evs 27

The 27th INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM & EXHIBITION

BARCELONA
17th-20th November 2013

European Commission

e-light

Overview

Organized by Fira Barcelona avele

Hosted by AVERE mea Ajuntament de Barcelona

In collaboration with EVAAP EDTA

Supported by European Commission

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General Information

e-light

European Commission

Advanced Structural Light-Weight Architectures for Electric Vehicles (e-Light)

- Budget 2.9 M€
- Starting date 1st February 2011
- www.elight-project.eu

COOPERATION

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The Consortium

The University of Sheffield
Advanced Manufacturing Research Centre
BOEING

pininfarina

tecnalia Inspiring Business

RICARDO

EAST 4

Pôle Véhicule du Futur®
Solutions pour véhicules & mobilités du futur

cidaut
Transport and Energy
Research and Development Foundation

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Project objective

The main objective of the E-Light project is to develop a multi-material modular architecture specifically designed for urban EV, achieving optimal light weight and crashworthy performances whilst ensuring good ergonomics on board

Measurable objectives

- Lightweight EV architecture with a maximum vehicle weight of 600 kg (without batteries), a maximum BIW weight of 200 kg, and an electric motor in the range from 25 to 35 kW.
- On board space 4 passengers.
- Suitable and feasible joining technologies and manufacturing processes for the multi-material EV architectures developed.
- Equivalent performance to an IC vehicle architecture
- General design guidelines and testing procedures for EV automotive designers.

