

Evolving towards collaborative manufacturing

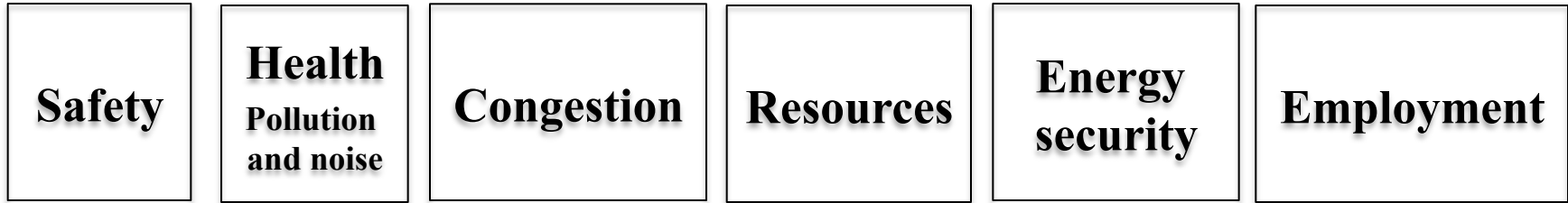
Pietro Perlo

I-FEVS

Torino e-district: Non-Profit Research Organisation

- Converging needs and trends in EVs
- Role of SMEs in electromobility
- Open SW and Open HW: Example Arduino Community
- Digital Economy and Industry 4.0
- Opportunities for SMEs and Large automotive TIER1s
- EVs: Toward “Collaborative Manufacturing”

Converging needs



Safer, More Efficient, Lower Footprint
Electric automated vehicles

Average[°] US car 1,879 kg, Average^{} EU car 1,372 kg (-507kg!)**

* <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0001:0015:EN:PDF> ° <http://www.msnbc.msn.com/id/14187951/>.

Plug-in vehicles: World CAGR 2015-2020*



Type	Light EVs (e-Bike)	Light EVs (other)	Micro EVs light-heavy Q-cycles	City e-Cars	Small e-Cars	Mid size e-Cars	Large e-Cars
Weight kg	15-50	50-350	350-700	700 -1000	1000-1300	1300-1500	1500-2000
Energy kWh/100km	1-2	2-4	4-8	9-12	12-15	Battery only and Battery with R.E	
kg/100km of Li-ion pack (180Wh/kg)	6 -11	11-17	70-80%		67-85	85-100	100 -150
DC link (V)	24-48	48-65	48-100	65-240	120-360	240-480	360-480++
Nominal Power (kW)	0.05-1.0	5-7%		15-40	18-70	50-140	70-200+
Speed km/h	to 35	to 45	45-90+	By design			

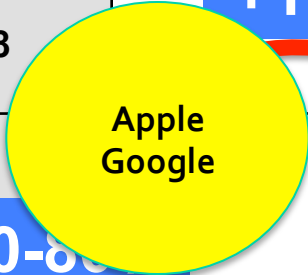
The sales of e-bikes has reached a certain consolidation: more smartness needed. Low speed e-vehicles in China and Kei e-cars in Japan follow exponential growths.

*Conservative forecast.

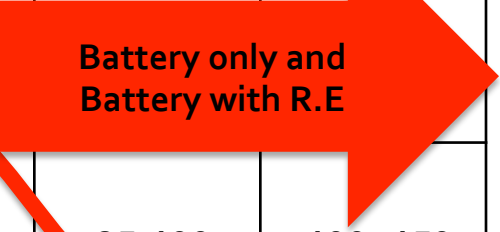
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Speed km/h	to 35	to 45	45-90+	By design			



+100%



70-80%

50-70%

5-7%

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M1 world

- Support large TIER1s and Large OEMs
- Act as TIER1s , TIER2s supply APPS, components, systems
- Provide specific sets
- Convert Conventional Vehicles
- Vehicle Prototypes “single model” niches

Large OEMs continue to dominate but SMEs have more important roles !

Slow speed vehicles (LEVs and Micro Evs): is an opportunity for SMEs to produce new forms of vehicles of secondary interest to large OEMs.



SMEs could also address large scale manufacturing **but...**

For whatever vehicle to produce:

- **Safety**
- **Automotive quality standards (Reliability....)**
- **Ergonomics**
- **Aesthetics**
- **Production cost**



Are not optional !

Basic Vehicle technologies cannot be re-invented.

There are no short cuts!

Cars are not toys.

