



## **Global Opportunities for SMEs in Electro-Mobility**

Project Nr: 609256

***Deliverable D3.2: “Identification of e-mobility related innovation capabilities of EU supplier & SMEs” (Final Report)***

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## 1. Introduction

The main goal of D3.2 is to evaluate the current involvement of the European supplier industry and SMEs to emerging e-mobility supply chains by interviewing cluster managers, analysing case of studies and considering the implications of requirements on specialization for production of different vehicle classes according to dedicated roadmaps.

This draft deliverable provides a partial overview of the aforementioned situation. It focuses mainly on Italian SMEs, evaluating their innovation capabilities in the field of e-mobility and collaborative approaches for Italian SMEs to enter a Chinese value chain of e-bikes.

The main objectives of this draft deliverable are the following:

- Demonstrate that in electro-mobility the innovation capability of SMEs and TIER1s is much more relevant than in the conventional ICEVs; when supporting a large OEM, both TIER1s and SMEs acquire a much more important role,
- Complement the Inventory of European Regional Skills capacities and competencies relevant for the e-mobility supply chain (D3.1) by analyzing the opportunities offered to SMEs when operating in clusters involving large TIERs,
- Analyze the evolution of the supply chain and report specific case studies of how the collaboration between large suppliers and SMEs could open new opportunities,
- Compare the Asian approaches (China, Korea, Japan) to the global supply chain with the European ones and propose the promotion of new forms of EU collaborative actions that would strengthen the innovation capabilities of EU companies while stimulating the manufacturing of electric vehicles and related enabling technologies in Europe.

## 2. Technical Innovation and Strategic Positioning

Addressing the business of mobility with in mind short developing time and quality standards, low investments and low production cost, impose much more than just technical innovation capabilities.

Electro-mobility changes the relations amongst all players in the value chain, the suppliers, whether large TIER1s or SMEs, can address much more important developments that what it was possible with vehicles based on internal combustion engines (ICEs). In electro-mobility large OEMs do not have any more the monopoly on innovative powertrain developments.

The companies tempted to enter the market of road mobility are faced to a complex environment in which having a high innovation capability is just one amongst the many aspects to consider.

The suppliers can continue to provide services, systems-components to the conventional automotive companies but at the same time electro-mobility offers the opportunity to produce new form of vehicles of secondary interest to the large OEMs. New highly innovative companies are also challenging the consolidated OEMs on their field, that is, M1 vehicles.

Independently from the role a company has in the value chain, the exponentially changing world of electro-mobility, requires innovative approaches to:

- R&D,
- Collaborations with the other players of the value chain,
- Manufacturing,
- Relation with public authorities,
- Finance,
- Market.

The strategic positioning of a company is crucial to assure its long-term sustainability. Excellence in the supply chain requires having the right product, in the right place in the right time and at the right cost<sup>1,2</sup>. At the same time the company should adapt as markets change and withstand the shocks of demand and supply volatility, characteristics of electro-mobility.

Experience teaches that the first market to address is always the local one. The parameter “produced in the country where is it sold” is also very important in that electro-mobility changes the rules of the supply chain and because of that, the concept « producing local thinking global » deserves a specific attention which will be further addressed on deliverable D3.3.

### **3. Small/Medium Enterprises (SMEs) and large suppliers workforce in the field of electro-mobility**

It is clear which impact SMEs have on innovation in the road transport sector: SMEs employ about 55% of EU auto-workforce, some act as TIER1s, most as TIER2s, many are providers of specialists to either TIER1s or directly to manufacturers OEMs. According to the 2013 ACEA pocket guide the EU27 motor vehicles employs a total of 12.9million people; of these 2.2 millions (about 20%) are directly employed by the large OEMs, the rest of the workforce, including the manufacture of transport equipment, are spread amongst large suppliers and SMEs. The 55% share attributed to the SME workforce is an estimate supported by a survey conducted by Torino e-district within the chambers of commerce of the automotive specialized EU regions.

SMEs participate in all phases of the innovation value chain, including: R&D, the first concept, vehicle design and modelling, engineering, manufacturing, services and sales.

