisliği alanında kullanımı becerisi
- Taşıt tasarımı ve imalatı alanlarında çalışabilme becerisi



ELEKTRONİK ve GÖMÜLÜ YAZILIM

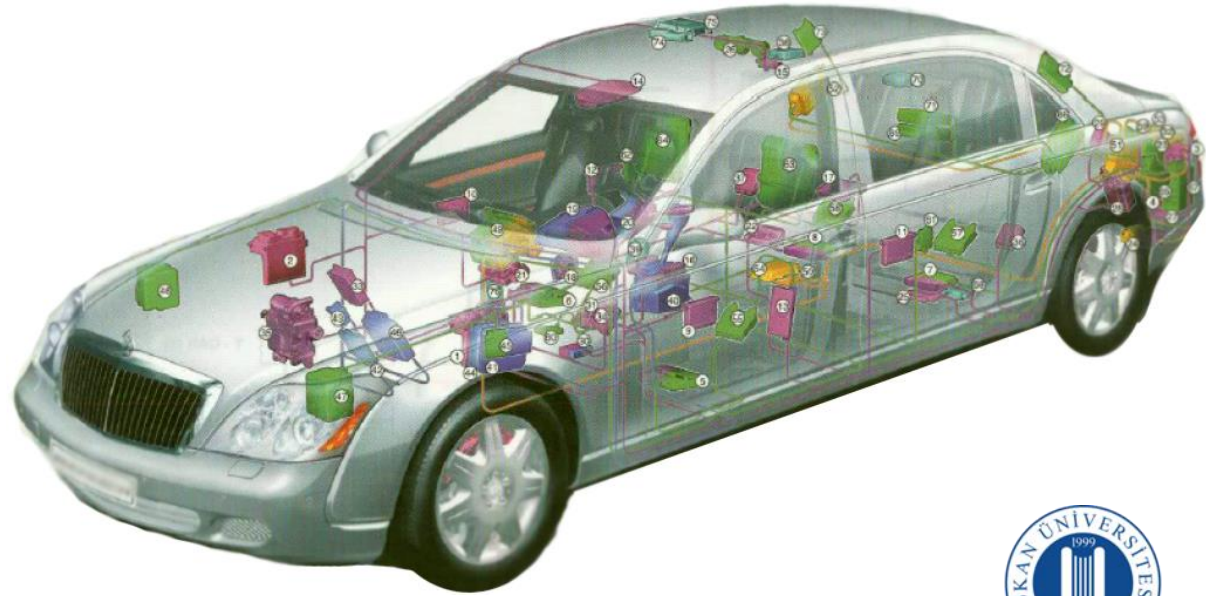
*Araç değerinde %30-35'lik pay
Önümüzdeki 10 yılda %40-70'lik pay tahmini
İnovasyonda %80'lik pay tahmini*

