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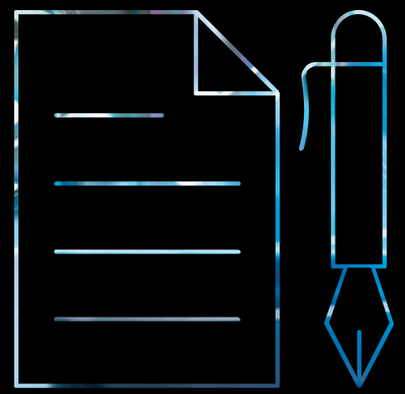

EDITORIAL

SPECIAL THEME - HIGH VALUE ADDED, RESILIENT AND SUSTAINABLE INDUSTRY

Let's Transform the Industry!

It is widely acknowledged that industry, namely the manufacturing industry, is crucial to Europe, as it provides direct and indirect employment to tens of millions of people, while generating, in general, high added value in produced goods, obtaining a large share of investment in research, development and innovation, and originating more than 80% of EU exports[1] .
Since 2000, Europe has experienced a significant de-industrialisation, leading to the reduction of the manufacturing industry's contribution to European GDP - from 18.5% in 2000 to 15% in 2012, as well as the loss of 3.8 million jobs between 2008 and 2012 in this sector[2].
However, in recent years, there has been a reversal of the decline in the EU manufacturing industry, with significant growth rates in terms of the industry's share of total added value (up 6% since 2009); employment (more than 1.5 million new net jobs since 2013) and labour productivity (growth of 2.7% per year on average since 2009)[2] (these statistics refer to the end of 2017).
It is vital to maintain the recovery of the manufacturing industry in Europe. The April 2018 report by the Independent High Level Group on Industrial Technologies, "*Re - Finding Industry Defining Innovation*", clearly states that the European economy will lose competitiveness and will not generate new jobs without a solid and modern industrial base, supported by new knowledge and technologies, and the creation of start-ups and new SMEs,

according to a new approach to public innovation policy. In this sense, the European economy ought to be mission-oriented (public policies must be established around missions that fully embrace the key enabling technologies, or KETs) and cover the entire value creation chain, from fundamental research to applied research, leading to product development and business creation.

The aforementioned report also highlights the need for Europe to pursue technological leadership in industry, mainly due to its net positive impact on the labour market. In this context, the same report states that European industry faces several challenges.

The first challenge relates to the speed of dissemination of already developed and emerging technologies, either seeking to increase the number of new companies entering the market and helping them grow, or contributing to increase productivity in established companies that face obstacles in the implementation of new technologies.

The second challenge is the result of increased global competitiveness, with the EU expected to promote the competitive development of strategic value chains, which are expected to generate most future jobs in manufacturing.

The third challenge is a consequence of the current global race for talent, because of the structural change in the labour market and the nature of labour (largely due to the ongoing digital transformation). This forces the EU to invest heavily in top-level education and skills acquisition among the European workforce, in order to increase employability and competitiveness[3].

In order to address the challenges mentioned above, both the EU and its Member Countries have been defining new public policies, focusing on the promotion of reindustrialisation. As an example of public policies at EU level, it is important to mention that the European Union Framework Program for Research and Innovation 2021 - 2027 (Horizon Europe) prioritises Industry, namely through its Pillar II, "Global Challenges and European Industrial Competitiveness", with a dedicated cluster (Digital, Industry and Space) and three other quite relevant clusters (Climate, Energy and Mobility; Food, Bio-economy, Natural Resources; Agriculture and Environment).

In Portugal, the questions associated with the manufacturing industry take on greater importance than in the rest of the EU, given the profound de-industrialisation experienced in the country as globalisation progressed, and the fact that the country is less prepared to carry out a recovery. This is a result of insufficient qualification of human resources, low added value of the majority of its production and scarce investment made (particularly in the field of research and innovation), all of them negatively affecting the value of productivity.

Therefore, it is crucial to restore the country's level of industrialisation to values similar to, at least, the average of the EU countries, investing in a high added value, resilient and sustainable industry, in line with public policies that have been developed by the EU.