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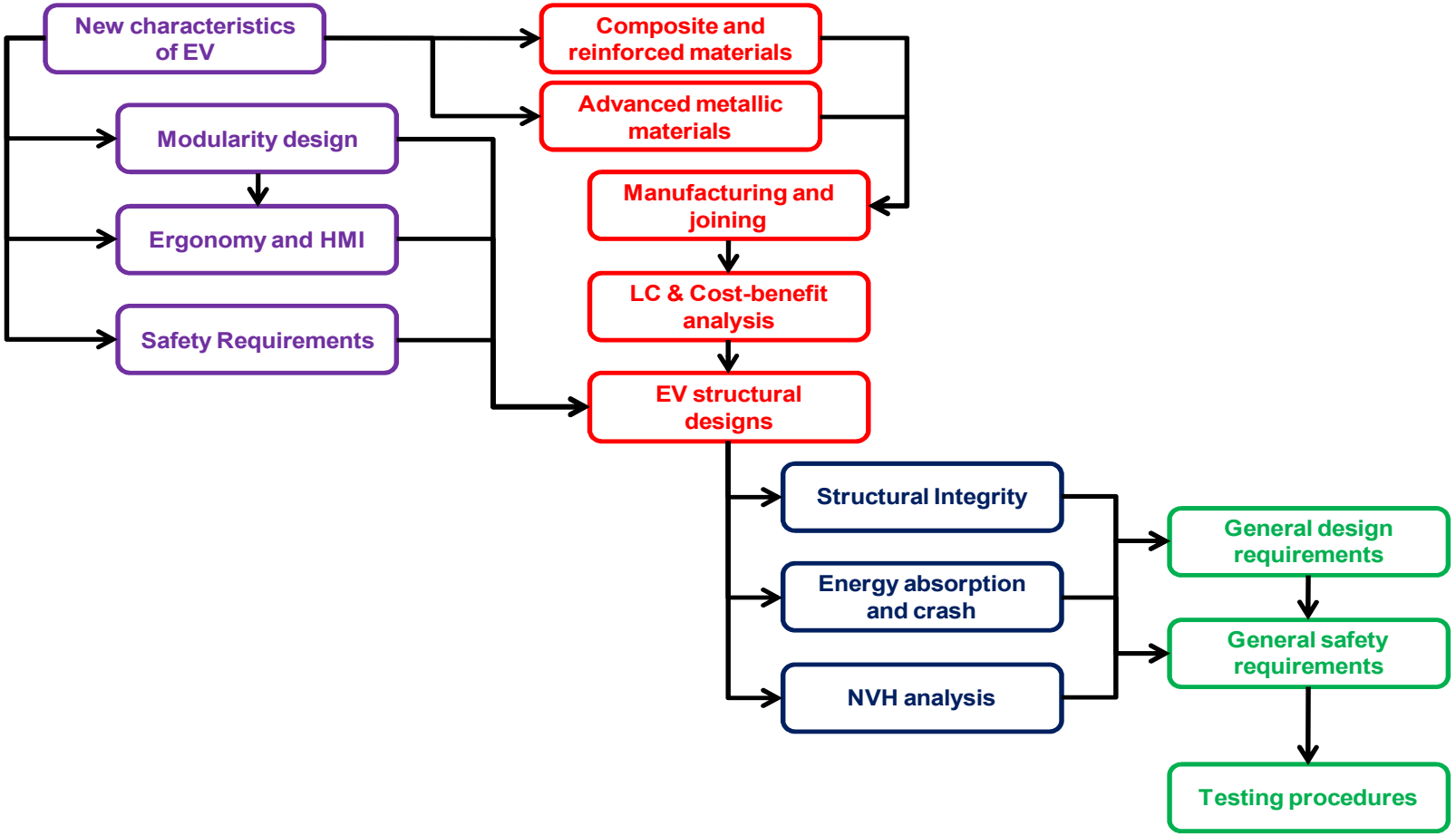
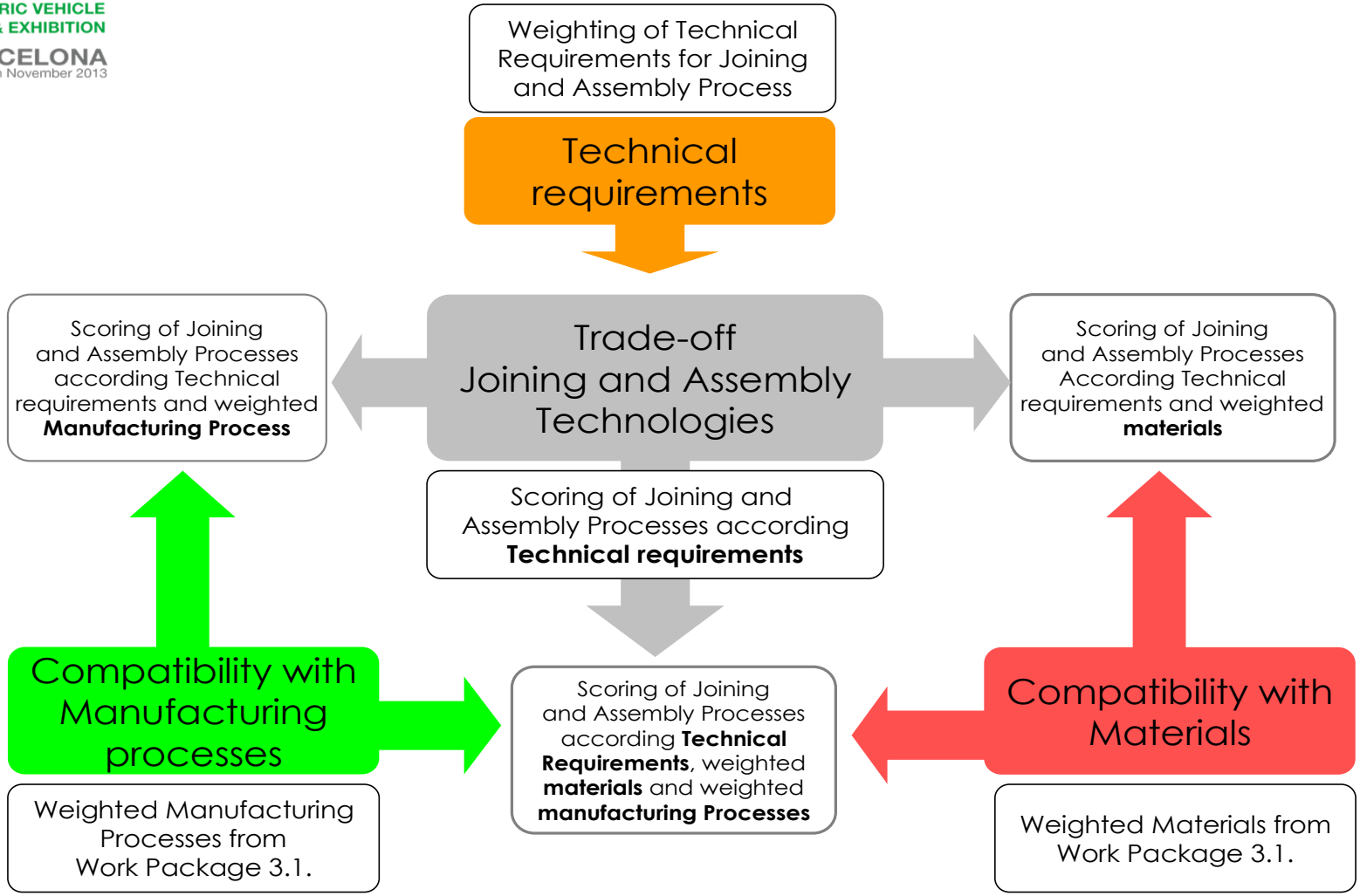
Project activities