Motor ve Aktarma
Organları Elektronik

Güvenlik Sistemleri

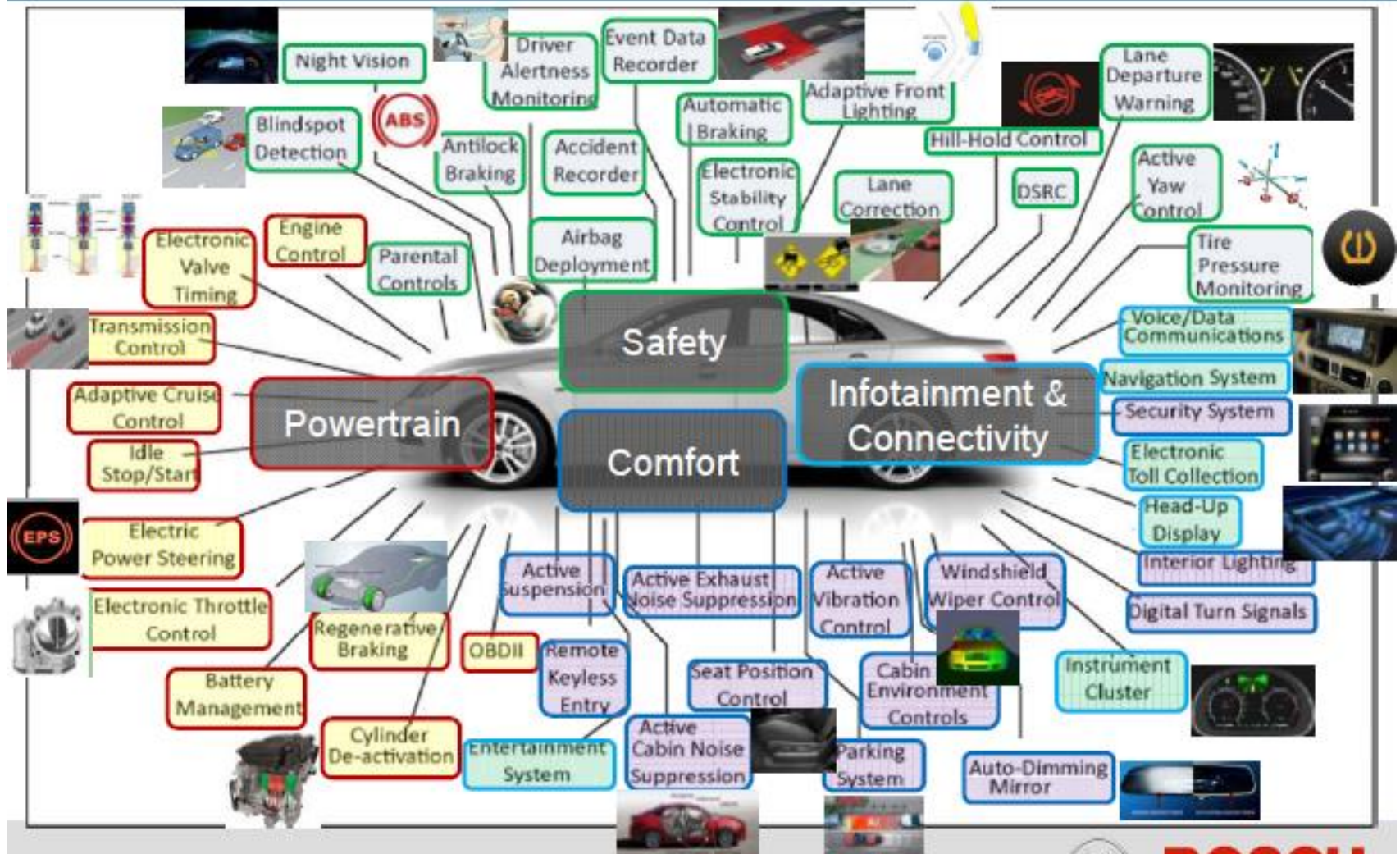
Eğlence ve Bilgi
Sistemleri

Gövde, Şase ve Araç
İçi Sistemler



Otomotiv Elektronikinin Geleceği

Future Trends in Automotive Electronics



Otomotiv Elektronikinde Gelecek

Future Trends in Automotive Electronics

Summary

Electronics will only increase in cars



Powertrain Electrification – mobility with future



Dynamic data will be basis for new services



Vehicles will be connected with internet (>80% by 2020)



Autonomous Driving will be reality



E/E architecture will be the road for future



Sürdürülebilir Ulaşım

- Verimli ve rahat ulaşım
- Güvenli ve emniyetli ulaşım
- Temiz ve Karbon salımı azaltılmış ulaşım

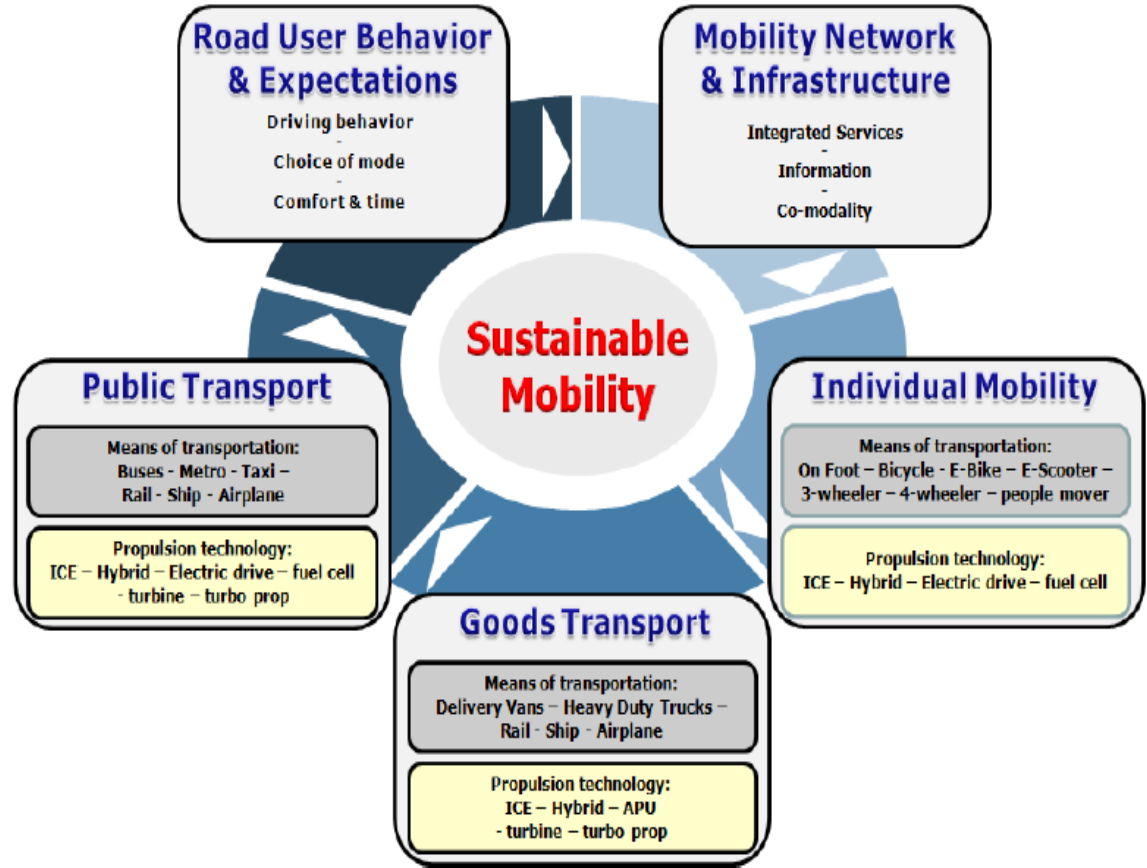
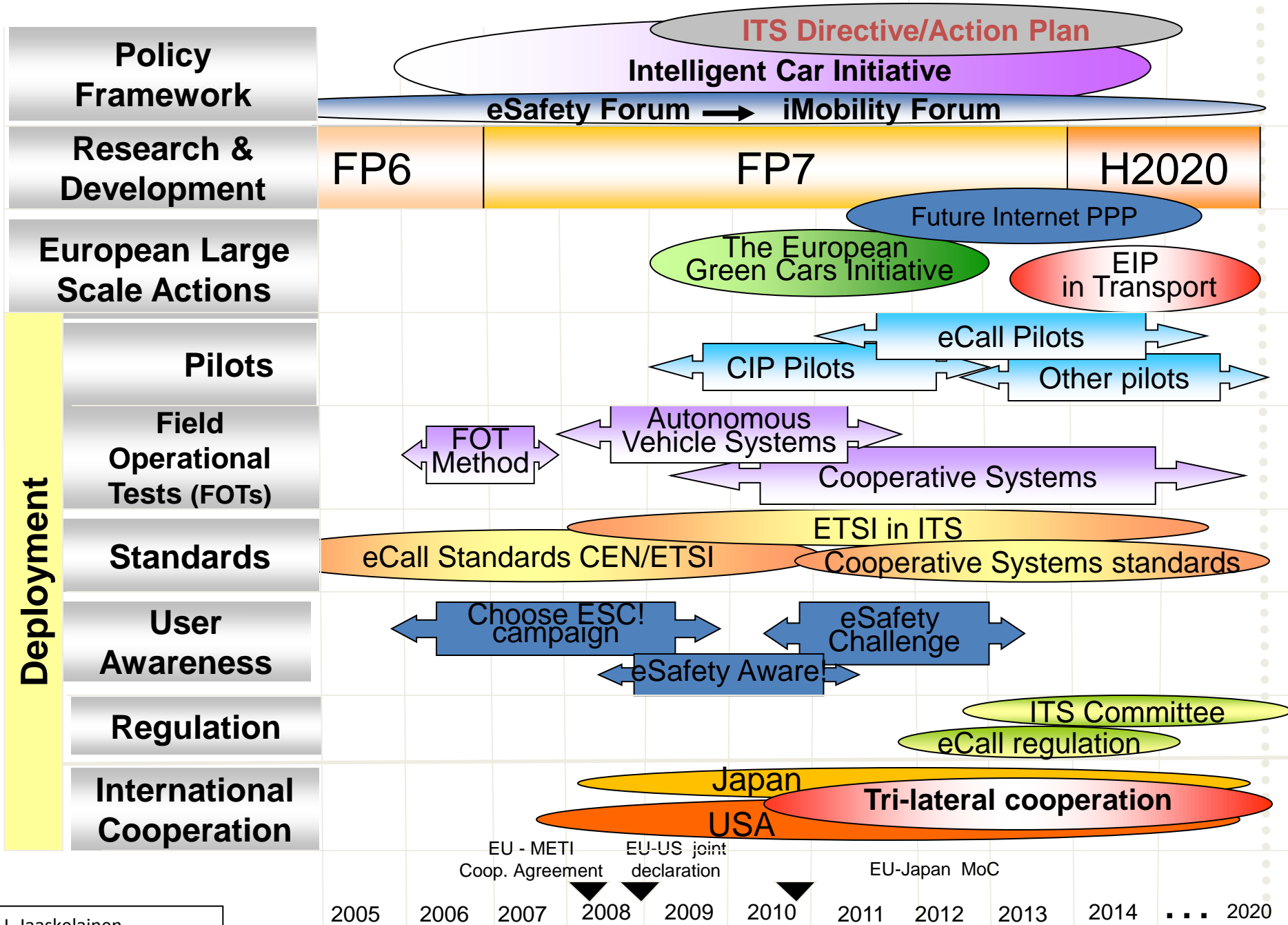