So far the Internal Combustion Engine (ICE) has been the heart of the automotive industry: the complexity of this industry is such that innovation could be driven and made only by few organizations. The advent of electro mobility and the demand of smartness and new form of integrated transport has changed the context: innovation can be made by many organizations, with SMEs playing new key roles both as suppliers of services and components or directly as vehicle manufactures. The following paragraphs will analyse how roles and opportunities of the industries are evolving distinguishing between the conventional M1<sup>3</sup> world and the new fast emerging sectors of slow speed vehicles (LEVs and MicroEVs).

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<sup>1</sup> Supply chain inside LLC. <http://supplychainindex.com/wp-content/uploads/2013/02/1.png>

<sup>2</sup> <http://www.ibs.net/Global/pdf/delivering-supply-chain-excellence.pdf>

<sup>3</sup> *Category M*: Motor vehicles with at least four wheels designed and constructed for the carriage of passengers.  
*Category M1*: Vehicles designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat.

### **a. SME and large supplier workforce in supporting the consolidated OEMs in the M1 context**

Because of the high content of software related developments demanded by electric vehicles the role of the SMEs in the M1 sectors is getting more important but the main actors will remain the OEMs.

SMEs will continue playing an important role in the M1 world supporting the large OEMs providing specialized workforce, acting as TIER2s and sometimes as TIER1s as well.

### **b. SME and large supplier workforce acting together as vehicle manufacturers**

SMEs can play a key and major role in the light EVs and Micro e-cars sectors, where adaptation capacities, flexibility and efficiency are required and the conventional auto-motorcycle industry cannot fully compete.

Three wheelers, low speed vehicles and Micro e-cars are clearly new exploding businesses open to SMEs which can conceive, design, develop, prototype and produce safe, ergonomic and energy efficient vehicles meeting most people needs.

To generate a sustainable business SMEs should consider that whatever electric vehicle will be produced:

- Safety
- High quality standards (reliability)
- Ergonomics
- Aesthetics
- Smartness
- Low production cost

Are not optional. European, Japanese and US customers are the most demanding and those SMEs aiming at becoming OEMs with large scale manufacturing of e-vehicles must seriously consider those basic points otherwise sooner or later they will face severe problems.

Addressing the business of mobility with in mind short developing time, high safety and quality standards, low investments and low production cost, impose close relations with TIER1s to use off-the-shelf components (carry over) and to profit from their familiarity with the technical demand of highly competitive markets<sup>4</sup>.

In these emerging markets very different business models are possible; strong collaboration between SMEs and TIER1s results in advantages in order to produce safe-efficient vehicles that can be distributed even without the support of large OEMs.

In such a rapidly changing, evolving and growing market (low speed EVs sales in EU are estimated to be 3 million units/year by 2020<sup>5</sup>, i.e. fork lifts, special delivery, golf cars, wheel chairs, etc.), SMEs willing to address this identified niche areas need to be oriented towards new business models, emerging sectors and technologies, new funding models and tools, relevant value chains and innovation stakeholders, customer needs understanding, etc.

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<sup>4</sup> <http://ec.europa.eu/programmes/horizon2020/en/news/electric-cars-driving-seat>

<sup>5</sup> Bosch at the recent EPoSS annual meeting (Torino 24-26 September 2014) forecasted sales up to 3 million units year by 2020.

### ***On challenging the consolidated automotive manufactures in electro-mobility***

Although the powertrain of the fully electric vehicle is simpler than the conventional ICE one, SMEs alone or even when aggregated in clusters with large suppliers cannot challenge the consolidated OEMs on large-scale manufacturing of M1 vehicles.

The current European environment does not offer the possibility that for instance TESLA could find in the US with continuous support from Capital Ventures, Government (450M\$ single loan) and the stock market (B\$). The complexity of the business, the expensive homologations and the necessary large investments to reach the market are prohibitive for EU-SMEs even when addressing specific niches or the retrofitting of conventional motorisation into EVs.

EU SMEs that have addressed the M1 electric vehicles challenging the traditional OEMs either bankrupt or are in serious financial problems. The first example is Micro-vett (Modena, Italy) an SME specialised on transforming conventional FIAT vehicles; after 25 years of quite profitable operation and over 5000 transformations the company bankrupt when the first OEMs have started their own commercialisation of fully electric vehicles.

The second example is CECOMP an SME who has started in Torino the production of the Blue Car (known as the Bollorè car) for Paris before Nissan introduced the LEAF in the US market; the company, although supported by a large group like Bollorè, is continuously passing from one financial problem to another. The last examples, **amongst the many**, are MIA from France who went into liquidation this year<sup>6</sup> and Qbeak from Denmark also hitting problems<sup>7</sup>.

