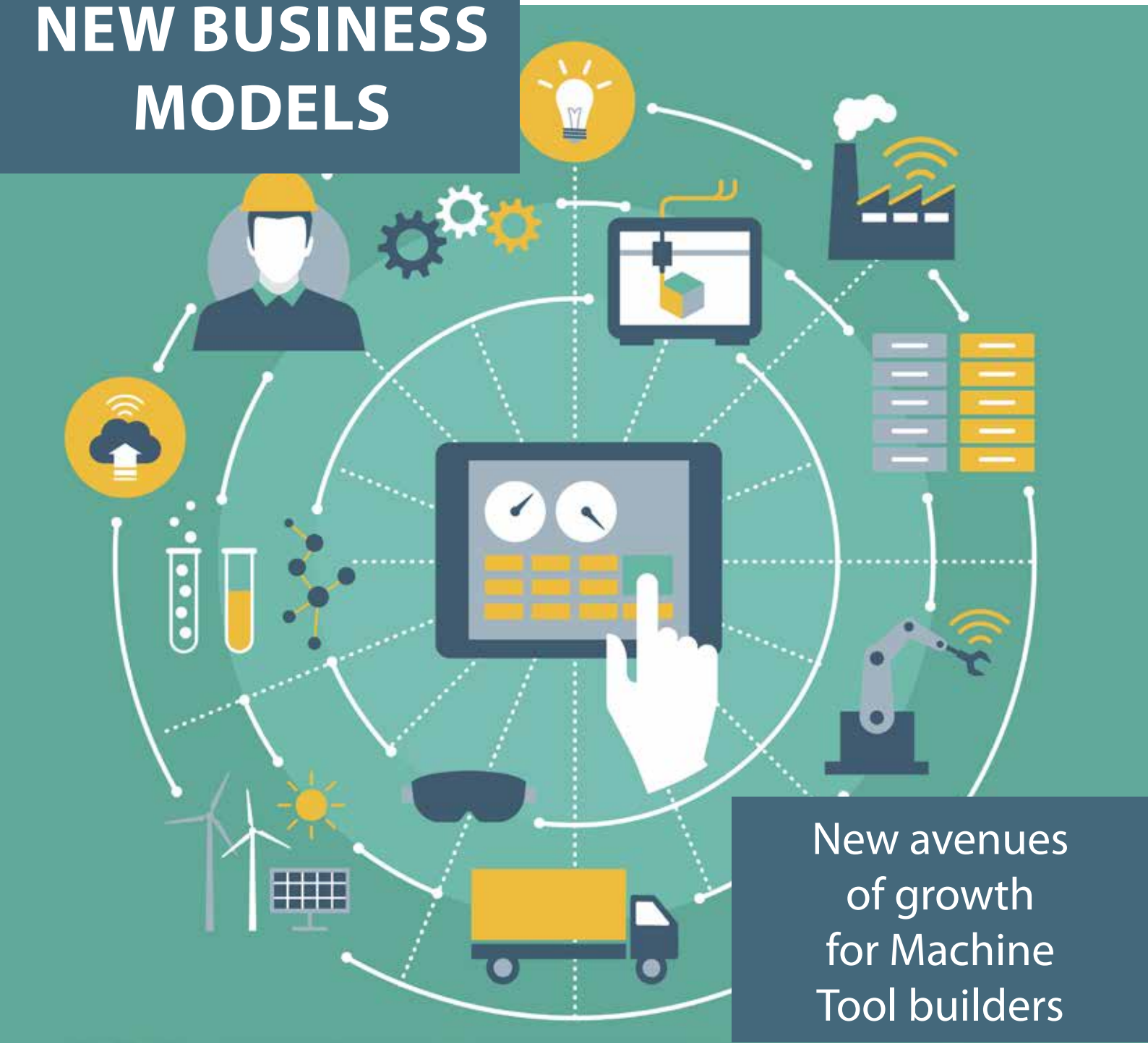
Spring 2017
Issue #11

cecimo magazine

Where manufacturing begins

NEW BUSINESS MODELS



New avenues of growth for Machine Tool builders

Digitisation

Data-driven Business Models are on the rise

Industrial Policy

CECIMO participates in the first EU Industry Day

Skills and Education

METALS: European skills panorama on additive manufacturing

EMO Hannover

18-23·9·2017

The world of metalworking

Connecting systems for intelligent production!