Figure 1: The context of Sustainable Mobility

Towards Connected and Sustainable Mobility in Europe



Hyundai Decision 2012

- Hyundai Motor Group recently set up a new unit, Hyundai Autron (a combination of Automotive and Electronics) aiming to enhance its R&D capabilities in automotive electronic systems, semiconductors and software.
- Hyundai Autron has specified its main business goal as to secure its own technologies in the following five automotive electronics areas – 1) Automotive electric and electronic systems, 2) Automotive semiconductors, 3) Automotive software, 4) Electronic controllers, and 5) Vehicle telecommunication standardization.
- **Hyundai aims for technology independence**
- Although Hyundai has heavily invested in its auto parts makers for electronics area such as Mobis, Kefico and Carness , it is still relying on imports and technological supports from foreign makers especially in automotive semiconductors, control systems and software.





Prediction is a Critical Component

OKAN ÜNİVERSİTESİ
İSTANBUL

► Energy Management with Prediction

- Topology
- Traffic Conditions
- Weather / Temperature
- Traffic Signals / State
- Hybrid Energy Usage

All constantly transmitted
to the car's
Energy Management System



▶ Improved Navigation

- Intelligent / Safe routing
- Out of Area notification

▶ Driver Capability and Skill

- Alertness
 - Lane departure
 - Over/Under speed limit

▶ Medical Condition Awareness

- Automatic notification
- Autonomous operation in medical emergency
- Integrated medical sensing

Diagnostic Steering Wheel





- ▶ Sensor / Radar / Camera networks
- ▶ Vehicle – Road / Vehicle – Vehicle Communications
- ▶ Automated driving
- ▶ Predictive safety
- ▶ Platoon: Increased traffic density at higher speeds

Why electric vehicles?