### ***On defining a strategy for a sustainable manufacturing of electric vehicles***

Rather than challenging the large OEMs on the M1 field, the companies entering the direct manufacturing of electric vehicles should be focused on the new emerging sectors of LEVs and slow speed vehicles. Because these emerging markets are large<sup>8</sup> they are attractive for the conventional OEMs as well. These have a variety of advantages besides they can afford failures and large losses<sup>9</sup> for several years, however, the large OEMs lack the speed and flexibility required by these sectors.

It is also true the opposite: for large OEMs it is difficult to challenge those companies that base their business on flexibility and speed.

More than 20 companies addressing the development of L7e vehicles are available in Italy only. Several others can be found in France, Poland, Germany, UK and in most EU countries.

Several companies are approaching the business quite seriously but many SMEs are facing big economical problems or are in liquidation. Excluding Renault, most large OEMs are reluctant to enter the low speed sector because less profitable (the TWIZY is an example in-spite of its relatively high price). A far less than complete lists of micro EVs and classical M1 vehicles with a less than 60kW motor is shown Table 1.

<sup>6</sup> [www.lemonde.fr/economie/article/2014/03/12/liquidation-judiciaire-pour-la-voiture-electrique-chere-a-segolene-royal\\_4381737\\_3234.html](http://www.lemonde.fr/economie/article/2014/03/12/liquidation-judiciaire-pour-la-voiture-electrique-chere-a-segolene-royal_4381737_3234.html) (summary in English [http://en.wikipedia.org/wiki/Mia\\_electric](http://en.wikipedia.org/wiki/Mia_electric)).

<sup>7</sup> : <http://ing.dk/blog/dansk-elbil-lukker-og-slukker-167465>.

<sup>8</sup> Bosch at the recent EPoSS annual meeting (Torino 24-26 September 2014) has forecasted the sales of all low speed vehicles up to 3 million units year by 2020.

<sup>9</sup> With \$4.6 billion over the lifetime of the project, Mercedes-Benz's Smart tops list of all-time European money losers, Detroit news OCT 7, 2013. Renault Twizy is also a big failure with sales well below the original expectations.

**Table 1:** Short list of European L7e and City Fully Electric Vehicles

1 Birò Estrima (4 kW)	7 Tazzari (15kW both L7e and M1)
2 Renault Twizy 45 (4 kW), Urban (8 kW)	8 Peugeot iOn (49 kW)
3 Microcar M Go SXI (6 kW)	9 Citroen C-zero (49 kW)
4 Aixam mega (4 kW)	10 Bollore Blue car (50 kW)
5 Alkè (8kW)	11 Smart-for-two (55 kW)
6 Sees City Fashion (10 kW)	12 VW e-UP! (60 kW)

Interesting is Tazzari (Italy)<sup>10</sup> offering a passenger vehicle that can be adapted to both L7e and M1 homologations. Tazzari is amongst the companies suffering financial problems for their EVs business.

In terms of variety of vehicles offered, the Italian Alkè<sup>11</sup> deserves a special mention for the strategy adopted on speed and flexibility and degree of technical innovation: focus on L7e special vehicles, avoid the competition with large OEMs, adopt lead acid batteries, low speeds (<45km/h) and limited ranges. For these categories of vehicles crash tests are not demanded. Production is made mostly by manual operations that do not assure high automotive quality standards. The presence Alkè has acquired in the global market is an indication of how a good strategy is as much necessary as having a high technical innovation capability.

#### 4. The growing demand for Smart and Integrated mobility

Looking at the smart mobility sector, energy efficiency, low-carbon mobility solutions, electric vehicles, satellite-enabled solutions, all these areas are stimulating the emergence of thousands of applications developers, and especially Micro, Small and Medium Enterprises.

The World Business Council for Sustainable Development (WBCSD) has defined sustainable mobility as: “the ability to meet the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological values today or in the future”.

It is clear the need for smart and innovative solutions filling the gap between the fast growing urban population and existing transport infrastructures on one side, and the need for safer, greener and smarter mobility solutions on the other side.

Smart Mobility is about finding these solutions; integrated solutions provided by different industries operating together.