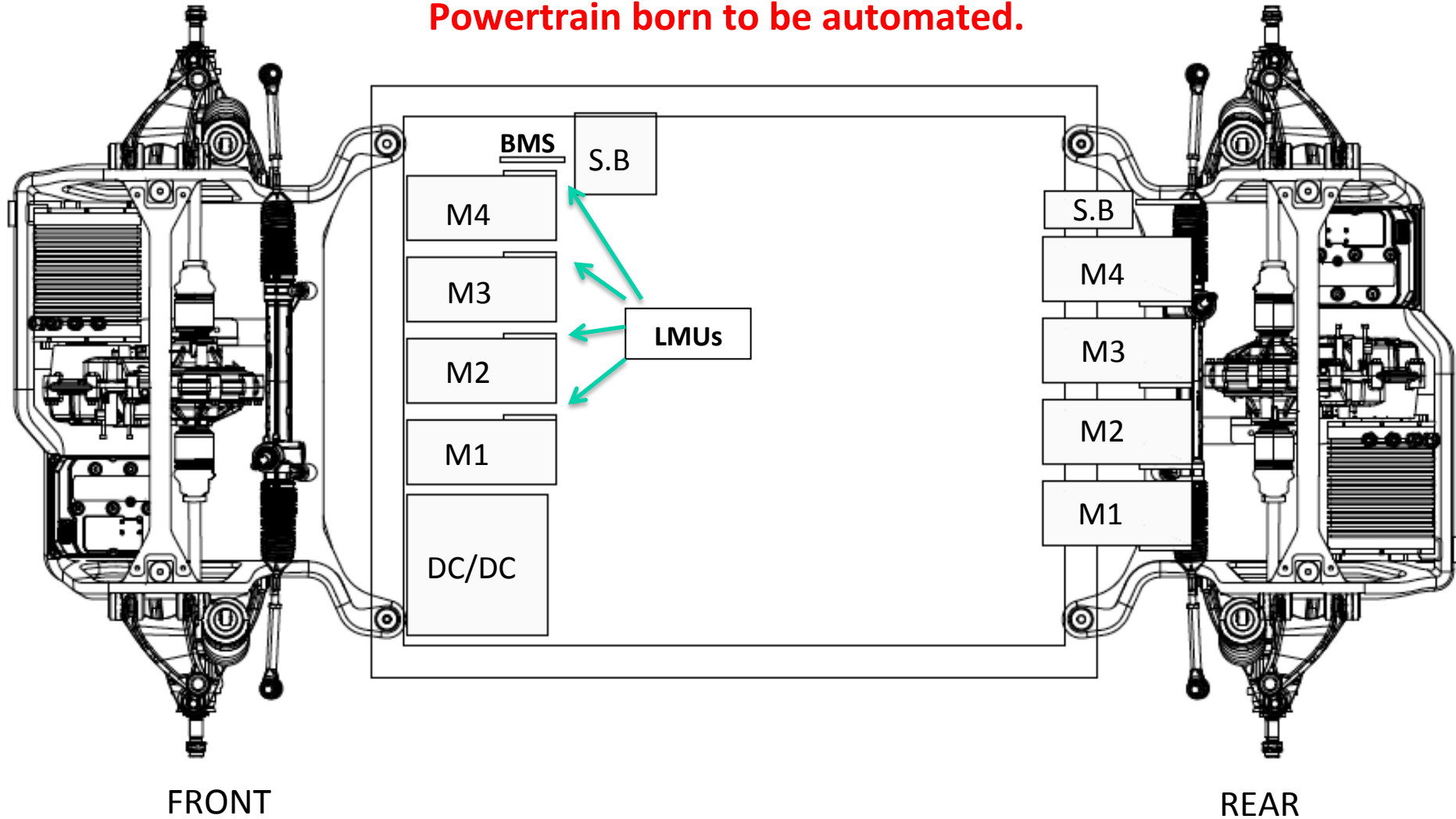
SMEs aiming at large scale manufacturing of e-vehicles that do not follow those basic points were:

“BORN DEAD”