Design Methodology



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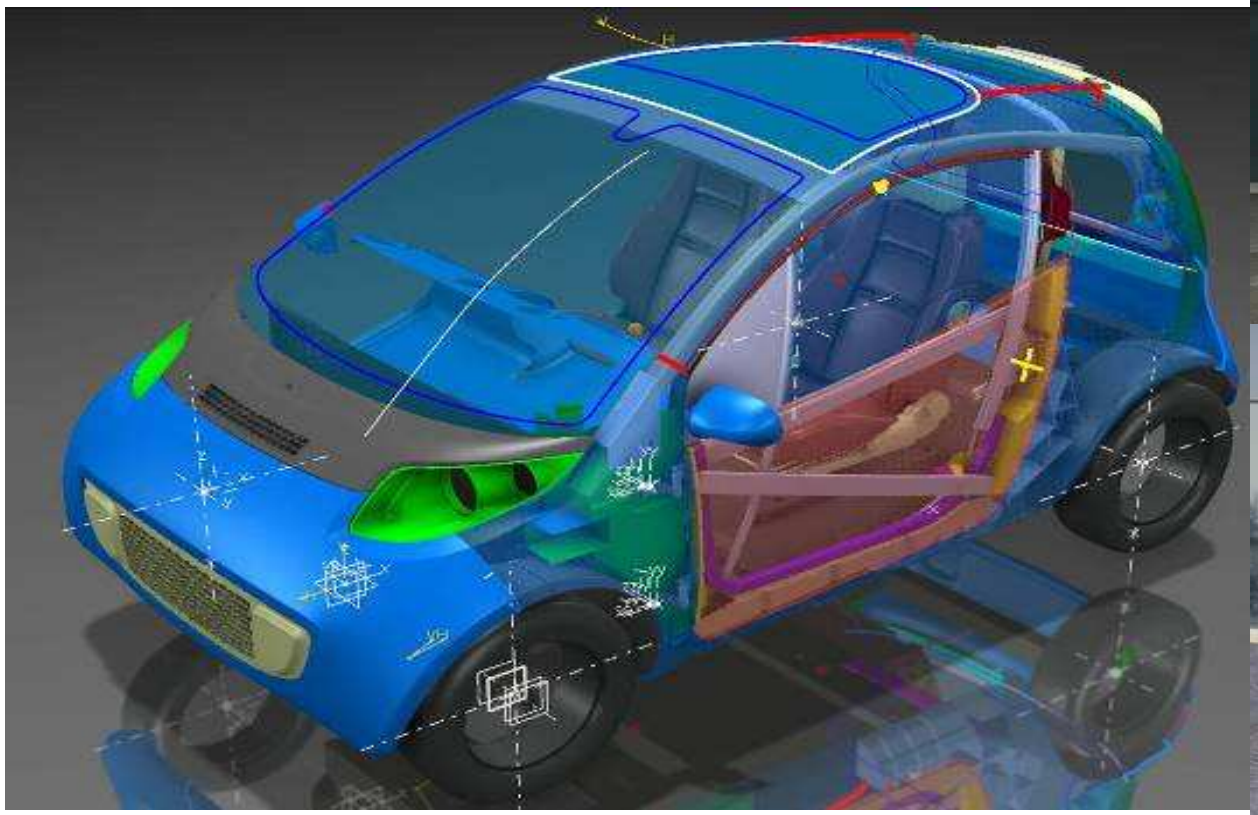
The starting point