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VDW – Generalkommissariat EMO Hannover 2017
Verein Deutscher Werkzeugmaschinenfabriken e.V. · Corneliusstraße 4 · 60325 Frankfurt am Main · GERMANY
Tel. +49 69 756081-0 · Fax +49 69 756081-74 · emo@vdw.de · www.emo-hannover.de

Director General's Foreword

Dear readers,

The machine tool industry is going through a rapid transformation. The machines that our companies produce are getting increasingly connected across borders. More and more European machine tool builders invest in data-driven business models, generate connected systems and boost intelligent production. Data-driven business models indeed provide tremendous avenues of growth for our companies. Nevertheless, at this early phase, tapping into industrial data is a new topic for many manufacturers and entails challenges too.

The rapid transformation that is happening within the factories of machine tool builders and user industries has a strong policy aspect. Governments at national and European levels are working on implementing policies underpinning the growth of our industry in the digital age. For instance, industrial data is now under the spotlight of policy-makers. This year, the European Commission has adopted the communication on "Building a European data economy" as part of the Digital Single Market Strategy. The communication looks at the rules and regulations impeding the free flow of data and outlines legal issues on access to and transfer of data, data portability and liability of non-personal and machine-generated digital data.

Considering such developments, we have dedicated this edition of our magazine to new business models in the machine tool industry. We have brought together various researchers and industry experts, and developed a rich content on emerging business models in our sector. In addition to business practices, we have shed light on surrounding issues that are crucial for our companies, like public policies, standards, research and education.

This edition of our magazine covers other key developments in the European machine tool industry as well. The Commission organized the First European Industry Day and saw the participation of CECIMO. As for education and training, we have built a European skills panorama on additive manufacturing technologies, together with our partners from the METALS initiative. On trade, Mexico gets the attention of machine tool builders. Concerning energy-efficiency, the industry is now building its way forward on the eco-design dossier. Looking at exhibitions, 2017 is an EMO year and you will have a good overview of the EMO Hannover 2017 in our magazine.

Many exciting opportunities as well as new challenges face the European machine tool industry and it is important for the actors of our sector to remain ahead of the issues affecting their business. We believe CECIMO magazine is an excellent tool to raise awareness on key issues for our companies and disseminate our priorities at the European and national levels. Enjoy your reading!

Filip Geerts
Director General

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Ensuring technology access for European machine tool SMEs

by Luigi Galdabini, President of CECIMO & Managing Director of Galdabini SPA

During the first European Industry Day, that took place on 28 February 2017, 400 participants, key industrial players, global trend shapers and high-level policy makers inspired a debate on the future of European industry. CECIMO, represented by President Luigi Galdabini, has been the key sectorial representative, highlighting the technology needs of European machine tool SMEs.

What was said:

"If Europe wants to remain the global center of manufacturing excellence, we should strengthen the ties between machine tool SMEs and technology centers at cross-border level."

Luigi GALDABINI
CECIMO President and Managing Director Cesare Galdabini S.p.A

The European machine tool industry provides end-users from strategic sectors ranging from aerospace to energy with highly-customized, sophisticated and key-enabling production equipment and services. The industry, represented by CECIMO at the EU level, accounts for 40 percent of the global machine tool production. Internationalization, continuous innovation, as well as a highly skilled workforce are the key competitiveness factors of European machine tool builders. The European machine tool sector, of which 80 percent are SMEs, is an export champion as well. Every second machine tool exported in the world originates from Europe. Moreover, intra-European trade is becoming important more than ever for European machine tool builders' growth. Machine tool export between European countries has increased by 17 percent in the last 4 years. Nevertheless, the industry faces new challenges, threatening its innovative and international character. Europe's machine tool SMEs need to increase their awareness on emerging business models in the advanced manufacturing sector, and develop the technical capabilities needed at the age of digitisation and globalization. In this picture, Europe's technology centres and innovation hubs can play a pivotal role for the competitiveness of European machine tool SMEs.

As cost pressure is increasing and manufacturing technologies are going through a deep transformation, keeping up with international trends and remaining agile are indeed crucial for European machine tool builders. Machine tool SMEs, often family-owned, tend to face challenges of low capitalization to support continuous innovation and new market penetration. Moreover, shrinking government budgets in Europe and reduced corporate profitability put strains on R&D activities. Public authorities have little interest in funding incremental innovation, which is, on the contrary, crucial for the competitiveness of European machine tool builders.