Well-to-Wheel: View on gear technology

Type of drive	Type of fuel	Mode of production	Source of power	Gram of CO ₂ -equivalent per km		
				Well-to-Tank	Tank-to-Wheel	Well-to-Wheel
Otto engine	Petrol	Refining	Raw oil	24	140	164
Otto engine	Liquid gas	Conditioning	Natural gas	15	126	141
Diesel engine	Diesel	Refining	Crude oil	24	128	152
Diesel engine	Biodiesel	Esterification	Rape	-50	133	83
Hybrid drive (Otto engine)	Petrol	Refining	Crude oil	20	120	140
Fuel cell (electric motor)	Hydrogen	Electrolysis	European energy mix	196	0	196
Lithium Ion battery	Electricity	Complex of power plants	European energy mix	87	0	87

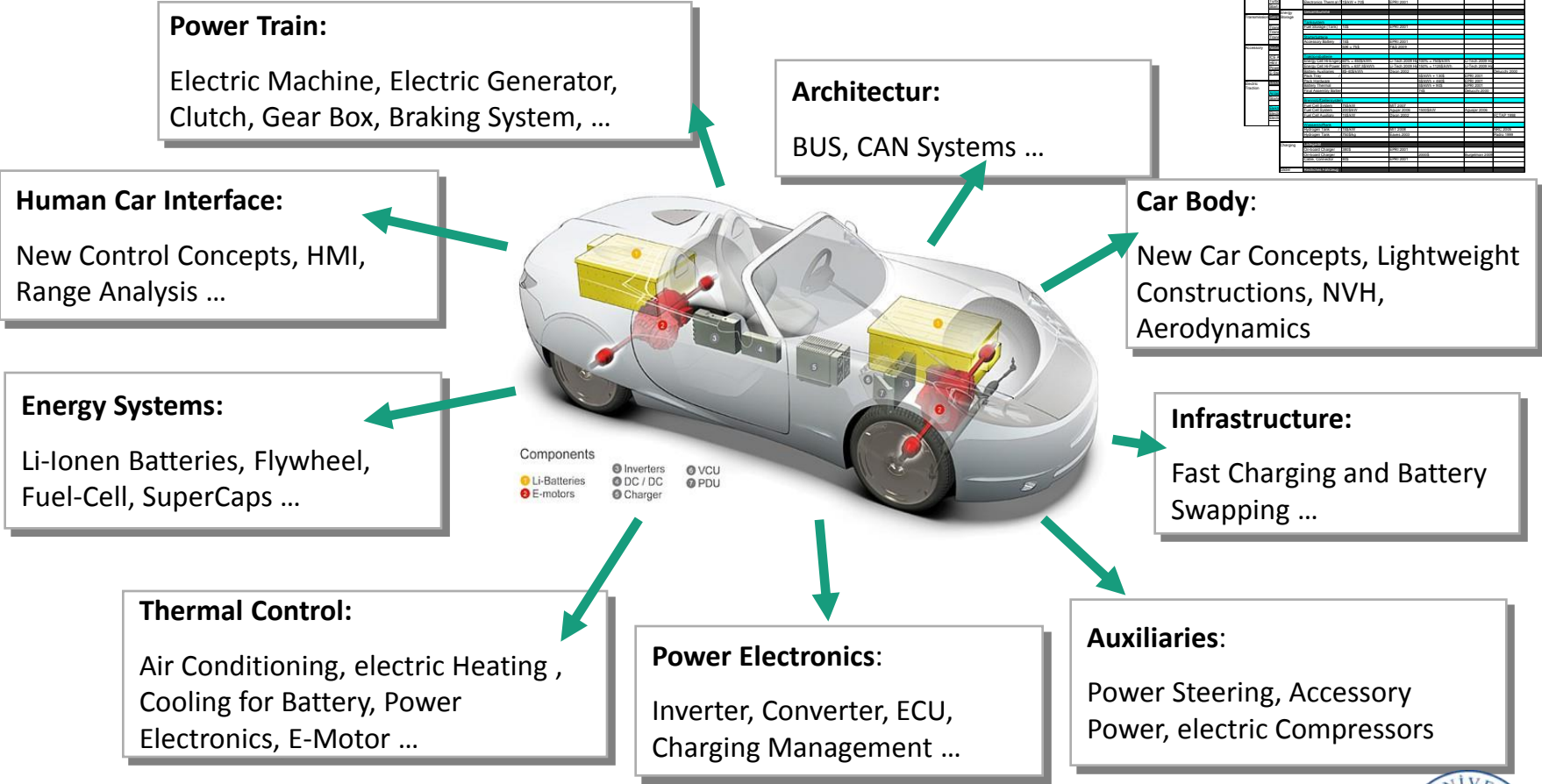
Enevate Final Report 2013

Source: adapted from Mitusch/Liedtke 2013















Electromobility influences a lot of components

System	Component	Function	Location	Control	Power	Signal
Power Train	Electric Machine	Propulsion	Front	ECU	High Voltage	CAN
	Electric Generator	Regeneration	Front	ECU	High Voltage	CAN
	Clutch	Power Transfer	Front	ECU	High Voltage	CAN
	Gear Box	Speed Control	Front	ECU	High Voltage	CAN
Architecture	BUS	Communication	Front	ECU	Low Voltage	CAN
	CAN Systems	Control	Front	ECU	Low Voltage	CAN
	ECU	Control	Front	ECU	Low Voltage	CAN
	PDU	Power Distribution	Front	ECU	Low Voltage	CAN
Human Car Interface	New Control Concepts	Control	Interior	ECU	Low Voltage	CAN
	HMI	Control	Interior	ECU	Low Voltage	CAN
	Range Analysis	Control	Interior	ECU	Low Voltage	CAN
	Charging Management	Control	Interior	ECU	Low Voltage	CAN
Energy Systems	Li-Ionen Batteries	Energy Storage	Front/Rear	ECU	High Voltage	CAN
	Flywheel	Energy Storage	Front/Rear	ECU	High Voltage	CAN
	Fuel-Cell	Energy Source	Front/Rear	ECU	High Voltage	CAN
	SuperCaps	Energy Storage	Front/Rear	ECU	High Voltage	CAN
Thermal Control	Air Conditioning	Climate Control	Interior	ECU	Low Voltage	CAN
	electric Heating	Climate Control	Interior	ECU	Low Voltage	CAN
	Cooling for Battery	Temperature Control	Front/Rear	ECU	High Voltage	CAN
	Power Electronics	Temperature Control	Front/Rear	ECU	High Voltage	CAN