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Decision process

REQUIREMENTS AND DRIVERS | **COMPONENTS DESIGN CONCEPTS** | **MANUFACTURING PROCESSES** | **MATERIALS**

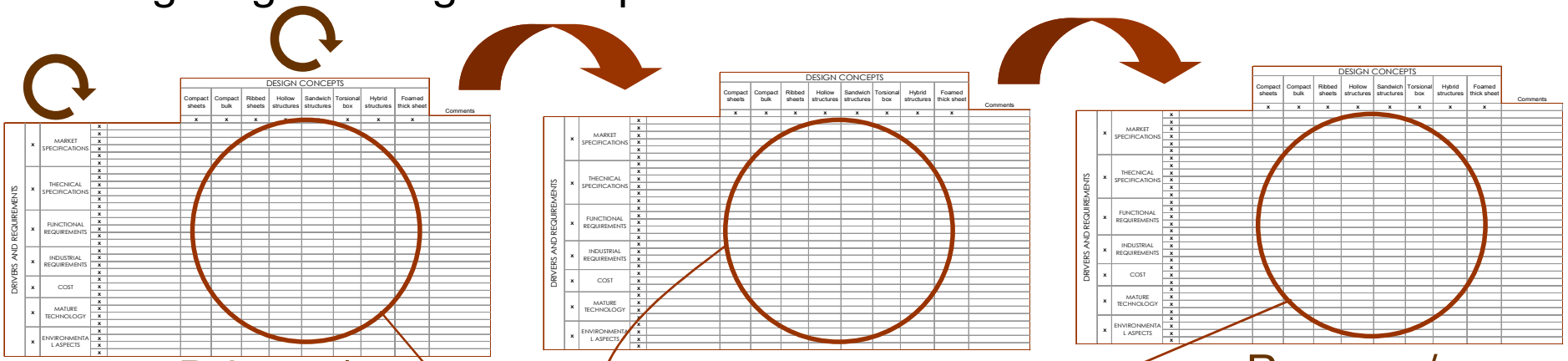
1- IDENTIFICATION
2- STRUCTURING
3- WEIGHTING
4- VALUATION
5- SCORING

- PREFERENCES
- RELATIONS OF DEPENDENCE

Decision process

Weighting of the drivers

Weighting of Design concepts



Drivers / Design concept

Design concept / processes

Process / material

Factors of influence

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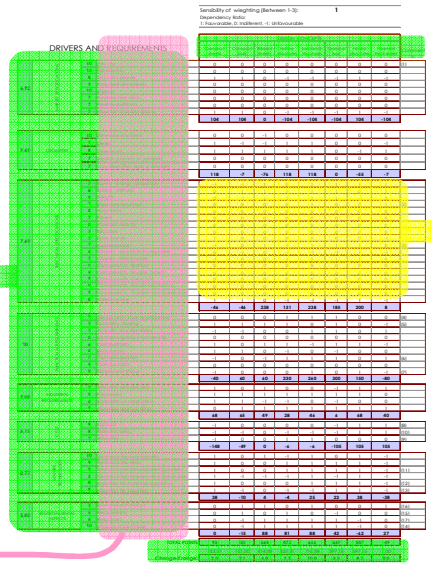
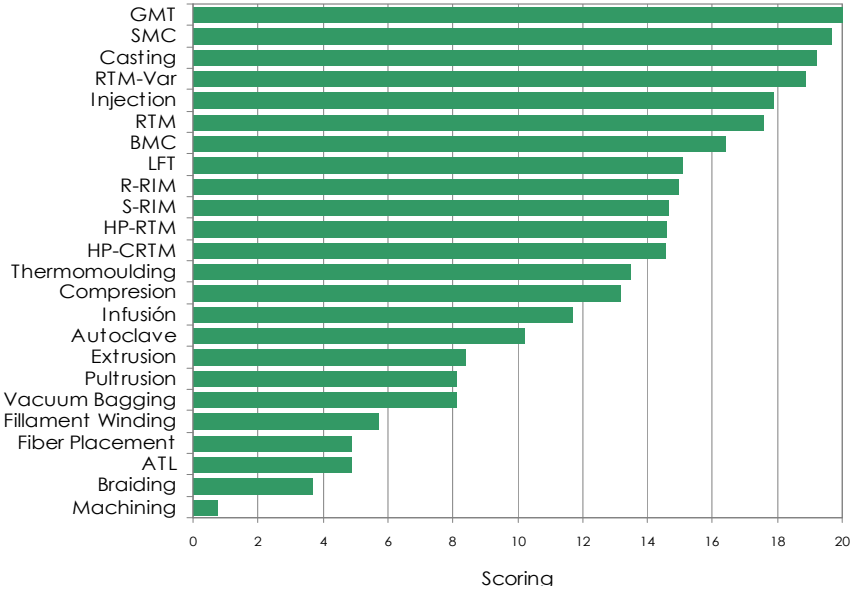
METHODOLOGY



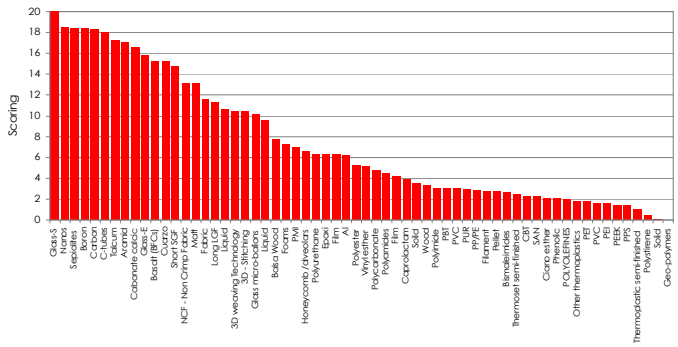
CONTRIBUTION OF PARTNERS

TECHNICAL KNOWLEDGE
Based on a statistical process.
2 researches expert in Plastics and Composites Technologies and 2 researches expert in Product Development