Europe's technology centers, as well as emerging innovation hubs, can help ease the access of SMEs to state-of the art facilities and equipment, consultancy and training aligned with the needs of foreign markets. The acquisition of sophisticated services and infrastructure would provide machine tool SMEs with important innovative solutions, productivity and efficiency gains. This is also an important step to repair the broken links in the European innovation eco-systems, caused by the departure of large customers to Asia. In parallel, cross-border partnership between European machine tool builders and technology centers would generate a better understanding of market needs and products meeting local demands.

Technology partnership at cross-border level, however, is not an easy task. It requires mutual understanding, trust and long-term partnership. For a successful collaboration between machine tool SMEs and technology centers, innovative business models and demand-driven solutions closer to market, which end-users are ready to pay for, should be put under the spotlight.

In short, Europe hosts world-class machine tool builders, and technology centers play a fundamental role in delivering innovative results. Nevertheless, the advanced manufacturing industry is becoming increasingly competitive and global. To remain in the driver's seat and keep its leadership in production technologies, Europe needs to tighten the link between its SMEs and technology centers and develop smart partnerships at cross-border level. ■

Joint Declaration for an ambitious EU industrial strategy

CECIMO and other 124 Association representing the manufacturing industry signed the following Joint Declaration for an ambitious EU industrial strategy, calling on the EU to safeguard the world leadership of European manufacturers:

"Europe is the cradle of the manufacturing industry and has been at the forefront of industrial revolutions and technological innovations. The industry directly employs over 34 million people across all Member States, in supply chains comprising hundreds of thousands of SMEs and larger suppliers. It also indirectly accounts for millions of additional jobs in related sectors.

The European manufacturing industry has tremendous capacity for research and innovation, boasts a skilled workforce and has earned a global reputation for quality and sustainability. What it now needs is the swift and determined support of the European institutions and the Member States to create more jobs and growth in Europe.

The time has come to raise the alarm about the considerable challenges that we are all facing. Between 2000 and 2014, the share of manufacturing in total EU output fell from 18.8% to 15.3%, while 3.5 million manufacturing jobs were lost between 2008 and 2014. Meanwhile, countries around the world are putting industry at the very top of their political agendas. The "Make in India" strategy aims to ensure India is "the next manufacturing destination" and "Made in China 2025" seeks to turn China into the "leading manufacturing power". The recent US shift towards "America First" will inevitably have a strong impact on their industrial policy.

At the beginning of his mandate, European Commission President Jean-Claude Juncker identified the reindustrialisation of Europe as one of his top priorities and confirmed the objective of increasing the share of industry in the European GDP to 20% by 2020. As we approach the preparation of the next Multiannual Financial Framework, it is vital for the European Commission to act and help the EU remain a competitive global industrial power playing in a fairer world market.

Therefore we, the European manufacturing industry, representing a diverse range of sectors, call on the European Commission to:

- **reaffirm its commitment to reaching the target of 20% of GDP from industry, with an ambitious and realistic timeline;**
- **adopt an Action Plan to tackle the challenges that the industrial sectors are facing, in the framework of a Communication that would include concrete steps and milestones; and**
- **commit to implement this Action Plan in a timely manner and regularly report on progress.**

Member States and the European Parliament clearly stated their full support for a strong European industrial strategy via the European Council Conclusions calling to strengthen and modernise the EU's industrial base (15 December 2016) and the Parliament Resolution on the need for a European reindustrialisation policy (5 October 2016).

We, the Signatories of this Joint Declaration, are ready to step up our cooperation with the European Commission, the European Parliament and the Competitiveness Council to define and implement this ambitious and coordinated European industrial strategy that will help safeguard the world leadership of European manufacturers and jobs in Europe." ■

"There has been no better time to reaffirm Europe's commitment to manufacturing, innovation and jobs. European associations representing 125 manufacturing sectors are ready to offer their cooperation to the European Institutions"