In particular, potential areas where SMEs can contribute are:

- In-Vehicle Information Systems
- In-Vehicle driver support systems
- Fleet Management Systems
- Traveller journey planning systems
- Underlying technology (i.e. Data Transformation; Cloud Data; Mash-ups; M2M)

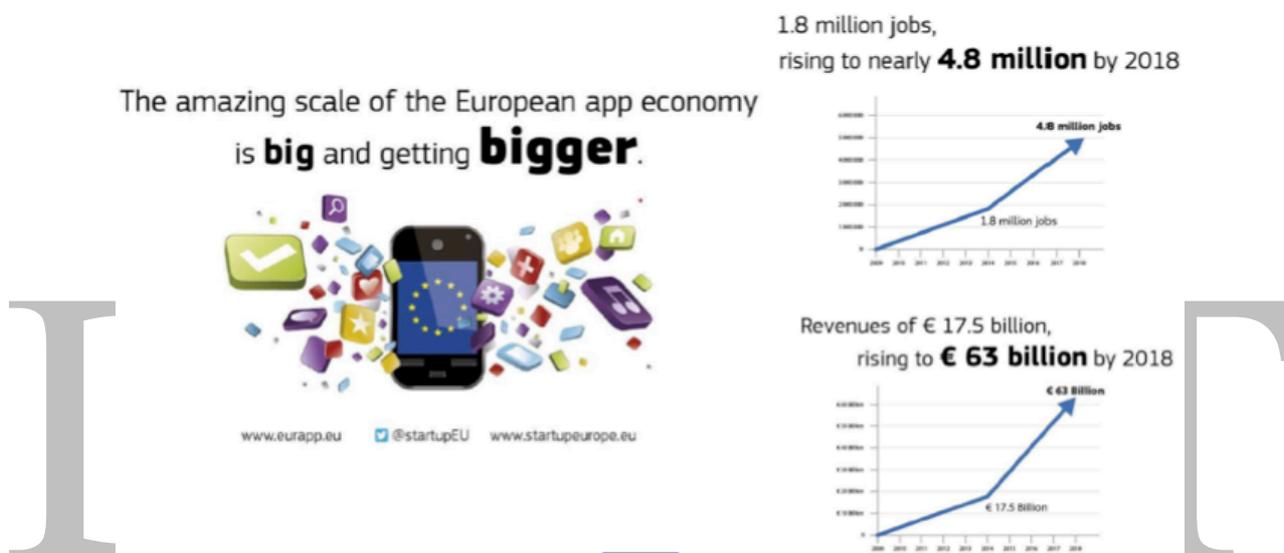
<sup>10</sup> [www.tazzari-zero.com](http://www.tazzari-zero.com)

<sup>11</sup> [www.alke.it](http://www.alke.it)

Mobility has had a radical change in the last decade, it is now provided through a wide community of suppliers including:

- Transport infrastructure providers;
- Transport infrastructure managers;
- Telecoms providers;
- Network equipment providers;
- Mobile data device manufacturers;
- Content suppliers;
- Vehicle manufacturers;
- Emerging technology providers.

In this broad community lies challenge and opportunity. An example is given by the app economy currently employing about 1.8 million people in Europe<sup>12</sup> (see Figure 1); a considerable portion of these new companies (most SMEs) address smart and integrated mobility.



**Figure 1:** Impact of the European app economy on Jobs. Most of these develop packages for smart and integrated forms of mobility proving that European suppliers and SMEs are quick to innovate to respond to market needs.

## 5. Example of innovation capabilities of SMEs in electro-mobility

The innovation capability of EU SMEs or more in general of the EU R&D environment in which the SMEs operates, is proven by the many examples of globally leading companies capable to provide price-performance state-of-the-art electronic drives and transmission systems globally. The innovation brought in the low voltage drives context by ZAPIGROUP, Gruppo SME and SEVCON is a quite representative case. Worthwhile noticing that Gruppo SME is also providing satellite based systems used in US and Australian autonomous tractors.

While there are several examples of SMEs commercialising slow speed vehicles across Europe, very few produce in Europe and export globally, one of these is the Italian Alkè whose strategy is based on diversification on all low volume niches, carefully avoiding the competition with large OEMs.

A further example of innovation capabilities crossing different sectors of electro-mobility is given by Solbian<sup>13</sup> providing smart photovoltaic globally to the boat industry as well as to the automotive OEMs.