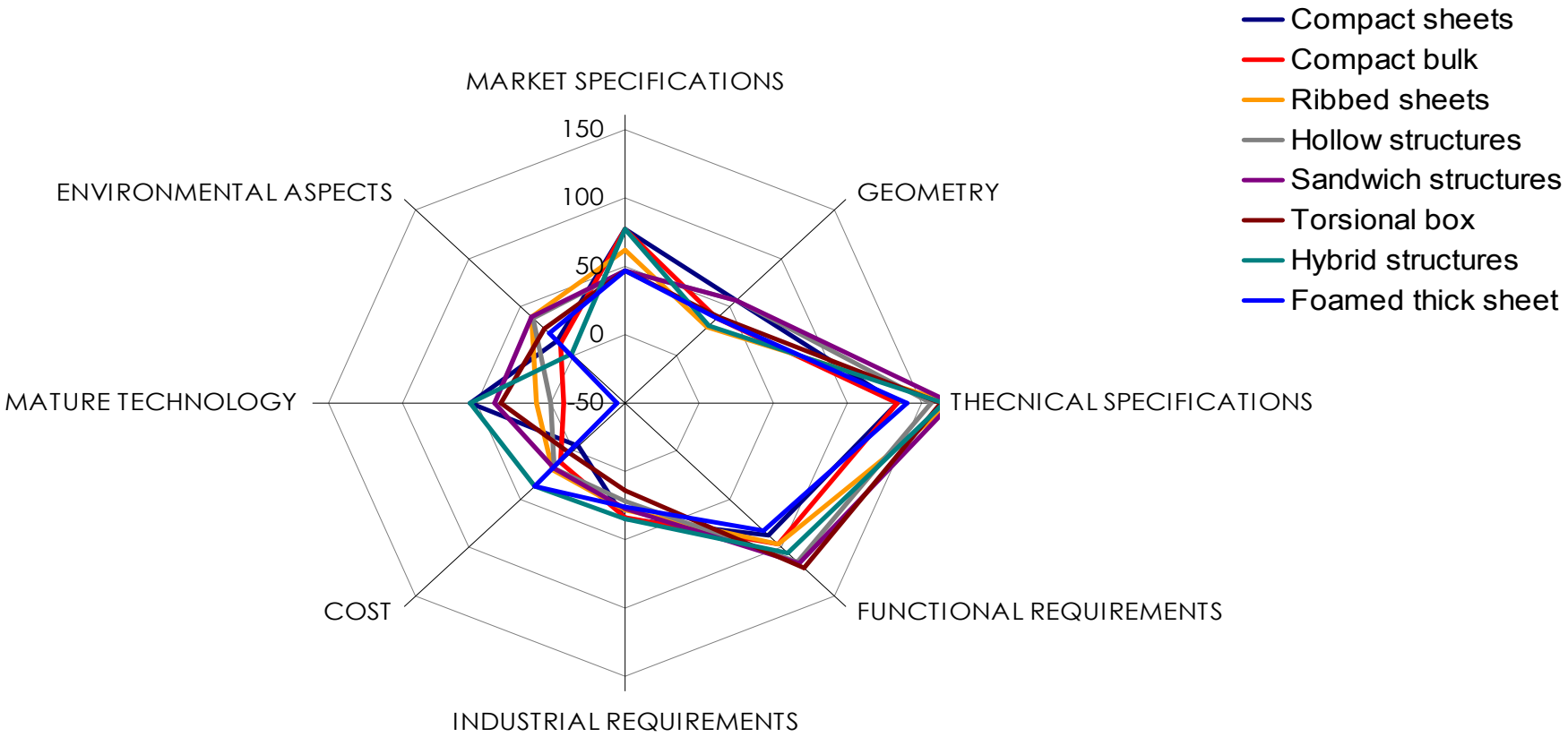
PROCESSES SCORING (respecting drivers and design concepts)



MATERIALS SCORING (Respecting process)



Decision process



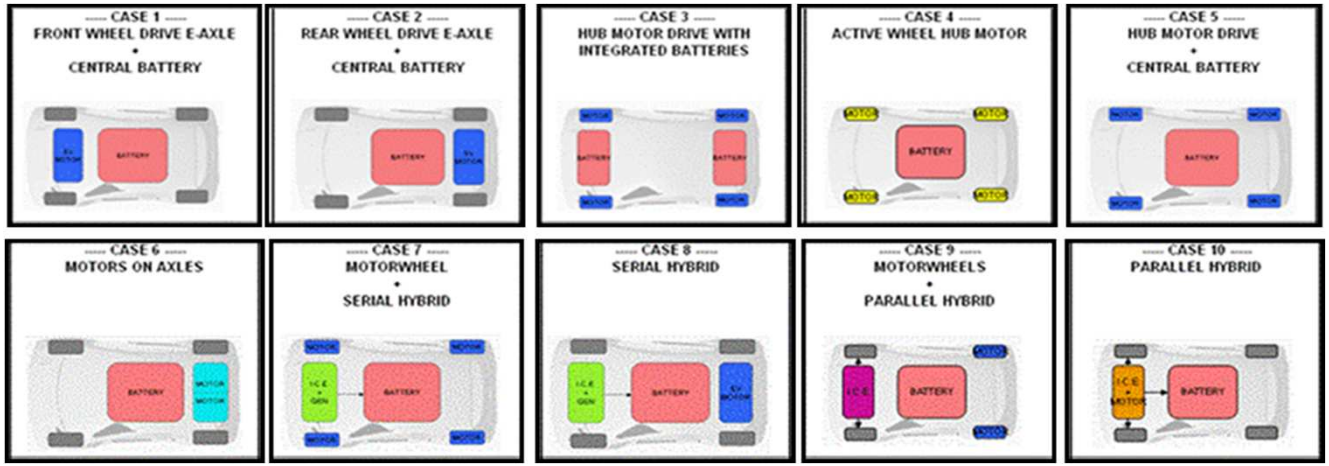
Adequacy of design concepts to requirements and drivers