Changing Market Players

EV implications on established and new market players in the automotive sector

	Traditional players					New entrants
Industry	OEMs, distributors, retailer 	Automotive Suppliers 	Petrol Companies 	Utilities 	Electronic & Battery OEMs 	New Business models 
Impact						
Opportunities	<ul style="list-style-type: none"> - First mover advantage - "Own the consumer" - Definition of standards 	<ul style="list-style-type: none"> - Differentiation possibilities by newly invented products (eg. "active wheel") 	<ul style="list-style-type: none"> - Adaption of existing station infrastructure - Close customer link 	<ul style="list-style-type: none"> - New revenue streams - Smart grid provider 	<ul style="list-style-type: none"> - Innovation leaders - Forward integration 	<ul style="list-style-type: none"> - New customer demands - New designed products and service offerings
Risks	<ul style="list-style-type: none"> - Inflexibility and investment in plant & technology - Further product 	<ul style="list-style-type: none"> - Lack of EV technology know-how - Inflexibility to adapt new requirements 	<ul style="list-style-type: none"> - Declined demand for diesel, gasoline and lubricants in the long run 	<ul style="list-style-type: none"> - Availability of green power - Lack of vehicle competence 	<ul style="list-style-type: none"> - High investment required - New entrants - Lack of vehicle OEM knowledge 	<ul style="list-style-type: none"> - High capital requirements - Existing players will fight for "their" market

Electric Vehicle Sales Estimates

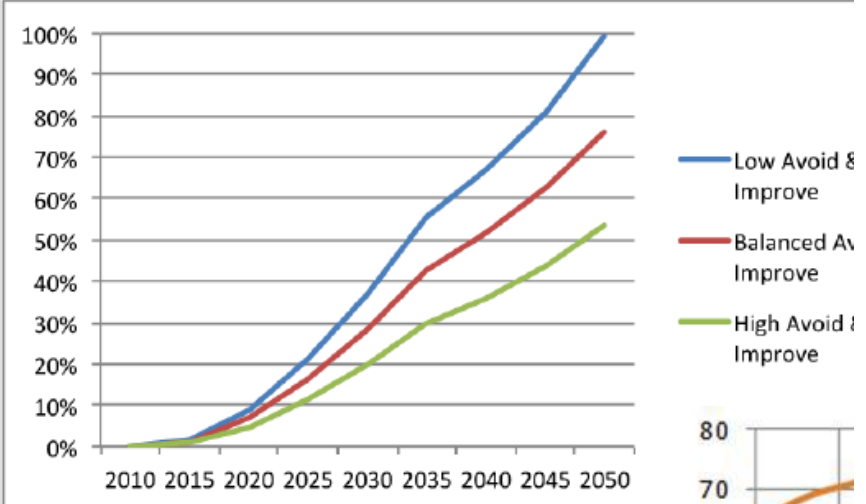
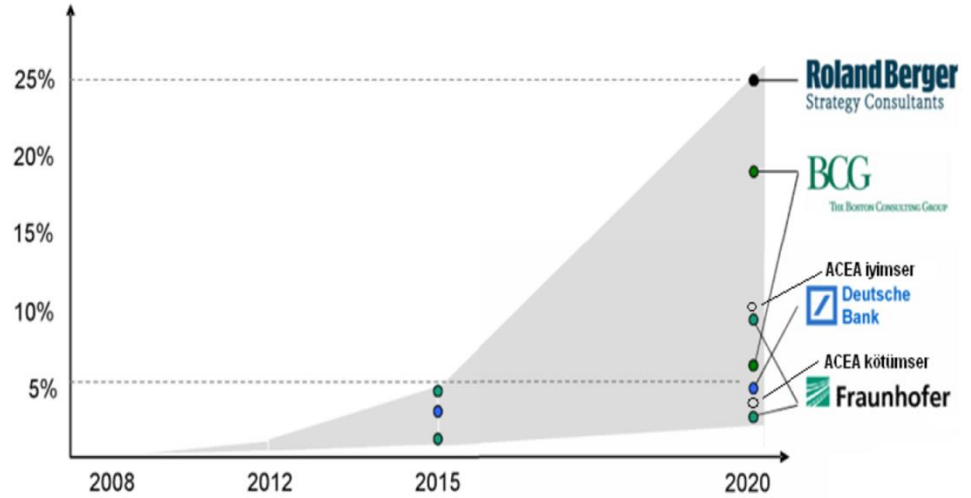
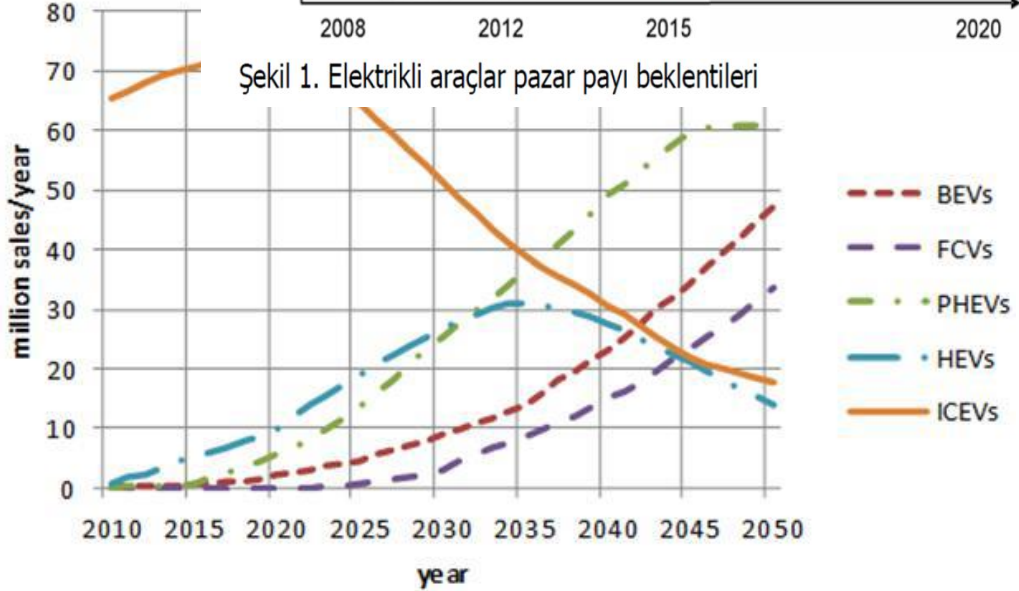


