

## MASTER UP: INNOVATIVE TECHNOLOGIES FOR RENEWABLE ENERGIES STORAGE

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### 1. MasterUp and the international scenario of academic spin-offs

MasterUp started as a spin-off born out of the aggregation of some members of the Chemistry Department and the Mathematics and Informatics Department of the University of Perugia experts in molecular dynamics simulations and computer science. MasterUp mission is the designing, producing and trading of products and services for technological innovation by means of the simulation and modeling of molecules and molecular processes. One of the main targets of MasterUp is, indeed, the use of results of molecular and computer research for technological innovation and industrial applications.<sup>1</sup>

During its life, MasterUp, founded as a Spin-off of the University of Perugia in 2004, became an Srl (Limited Liability Partnership, LLP) in 2012, becoming rapidly a little but dynamic Company pursuing business through innovative projects.

According to the 2015 classification of “*Venture Radar*” the most successful business pursued by US academic spin-offs are (see Tab.1):

**Tab.1**

Name	Industry	University	State
<i>NextPotential</i>	<i>Green Technologies</i>	<i>Arizona State University</i>	<i>USA</i>
<i>SioTeX</i>	<i>Green Technologies</i>	<i>Texas State University</i>	<i>USA</i>
<i>SmartUQ</i>	<i>Information Technologies</i>	<i>University of Wisconsin-Madison</i>	<i>USA</i>
<i>A-76 Tecnologies</i>	<i>Materials</i>	<i>Rice University</i>	<i>USA</i>
<i>Alkahest</i>	<i>Biotechnologies</i>	<i>Stanford University</i>	<i>USA</i>
<i>Emulate</i>	<i>Biotechnologies</i>	<i>Harvard University</i>	<i>USA</i>
<i>ExoVita Biosciences</i>	<i>Biotechnologies</i>	<i>University of New Mexico</i>	<i>USA</i>
<i>Synlogic</i>	<i>Biotechnologies</i>	<i>Boston University and MIT</i>	<i>USA</i>
<i>InvisionHeart</i>	<i>Medical Devices</i>	<i>Vanderbilt University</i>	<i>USA</i>
<i>Accion System</i>	<i>Electronics</i>	<i>MIT</i>	<i>USA</i>

Top Spin-offs of US Universities according to 2015 Venture Radar Classification<sup>2</sup>

<sup>1</sup> [www.master-up.it](http://www.master-up.it)

<sup>2</sup> [www.blog.ventureradar.com](http://www.blog.ventureradar.com)

For the corresponding European sectors of academic Start Ups, with Belgium, Denmark and Germany acting as leaders, see Tab.2.

**Tab.2**

Country	Total	% on Europe	Industrial Sector	Total	% on Total
<i>Belgium</i>	32	17%	<i>Pharma/Biotech</i>	52	28%
<i>Denmark</i>	11	6%	<i>Electronics</i>	47	25%
<i>Germany</i>	22	12%	<i>Software</i>	37	20%
<i>Italy</i>	9	5%	<i>Materials</i>	12	6%
<i>Netherlands</i>	31	17%	<i>Medical Devices</i>	8	4%
<i>Norway</i>	10	5%	<i>Energy Cleantech</i>	8	4%
<i>Spain</i>	11	6%	<i>Agriculture/Food</i>	5	3%
<i>Sweden</i>	48	26%	<i>Mechanics</i>	3	2%
<i>UK</i>	11	6%	<i>Others</i>	13	7%
<i>Total</i>	185	100%	<i>Total</i>	185	100%

*European Industrial Composition Spin-Offs according to Start-up Book Classification<sup>3</sup>*

## 2. The MasterUP ESODIS Project

The most innovative project MasterUP is pursuing is in the area of Environmental Technologies. This project called ESODIS is, indeed, the realization of a prototype of an industrial apparatus as an innovative solution to produce methane out of Carbon Dioxide and electricity generated from renewable energy sources.<sup>4,5</sup>

This production process leverages chemistry, engineering and computational simulation technologies and is led by Professor A. Laganà, CEO of MasterUP, and by Eng. A. Capriccioli, CTO and inventor of the “ESODIS” technology.

The method re-uses CO<sub>2</sub> (Carbon Dioxide), a byproduct of several industrial production processes like fuels combustion and natural processes like biomasses fermentation. For this purpose ESODIS exploits surplus low cost electrical energy to produce electrolytic hydrogen (H<sub>2</sub>), which then reacts with CO<sub>2</sub> (P. Sabatier Process<sup>6</sup>) to produce CH<sub>4</sub> (Methane).

<sup>3</sup> [www.startup-book.com](http://www.startup-book.com)

<sup>4</sup> *patent application 14/03/2016 Reattore di Metanazione n° 102016000026534*

<sup>5</sup> *patent application 18/01/2017 Elettrolizzatore per la produzione di H<sub>2</sub> n° 102017000004794*

<sup>6</sup> [www.wikipedia.org/wiki/Sabatier\\_reaction](http://www.wikipedia.org/wiki/Sabatier_reaction)

In this ESODIS is the natural evolution of the older “ProGeo Project”<sup>7</sup> with the addition of an accumulator making it act as a “Closed-loop” allowing the storage of CH<sub>4</sub> and its possible re-use for energy production “on demand”.