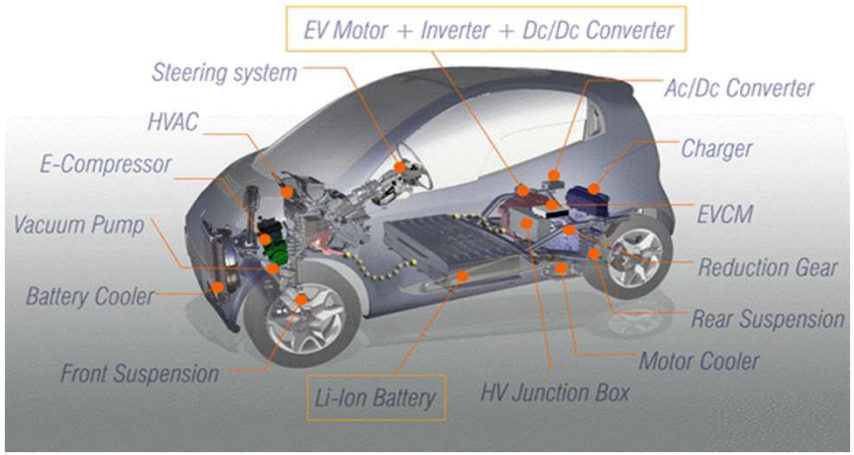
Decision process

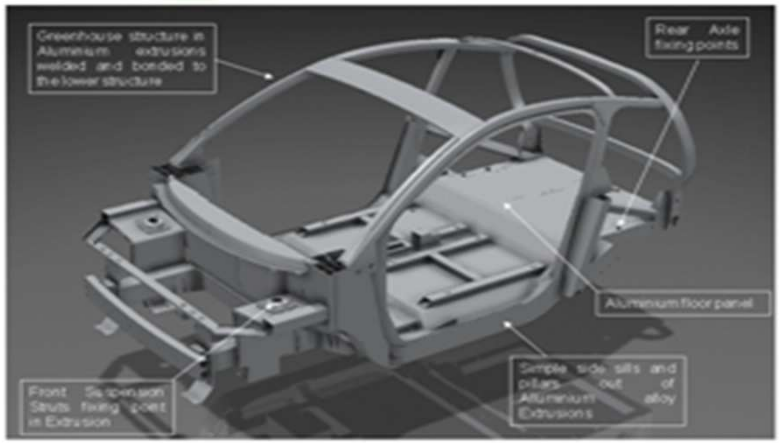
Comparative Matrix

	MARKET SPECIFICATIONS	GEOMETRY	THECNICAL SPECIFICATIONS	FUNCTIONAL REQUIREMENTS	INDUSTRIAL REQUIREMENTS	COST	MATURE TECHNOLOGY	ENVIRONMENTAL ASPECTS
MARKET SPECIFICATIONS		0	1	1	-1	-1	-1	-1
GEOMETRY	0		0	0	-1	1	0	1
THECNICAL SPECIFICATIONS	-1	0		1	-1	0	-1	-1
FUNCTIONAL REQUIREMENTS	-1	-1	-1		-1	-1	-1	-1
INDUSTRIAL REQUIREMENTS	1	1	1	1		0	-1	0
COST	1	1	0	1	0		-1	-1
MATURE TECHNOLOGY	1	1	1	1	1	1		1
ENVIRONMENTAL ASPECTS	1	1	1	1	0	1	-1	
TOTAL	**3**	**3**	**3**	**6**	**-3**	**1**	**-6**	**-2**
Changed range:	**7,7**	**7,7**	**7,7**	**10,0**	**3,1**	**6,2**	**0,8**	**3,8**