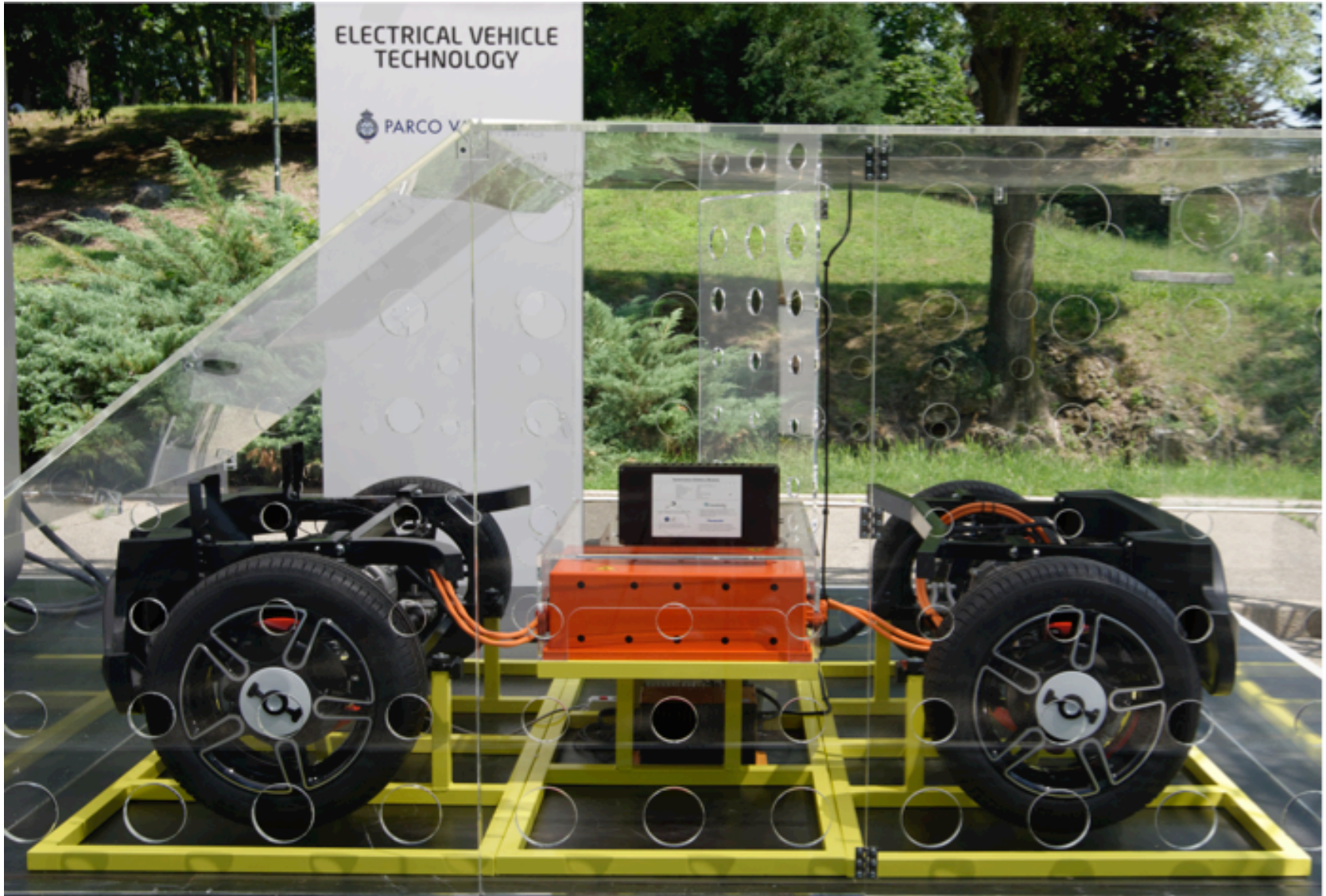
In the last two years + 15 EU companies bankrupt.....

I-FEVS Macro scheme of the Powertrain: front and rear axles are exactly the **same 4WD and 4WS.**

Powertrain born to be automated.