Further innovation design of the ESODIS methanator are the optimization of the reaction gas fluid dynamics by guaranteeing a constantly exothermic process and the maximization of the cost/performance ratio by adopting an innovative electrolyser.

My internship aims to improve the management model of the related industrial applications.

### 3. The Market perspectives of MasterUp

In order to properly manage the ESODIS project it is useful to understand, at the outset, the market structure and the industrial trends of Italy, to better manage the possible application of technology in the different economic sectors.

According to the “*Prometeia*” analysis, indeed, in 2017 there will be a strong growth of revenues for the Italian manufacturing industry (+1,6 % at constant prices) to stabilize at slower growth rates (average of annual +1,5 %) in the years 2018-2021 (see Fig.1). This slow down, is likely to be caused by the still strong uncertainty in international markets with a reinforcement of old and mature sectors.<sup>8</sup>

As a result, the Italian manufacturing industry seems to have reached a profitability similar to that of most of its European competitors. The same data suggests similarity in terms of capitalization, as well.

It is appropriate, therefore, for companies operating in the manufacturing sector to bear a high level of investments in the next years, by means of a strong capitalization aiming at making possible to upgrade the production apparatus, as suggested also in “Industria 4.0” with internationalization plans, allowing, at the same time, the entry of new potential investors.<sup>9</sup>

From the international point of view, the Italian export should grow with a rate of 2,4% in 2017 to stabilize on an average of 3% per year in the next period.

The Italian exporters will continue to benefit of a strong position in European production industries, especially in the fashion, metal and automotive industry, where Italy is the first producer together with France.

Moreover, the results reached by Italy in the growing of its contribution (in terms of added value) on the value of Output of the European leaders France and Germany are very

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<sup>7</sup> patent n° 2864524

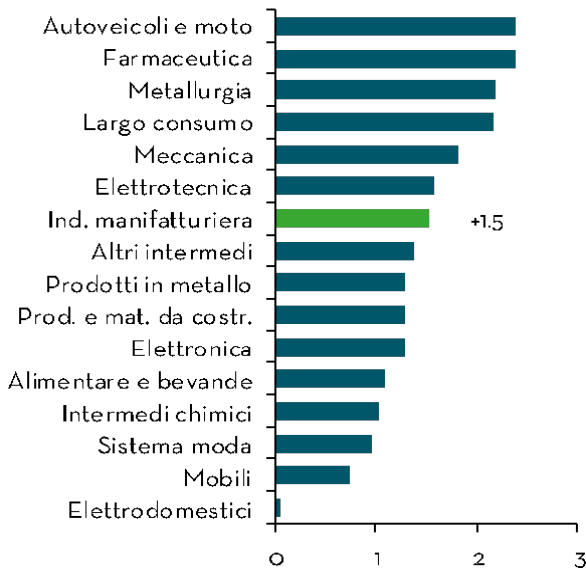
<sup>8</sup> [www.prometeia.it/media/comunicati-stampa/analisi-settori-industriali-maggio-2017](http://www.prometeia.it/media/comunicati-stampa/analisi-settori-industriali-maggio-2017)

<sup>9</sup> [www.economyup.it/blog/cos-e-l-industria-40-e-perche-e-importante-saperla-affrontare/](http://www.economyup.it/blog/cos-e-l-industria-40-e-perche-e-importante-saperla-affrontare/)

interesting.

Eventually, it is very important to pinpoint similar perspectives for the Italian Electronic Industry which will be able to benefit of the “Industria 4.0” Plan with new investments targeted to environmental problems and renewable energy.<sup>10</sup>

**Fig.1**



*Industrial Growth Rate in the 2017-2021 period (var. % of revenue at constant prices)*

For this purpose it is useful to create for MasterUP a business plan suited to attract either a Venture Capitalist or an Angel Investor capable to disclose new horizon and new development phases enabling it to exploit the new opportunities that the new industrial development could offer, especially to the above mentioned innovative technologies of ESODIS.

## 4. Work Plan

My internship work plan has been up to now articulated as follow:

- **First session** (19/09/2017): Introduction to MasterUP and internship paperwork
- **Second Session** (24/09/2017): Illustration of the projects and selection of the activities
- **Third Session** (2/10/2017): Reporting and Planning MasterUP activities

According to the above reported analysis it is now essential to establish appropriate medium and long term objectives for the company by means of a properly tailored Business Plan.

Key to this industrial-economic analysis is a thorough examination of industrial sectors for which the demand of innovative machinery could be satisfied by the “ESODIS” apparatus.

<sup>10</sup>[www.prometeia.it/media/comunicati-stampa/analisi-settori-industriali-maggio-2017](http://www.prometeia.it/media/comunicati-stampa/analisi-settori-industriali-maggio-2017)

In this regard, the input from professional business-focused advisors possessing a specific Economic and Business background will results to be essential for a correct strategy planning.

The target market to be addressed by MasterUP should be predominantly a Business to Business (B2B) one that needs a correct planning for the proper exploitation of the patents.

Finally, with regard to the need for an adequate financial support it is vital to find private or institutional investors, and/or apply to an appropriate “HORIZON 2020” program call.<sup>11</sup>

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<sup>11</sup> [www.ec.europa.eu/programmes/horizon2020/](http://www.ec.europa.eu/programmes/horizon2020/)