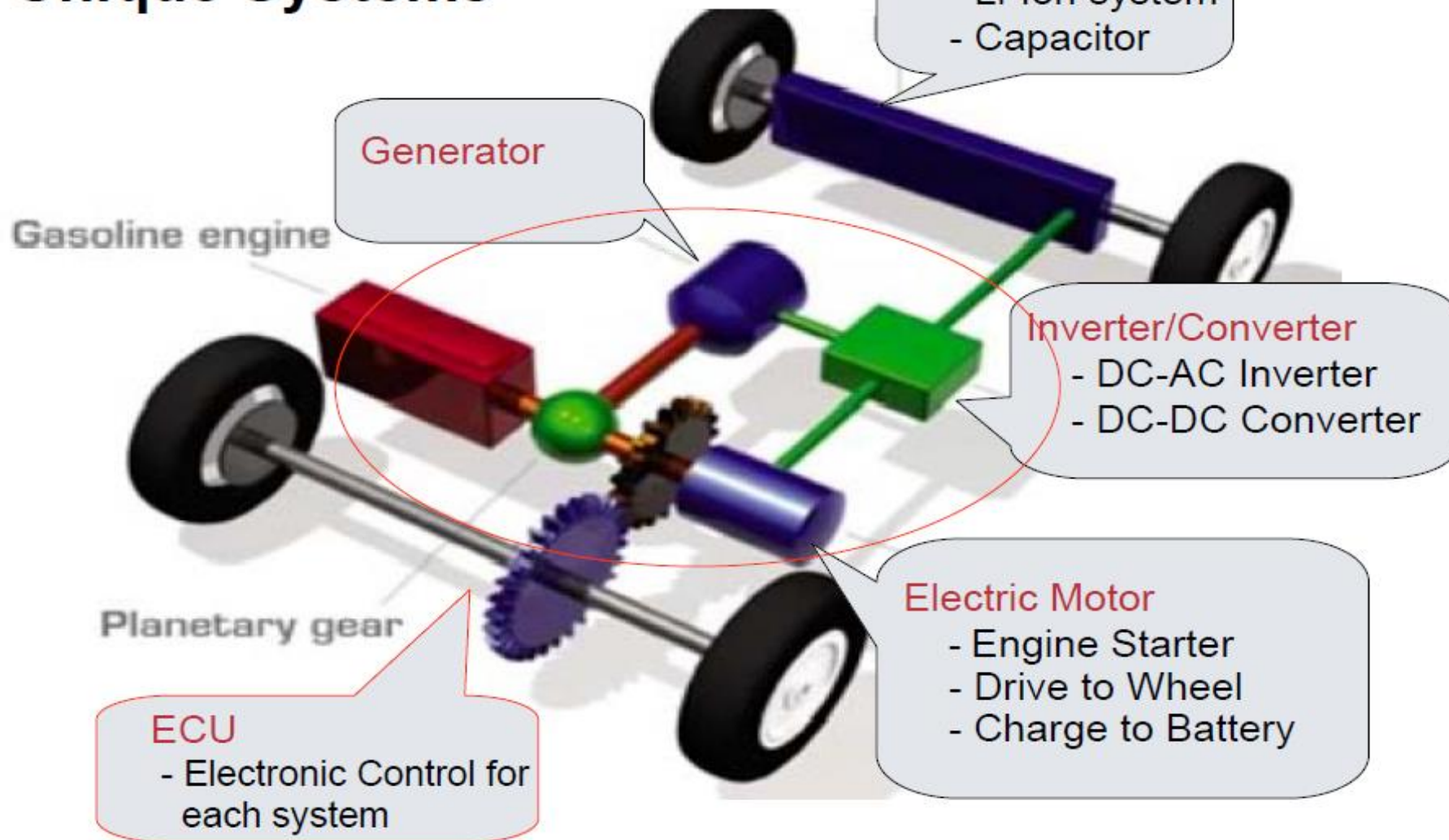
Figure 1: Combined battery electric vehicle (BEV), plus share in three versions of a 2 Degrees stabilisation scenario (the IEA Energy Technology Perspectives).