Two identical axles powertrain



EU-MOBY Platform

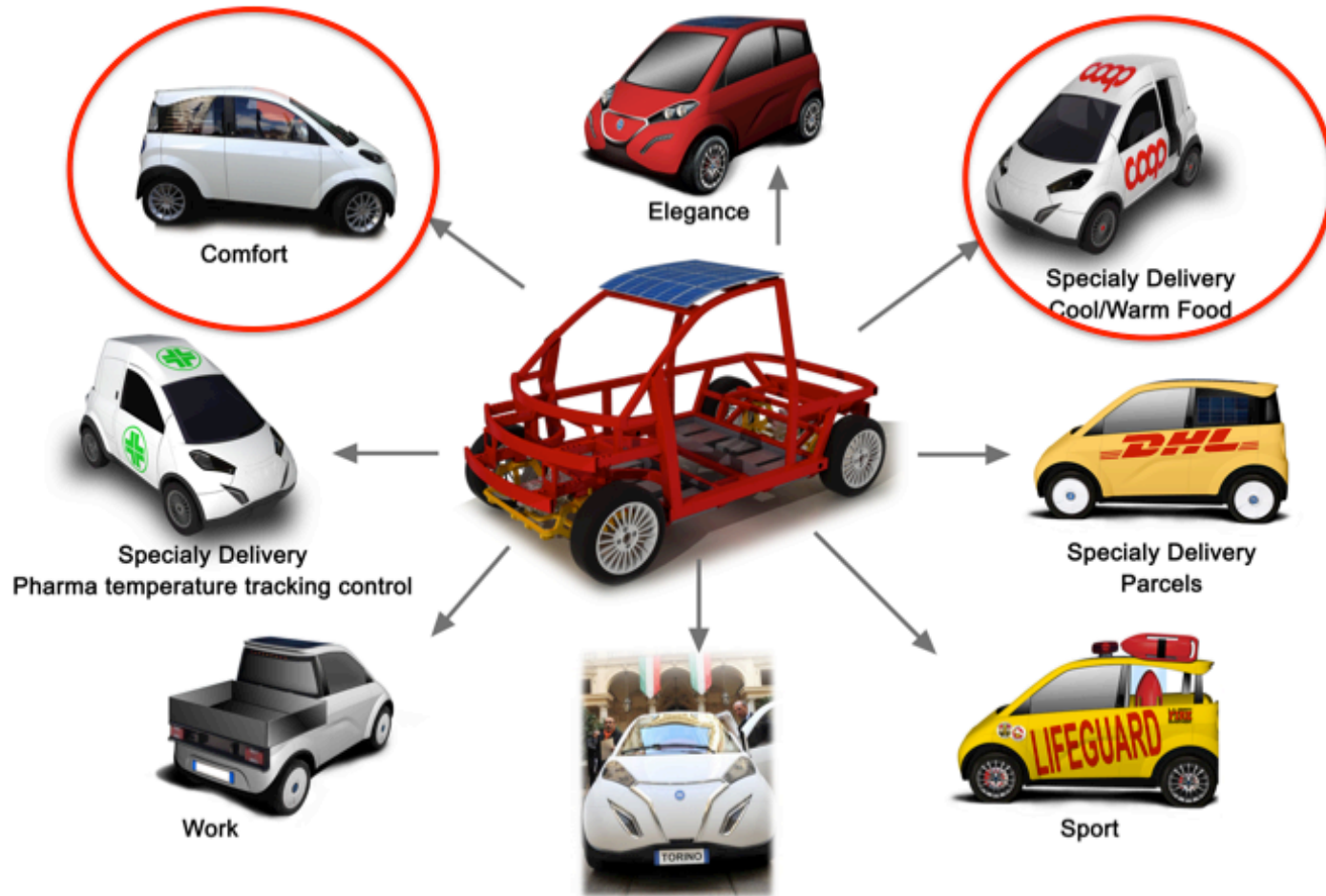


SME spending 120k€ to deposit patents in the last 12 months.
IPR Agreement with SISVEL Technologies.



A low cost chassis made with a mix of super high strength steels for a variety of different missions

EU-MOBY: Variable Design Platform



What approach to large scale manufacturing??

Digital Economy & Society Commissioner,
Günther Oettinger

“..we are in the middle of a true revolution...the fourth industrial revolution will change all our industries, it will change our economy and it will change our lives..”.

Fourth industrial revolution

The fourth industrial revolution — characterised by the increasing digitisation and interconnection of products, value chains and business models — has arrived. Great implications on **Open SW and Open HW**, in few words **sharing economy, generation of communities, collaboration.**

Angela Merkel *“40% is the share of worldwide manufacturing (a total of €6,577 billion) is held by emerging countries. They have doubled their share in the last two decades. As part of traditional industrial economies, Western Europe has lost over 10% of manufacturing value added, from 36% to 25%. On-going investment will be key. We enter this race with great confidence. But it’s a race we have not yet won.”*

German industry will invest a total of €4 billion in Industry 4.0 every year by 2020. Applying the same investment level to the European industrial sector, the annual investments will be as high as €140 billion per year.

Kingdom of Bikes established in Tianjin

- 159 research institutes - 8 national laboratories,
- 10 national engineering research centres,
- 27 national and ministerial level technical test centres.
- 80 US Billions investment in the period 2009-2016.

The development plan for the bike industry to compete globally approved in August 2009 and enlisted as one of Tianjin's major projects addresses:

- Bike industry and cultural centre,
- Premium bike and parts manufacture base,
- New material and new energy development,
- Associate transportation vehicle and parts manufacture base.