Portugal has been adopting public policies focusing on the transformation of our industrial fabric, towards the targets mentioned previously, such as the following: Portugal 2030 Strategy; Recovery and Resilience Plan; Economic and Social Stabilization Program; Industry 4.0 Initiative; National Strategy for the Digitization of the Economy; Action Plan for Portugal Digital Transition.

Since its establishment, INESC TEC perceives the manufacturing industry as one of the main areas of research, development and innovation activities, carrying out hundreds of R&D and technological transfer projects, the vast majority with key national and international partners, either institutional or corporate. Several of these projects resulted in important contributions to the pursuit of public policies aimed at the industry's progress. This issue of Science & Society Magazine presents a set of articles dedicated to INESC TEC's expertise in this field, in order to demonstrate how it can contribute to the implementation of public policies already defined, or to the design of new ones.

The first is an opinion article stating that the connection between public policies and business strategies in the fields of Research, Innovation and Training will take on a critical importance for the Portuguese and European industry,

which today faces new and disruptive challenges.
The pressing need for Portuguese industry to evolve in the value chain is addressed in an article about the development and industrialisation of products in high added value industries. The article stresses the importance of companies mastering the development of new and innovative products, giving as an example the recognised progress of the Portuguese mould industry.
The following three articles address fundamental concepts associated with the theme of this magazine: a company's Maturity (within the scope of its Digital Transformation); Circular Economy; Servitization.
The first addresses the maturity assessment by a company; that is, knowing and understanding its starting point, in the different dimensions of the organisation: resources, processes, systems and technologies, organisation and strategy, culture and people, products and services. The second article presents the concept of circular economy, the basic principles and implications for manufacturing systems and research, advocating its adoption as a new paradigm. The third article presents servitization as a group of services and products, allowing a manufacturing company to differentiate its offer, reinforcing the relationship with the customers, and creating new sources of revenue, more stable and resistant to economic cycles.
The ensuing five articles present a set of technologies that are worth getting to know, particularly by those owning industrial companies, seeking to keep track of the authentic revolution underway. The first article characterises collaborative robotics, depicted as the key technology to enable the harmonious interaction between humans and machines - considered one of the pillars of Industry 4.0. It is followed by an approach to improve the quality of decision-making, resorting to data analysis and machine learning in the development of more appropriate analytical models. Another article deals with immersive technologies that help people improve their ability to act in industrial environments, in a more effective way and with less cognitive overload, thus foreseeing the emergence of augmented humans, integrating themselves in industrial systems, smarter and more autonomous. Another article characterises and exemplifies the IoT (Internet of Things) platforms, considering the development of solutions around smart manufacturing, predictive maintenance and optimisation of manufacturing systems, among others. This set of articles ends with the reasoning behind the need to develop smart manufacturing systems and, consequently, the evolution until the Intelligent Enterprise, i.e., companies that apply advanced technologies and better practices in agile and integrated business processes, becoming more resilient, profitable and sustainable.
The continuous qualification of human resources is a key prerequisite for implementing and monitoring the deep transformation experienced by industrial companies. The article on the Learning Factory presents the programmes and infrastructures that INESC TEC provides, which allow experiencing and learning in an almost real environment – truly, the principle that facilitates understanding and action in the context of the factories of the future.
Finally, the magazine presents a brief "history" of the evolution of the industry in Portugal, highlighting the main difficulties that led to some setback, in relation to the main partners in Portugal, also ending with a message of hope regarding future developments.
In addition to the relevant contribution in the past, well exemplified above, INESC TEC – through the quality of resources, the vast experience in the sector, the results already achieved and the focus on social responsibility - remains very committed to reinforcing its role in the country. This will be possible through an increasingly more active participation in the ongoing transformation of our industry, either influencing new public policies that support and accelerate this transformation, or contributing to their adoption in the field.

[1] MANUFUTURE Vision 2030, http://www.manufuture.org/strategic-research-agenda/vision-2030/

[2] Report *"Re – Finding Industry Defining Innovation" of the Independent High Level Group on Industrial Technologies*, https://op.europa.eu/pt/publication-detail/-/publication/28e1c485-476a-11e8-be1d-01aa75ed71a1

[3] World Manufacturing Forum 2019 Report – Skills for the Future of Manufacturing, https://worldmanufacturing.org/report/report-2019/

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