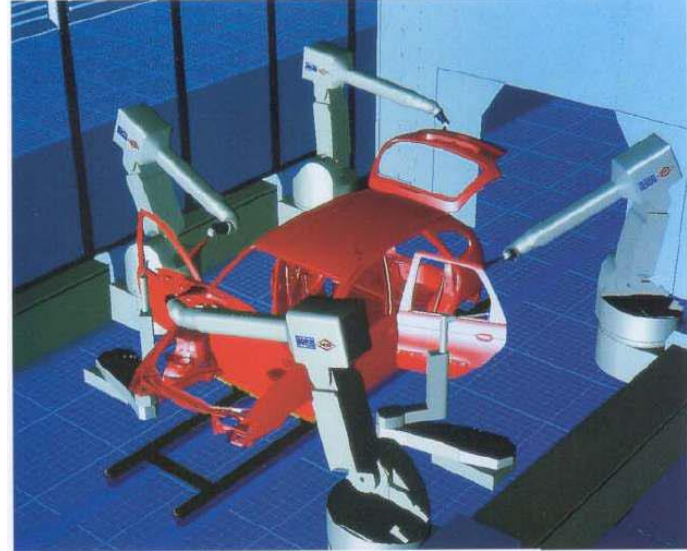
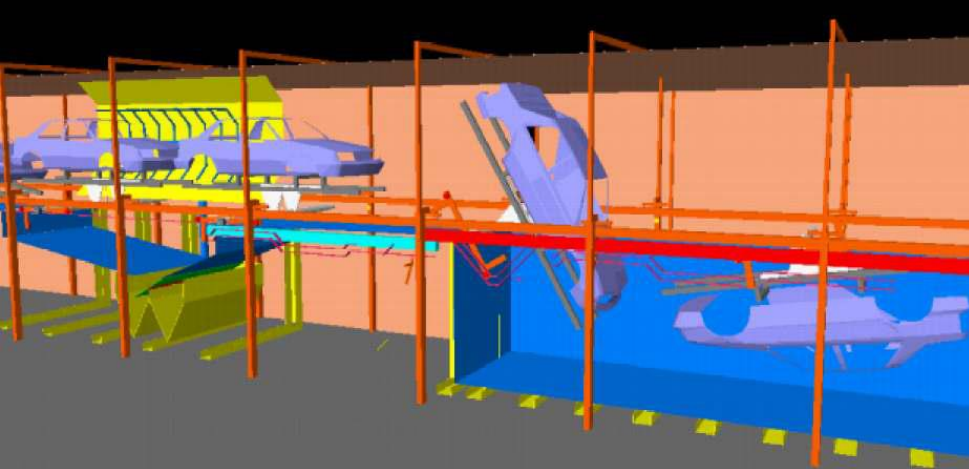
Şekil 1. Elektrikli araçlar pazar payı beklentileri



Hybrid Electric Vehicle Unique Systems



Otomotiv Üretimi



- Problem Çözme Teknikleri
- Takım Çalışması
- Yalın Üretim
- İletişim Teknikleri
- Proje Yönetimi
- Çevre
- Üretim Ekonomisi
- Deney Tasarımı ve Analizi



OKAN UNIVERSITY TRANSPORTATION TECHNOLOGIES & INTELLIGENT
AUTOMOTIVE SYSTEMS APPLICATION AND RESEARCH CENTER

«TTIS»

OKANOM Development of Autonomous Vehicle

- Phase 1.1. Development of self drive mechatronics and integration with LIDAR, IMU and Ultrasonic Sensors
- Phase 1.2. Developments of Obstacle Avoidance Application
- Phase 1.3. Verification of Self Drive Properties Experimentaly (year 2010-11)
- Phase 2. Integration of GPS, camera and experiments on normal road without traffic



**OKAN UNIVERSITY TRANSPORTATION TECHNOLOGIES & INTELLIGENT
AUTOMOTIVE SYSTEMS APPLICATION AND RESEARCH CENTER**

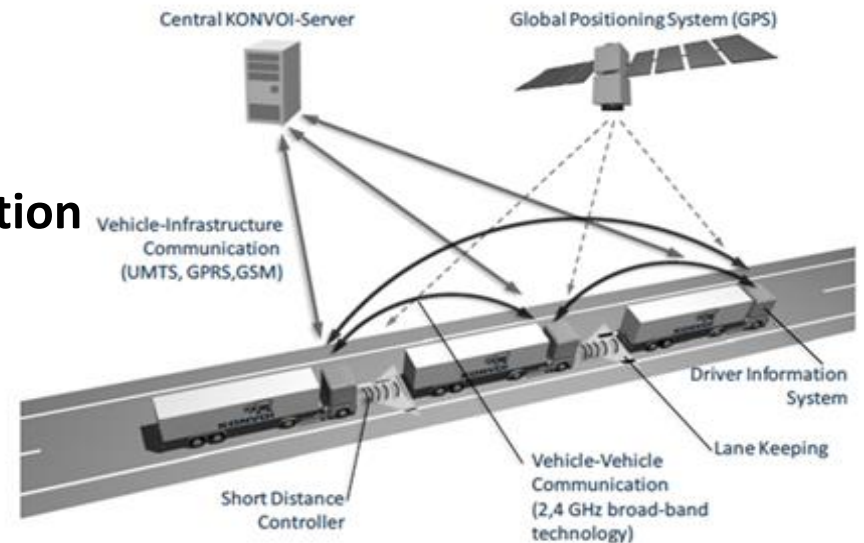
«TTIS»

**Development of Brushless DC and Permanent Magnet Synchronous Machine Drive
Systems for Electric Vehicles together with TOFAŞ and MEKATRO**



Some Research Projects

- **Tubitak funded Research Project with KocSistem-Tofaş-Ford Otosan**
- **Vehicle to Vehicle Communication Systems «V2V»**
- **Vehicle to Infrastructure Communication Systems «V2I»**



Okan University Innovative E-Mobility Clustering Project

«E-HIKE»



YENİLİKÇİ ve SÜRDÜRÜLEBİLİR ELEKTRİKLİ ve HİBRİD ARAÇ TEKNOLOJİ GELİŞTİRME ve KÜMELENME MERKEZİ (E-HIKE)

Innovative and Sustainable Electric and Hybrid Vehicle Technologies Development and Clustering Center Project , «E-HIKE»
funded by Istanbul Development Agency

Project Aim ;