<sup>12</sup> Source: Helen Kopman DG CONNECT Innovation 23° EBN Congress, 26 June 2014, Leida, Spain

Regarding the design and prototype of new forms of slow speed electric vehicles the majority of Chinese vehicles see their origin in Europe<sup>14</sup>.

The capability to innovate for the M1 world of European suppliers goes beyond the expectations. For instance amongst the suppliers of Tesla we can find:

- Bonetto group<sup>15</sup> providing the assembly line of the braking system developed together with Brembo (the same assembly line is developed as well for Daimler and Audi),
- Bonetto group providing the park lock,
- Smart pedal (undisclosed for confidential reasons),
- Actuators for smart seats (undisclosed for confidential reasons),
- Battery system control in the production line before its installation (undisclosed for confidential reasons).

Creativity, solid knowledge and speed allow European suppliers, including a strong presence of SMEs, to compete globally.

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<sup>13</sup> [www.solbian.eu](http://www.solbian.eu)

<sup>14</sup> <http://en.evcar.com/product.php>

<sup>15</sup> [www.bonettoautomazioni.com](http://www.bonettoautomazioni.com)

## 6. Asian large vertical supply chains versus EU collaborative R&D and manufacturing

European suppliers and manufacturers are also faced to the competition of Asian vehicles manufactured within state supported large vertical supply chains Europe cannot afford.

An example is the so called Kindom of Bikes established in Tianjin<sup>16</sup> where there are:

- 159 research institutes - 8 national laboratories
- 10 national engineering research centers
- 27 national and ministerial level technical test centers.

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 center
- Premium bike and parts manufacture base
- New material and new energy development
- Associate transportation vehicle and parts manufacture base

By 2012, the construction of 8 square kilometers area have been completed with investment of 200 billion Yuan (29.41 billion USD), generated tax revenue of 20 billion Yuan (2.94 billion USD), and provided 30,000 jobs.

By 2016, the plan is to complete 14 square kilometers development and construction. With investment of 500 billion Yuan (73.53 billion USD), generate tax revenue of 50 billion Yuan (7.35 billion USD), and provide 80,000 jobs.

The same approach has been more recently adopted for the development of Micro EVs focussing the effort in the Shandong region where more than 100 new companies "compete" amongst themselves under a "centralized" coordination whose major goal is the dominance of the global market.

Under this conditions Europe has little chance to be competitive. European industries need new instruments that could allow EU companies (SMEs and TIER1s) to emerge and lead the manufacturing of this new fast growing sector of electro mobility.

Rather than accept the competition based on Asian rules, Europe could explore new forms of collaborative R&D and manufacturing. In that direction further actions should be taken to facilitate:

- The generation of regional clusters with complementary SMEs and Tier1s
- The formation of superclusters amongst specialized regions motivated to generate a community (open platform) in which visions and knowledge are shared toward product developments personalised to the specific regional needs.

Specific funding mechanisms to support the collaboration amongst SMEs and large TIER1s are necessary to allow novel industrial aggregations that could address the fast growing sectors of three wheelers, low speed vehicles and Micro e-cars. In that direction worthwhile mentioning is InnovateUK (formerly the Technology Strategy Board) who has numerous funding mechanism supporting SMEs in collaboration with OEMs and TIER1s. A interesting case study is also the microEV platform under development within Torino e-district, a cluster of complementary companies of the conventional automotive environment, these starting from the commitment to produce locally are now exporting their solutions globally including Japan.

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<sup>16</sup> The Infrastructure and Environment to Develop and Manufacture EVs in China, **Tao WU**, Tianjin Polytechnic University. Update of the presentation delivered at the San Josè IDTECHEX first conference on land, sea, and air electro-mobility, December 2010 .

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## 7. Conclusions

The studies made in GO4SEM indicates that:

- Electro-mobility is not only large OEMs. The emerging sectors, not covered by the large OEMs, are currently larger than the conventional M1 world.
- SMEs and other large EU suppliers already have an important global role in the emerging sectors.
- It is important to strengthen the collaborations amongst SMEs, larger suppliers, and research institutes to better cover the new sectors.

The next step will be completing the study based on the WP2 output on global supply chains. The requirements identified in D2.1, D2.2 and D2.3 will be complemented identifying the European SMEs from D3.1 that could benefit the most from entering those global markets. A more detailed study will be then carried out interviewing cluster managers, analysing case of studies and considering the implications of requirements on specialization for production of different vehicle classes according to different markets.

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