The Infrastructure and Environment to Develop and Manufacture EVs in China, **Tao WU**, Tianjin Polytechnic University. Update of the presentation delivered at the San José IDTECHEX first conference on land, sea, and air electro-mobility, December 2010 .

Competition based on large vertical supply chains?

Winning the competition by establishing the largest possible vertical supply chains is a **commercial war-game**.

Europe is unable to play the game with Asian rules.

In most new technologies Europe is a loser.

The approach should be different.

If we do not like the rules we have to change them!

Competition is a modern term that has entered in the DNA of most people

- The verb to compete is not contemplated in the Bible nor in the Vangelis,
- The verb to compete is not contemplated in the Koran,
- The verb to compete does not exist in Paradise*

Without taking everything too seriously we could also notice that: In Paradise there are lots of blond Angels that offer their “consultancies” without competition.

Collaborative R&D and Collaborative Manufacturing

Cooperative R&D is the original vision behind all EU work-programmes.

Cooperative R&D is not enough any more we are all losers. As it is the best brains of the weaker Member States support the advancement of the stronger Member States.

We need some refinements considering we are living in a modern exponential technology era.

Collaborative manufacturing also including new forms of EU open SW-HW platforms is one amongst the most effective approaches. It requires a new spirit of collaboration that can be established only by the EC.

Example: Arduino

The do it yourself drones at <http://diydrones.com> is based on the open **SW-HW platform Arduino**. Few people guide the manufacturing of electronic boards in the Region that was previously producing Olivetti's personal computers. Several thousand people are involved in the production of the board.

All those that buy a board are given the necessary data so that the board could be adapted for the specific application. SW is for free with **algorithms developed by the world Community**.

The Chinese have copied the Arduino board but the Community acts faster and better. **Cooperation is the winner**.

To make your own robot start from there, **To transform your car into an automated car start from there**. One per cent of the cost of a typical R&D project. When your application will be ready for the mass market you are allowed to develop your own SW-HW without constraints.

Arduino has generated the birth of many new fully independent companies.

Sharing objectives to turn EU overcapacity positive

Overcapacity and excess production remain unresolved issues around the world including China (1,2,3).

In the last five years the decrease of EU car demand has been compensated “and hidden” by an increased EU production with export in non-EU markets. The reverse trend of importing low cost segments from emerging countries plus China likely exporting 1 million vehicles or more in few years, may have a disruptive impact on EU economy.

The infrastructure to manufacture new forms of mobility is already available in most EU member states! What we need is to promote local manufacturing sharing knowledge with common objectives....at few% of the usual engineering costs. Personalise product developments for local needs and share innovation for free.

1) KPMG's Global Automotive Executive Survey, 2012

2) www.acea.be

3) KPMG's Global Automotive Executive Survey, 2012

Serial versus Parallel Manufacturing

- The usual logic per which the larger the plant the better does not apply any more to small electric vehicles.
- *“The era of the mainframe is finished”*
- No need any more to spend hundreds of million€ to promote local manufacturing and local supply chains of new vehicles that meet most people needs,
- But we must remember that cars are not toys.
- The more than 100 years of vehicle technology **cannot be short cut.**

Conclusion on Collaborative Manufacturing

IFEVS has organised a complete international supply chain to produce EVs **meeting most people-mission needs.**

- Safe
- Efficient
- High performance
- Personalised to your local market
- Low cost manufacturing
- Ready to be updated for future automated and partially automomous drive.

Low cost turn key plants distributed in the EU member States (and not only) to produce 50 EVs/day. Managed by local companies.

*Thank you
for your attention!*

*Pietro Perlo
I-FEVS, Torino-e-district
www.ifevs.com*

Back Up slides

- ❑ Vertical supply chains: central planning

- ❑ Local manufacturing
 - Focus on key sectors,
 - Address key Innovations,
 - Be pro-active in the new exponential era,
 - Promote the formation of new communities addressing the manufacturing of EVs,
 - More convergence of the calls on manufacturing and R&D on Transport,
 - More convergence of the ICT calls and R&D on Transport.

Electro-mobility: **Local Manufacturing** is much easier

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Shared Local Manufacturing

- Building Community-Clusters,
- Cutting engineering costs to a small fraction,
- Making products the fastest possible way,
- Making products simpler and affordable everywhere,
- Making products different and personalised,
- Unlock Youth un-employment,
- Promote Social Innovation.

LINEAR → EXPONENTIAL

**“The average lifespan of an
S&P 500 company has decreased from:
67 years (1920’s) → 15 years (today)”**

- Richard Foster, Yale University

**Most new companies and technologies will disappear in 15 years.
Most large companies will continue to exist addressing very different
businesses.**