- Form a cluster with stakeholder companies
- Develop innovative business solutions and technologies for the stackholders
- Analysis the whole value chain
- Form the basic research structure
- Develop innovative concepts for
 - Urban Electric Vehicle Design
 - Energy management
 - Battery management
 - Light and safe vehicle body structure
 - Electric engines



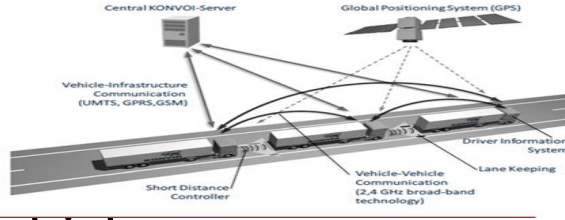
İlgili Lisans ve Y. Lisans Programları

- BSc. Automotive Engineering
- BSc. Mechatronics Engineering
- BSc. Electrical & Electronics Engineering
- BSc. Mechanical Engineering
- BSc. Computer Engineering
- BSc. Civil Engineering
- BSc. Energy Systems Engineering
- B.Sc. Industrial Engineering
- MSc. Automotive Mechatronics and Intelligent Vehicles
- MSc. Power Electronics and Clean Energy Technologies
- MSc. Computer Engineering
- MSc. Advanced Electronics & Communications
- PhD. Mechatronics
- PhD. Computer Engineering
- PhD. Civil Engineering
- PhD. Architecture



Some Project Examples/ UTAS

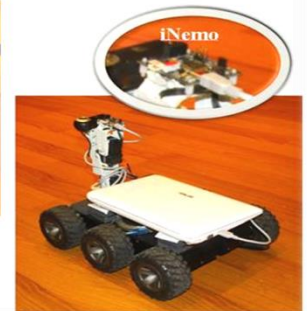
- Projects, Ongoing
 - Autonomous Vehicle
 - Communicating Vehicles
 - Metrobus System Optimization
 - Vehicle Dynamics
 - Active Safety Systems
 - Electric and Hybrid System Energy Management System
 - Battery management Systems
 - Electric vehicle heat management
 - Vehicle modelling
 - Lean and sustainable manufacturing



Robot

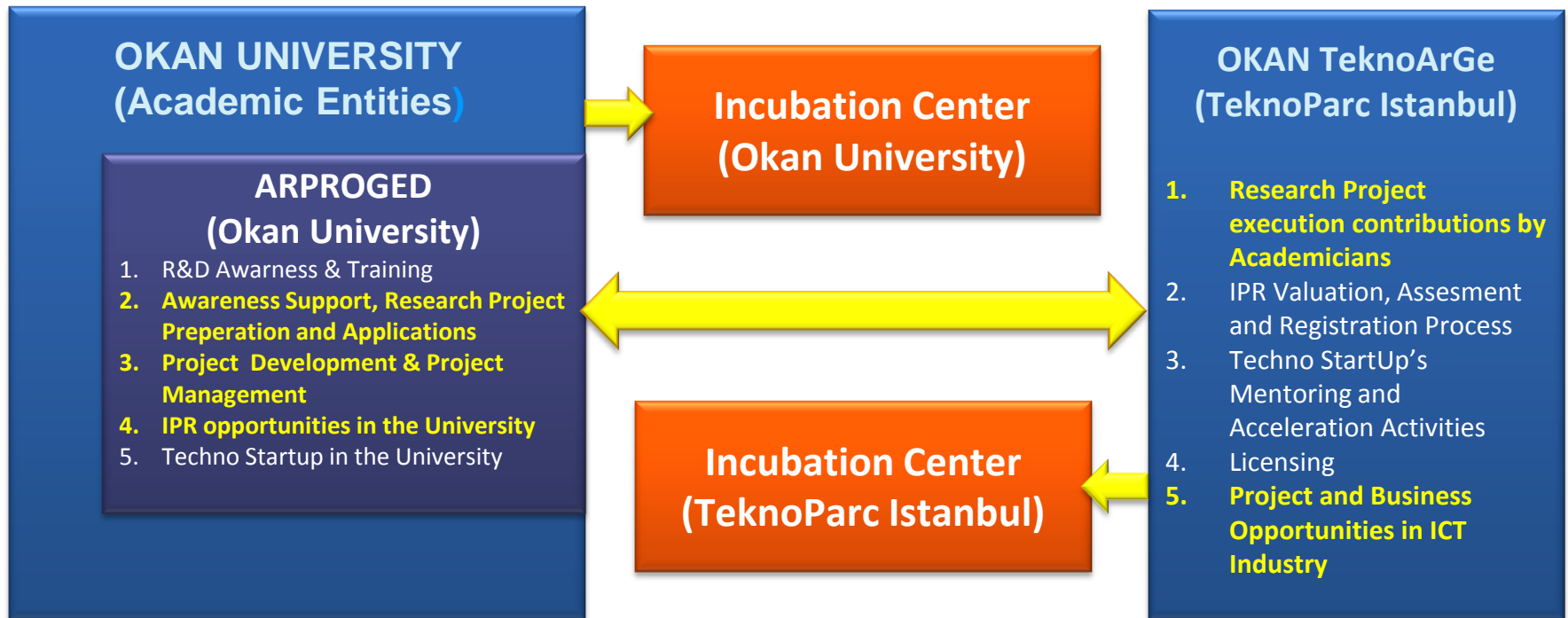


- 6 tekerlekli, sağ ve sol tekerlekleri ayrı kontrol edilebilen araç
- Laptop
- IMU (iNemo)
- Kamera



Okan Technology Transfer Office(ARPROGED) & Okan Tekno ARGE Inc.

Vision : Be a worldwide model for Industry-University colloboration and promote auto-funding of Research Institutes



TEŐEKKÖR EDERİM