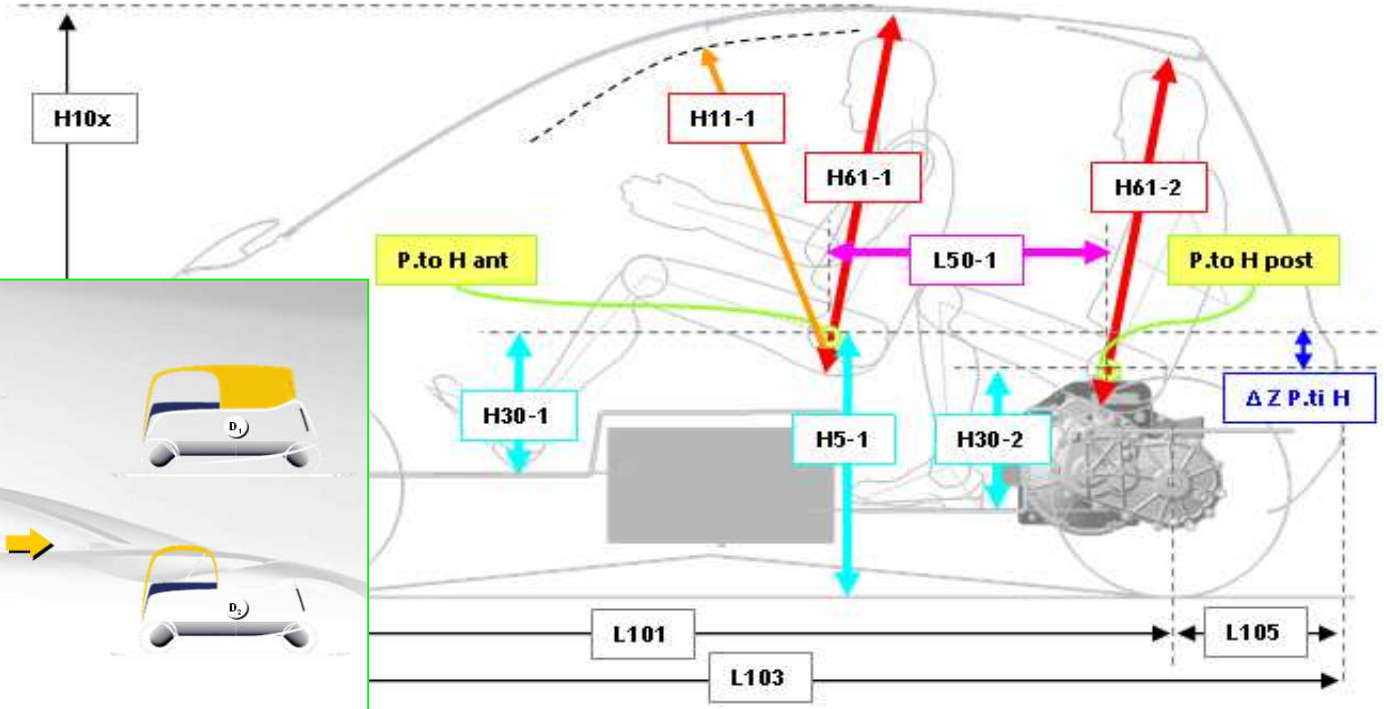
EV layout


CASE 1
FRONT WHEEL DRIVE E-AXLE
+
CENTRAL BATTERY
CASE 2
REAR WHEEL DRIVE E-AXLE
+
CENTRAL BATTERY
CASE 3
HUB MOTOR DRIVE WITH INTEGRATED BATTERIES
CASE 4
ACTIVE WHEEL HUB MOTOR
CASE 5
HUB MOTOR DRIVE
+
CENTRAL BATTERY
CASE 6
MOTORS ON AXLES
CASE 7
MOTORWHEEL
+
SERIAL HYBRID
CASE 8
SERIAL HYBRID
CASE 9
MOTORWHEELS
+
PARALLEL HYBRID
CASE 10
PARALLEL HYBRID


EV Motor + Inverter + Dc/Dc Converter
Steering system
HVAC
E-Compressor
Vacuum Pump
Battery Cooler
Front Suspension
Li-Ion Battery
HV Junction Box
Motor Cooler
Rear Suspension
Reduction Gear
EVCM
Charger
Ac/Dc Converter


Greenhouse structure in Aluminium extrusions welded and bonded to the lower structure
Rear Axle fixing points
Aluminium floor panel

Decision process



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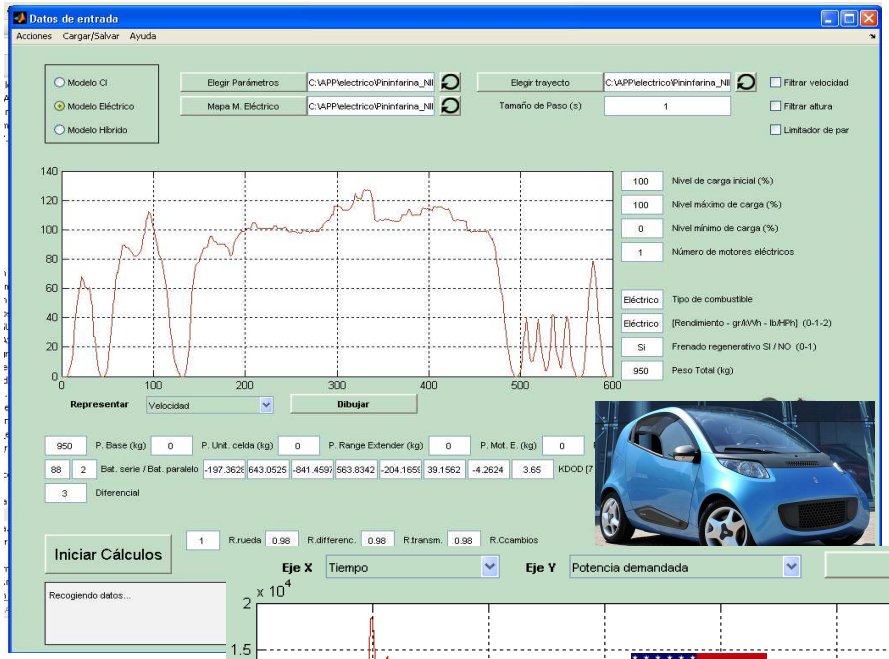

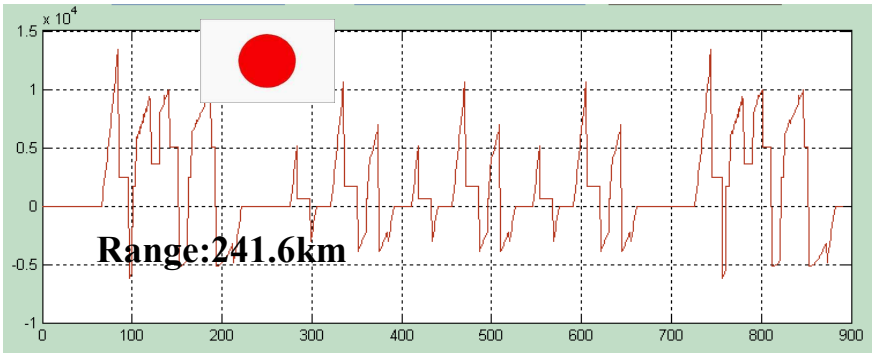

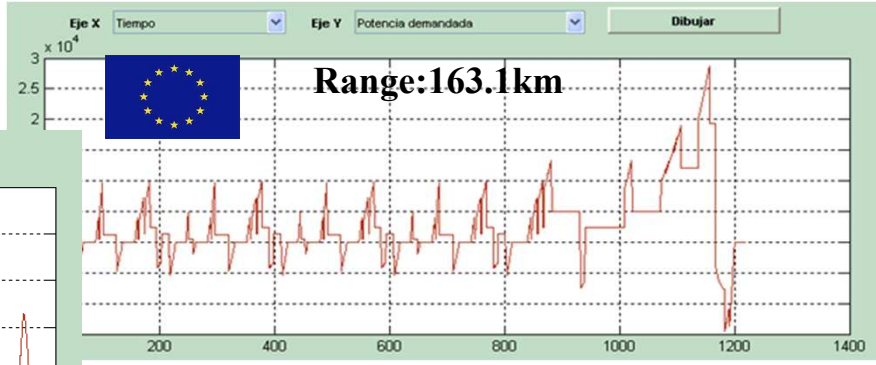

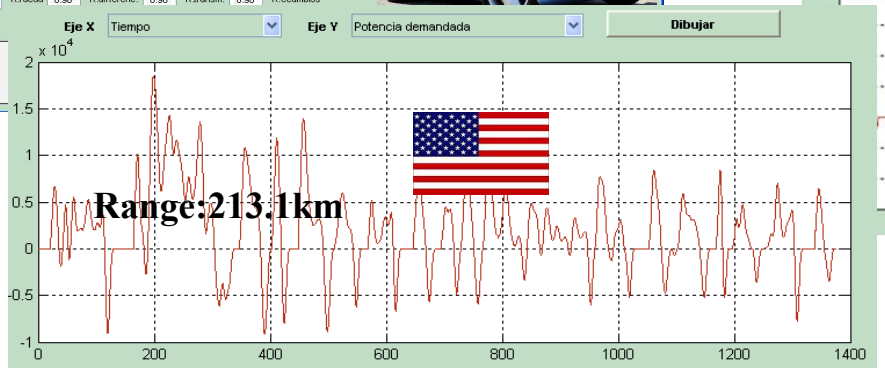

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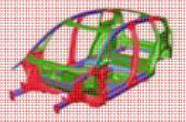
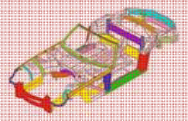
Decision process

LEVEL OF IMPORTANCE OF KEY FACTORS	BIW ARCHITECTURE / KEY FACTORS	----- CASE 1 ----- STEEL UNIBODY	----- CASE 2 ----- ALUMINIUM UNIBODY	----- CASE 3 ----- STEEL TUBULAR CHASSIS	----- CASE 4 ----- LOWERBODY STEEL UPPERBODY ALUMINUM	----- CASE 5 ----- ALUMINIUM SPACE FRAME (Casted joints)	----- CASE 6 ----- ALUMINIUM EXTRUSION EXTENSIVE (metal sheet joints)
							
		Alfa Romeo Brera Mitsubishi COLT Volvo C70	GM EV1 Honda Acura NSX	Lamborghini Diablo GT Jaguar XJ 220	Think! Renault Avantime	AUDI A2 AUDI A8	Aston Martin Vanquish BMW Z8 Roadster Lotus Elise
1	WEIGHT	2	0	2	1	0	0
1	PRODUCT SALEABLITY	2	0	2	1	0	0
2	PRODUCT DEVELOPMENT TIMING	0	1	0	1	1	1
2	PRODUCT MANUFACTURING TIMING	0	1	0	0	0	0
2	UNIT COSTS vs. INVESTMENTS	1	2	0	1	2	1
3	PACKAGING vs. ERGONOMY	0	1	1	0	0	1
3	VEHICLE DYNAMICS	1	0	1	1	0	0
4	STYLE (Current)	0	1	2	2	1	2
4	SAFETY	0	1	2	1	1	1
SUMMARY		0	1	2	2	0	1

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