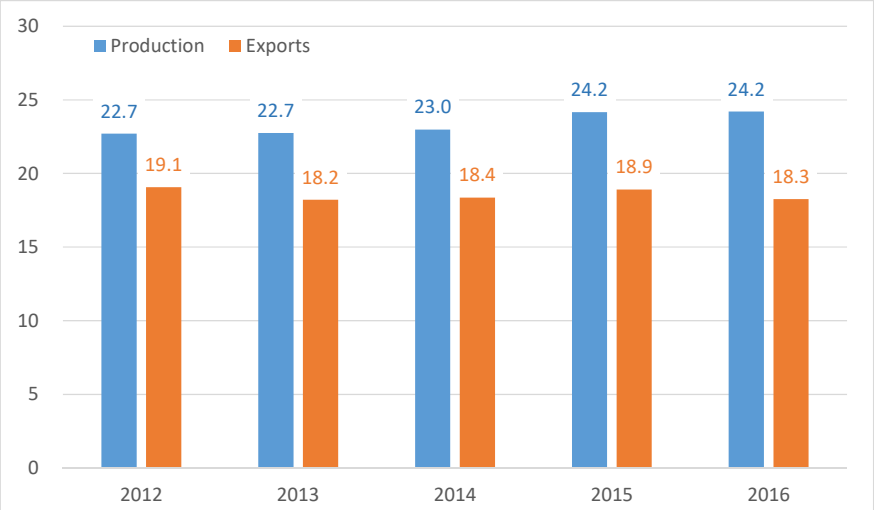
Filip GEERTS
CECIMO Director General

The European Machine Tool industry in 2016: figures and outlook

by Manuel Escamilla, EU Public Affairs Economist

The European machine tool industry is coping well with the difficult global environment, marked by higher levels of political uncertainty, stagnant global trade, subdued investment and increasing protectionist policies.

Machine tool production and exports of CECIMO countries, billion euro

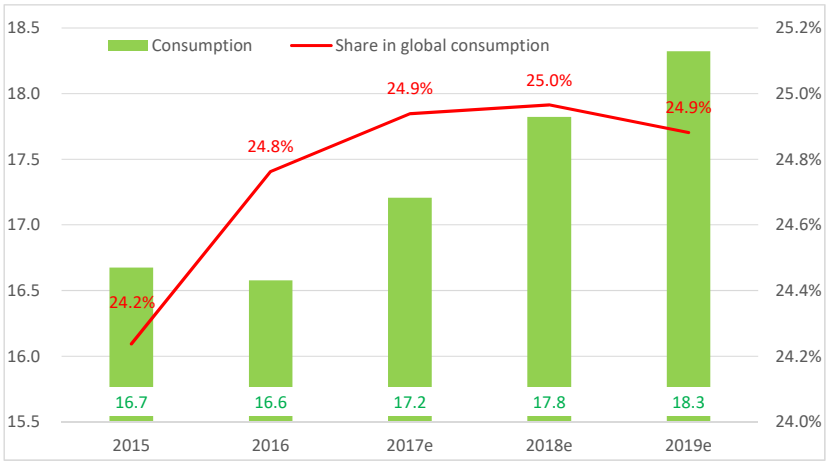


European countries' exported machine tools were worth nearly 19 billion euro in 2016, the vast majority of it (96%) coming from CECIMO countries. Total machine tool exports, originated in CECIMO countries, accounted for almost half of MT world exports in 2016. Even a little below projections, this value is significantly better than the global trend: international trade in this sector diminished by around 8% in 2016. Reflecting a less intense annual reduction of imports (-2.5%), the CECIMO trade balance slightly went down from 8.9 in 2015 to 8.5 billion euro in 2016. The high level of globalization, the strong openness to trade ratio (123% in 2016) and the fact that CECIMO exports about 36% of its production outside the EU make the sector prone to the feebleness of the international landscape. Intra-European trade clearly remains the most important for CECIMO members. More than 4 out of 10 machine tools foreign sales by CECIMO countries in 2016 had that area as destination, and it is the only region of the world with which CECIMO trade flows incremented with respect to 2015 (+0.3%). The other major market destinations for the CECIMO offering experienced some annual contraction, notably in Asia: CECIMO companies exported machines to Asia in value of 4.3 billion euro in 2016 (-6.8%). That value was led by the 10.5% annual drop of exports to China, which represents the 65% of the total Asian market for CECIMO. For the near future, some in-home surveys revealed the solid momentum for machine tool exports in CECIMO.

Production data also confirmed the good performance of the sector in the global context: production of machine tools in CECIMO-based companies reached 24,2 billion euro, while European businesses exported machine tools for some 18.25 billion euro in 2016. Again, this trend overpaced the international one, as, based on provisional data, global production fell 2.7%, from 68.7 billion euro in 2015 to 66.8 billion in 2016. Comparing the global production to the CECIMO one in 2016, CECIMO market share of production has increased beyond 36%. The spending of companies in equipment and machinery has been recently gaining strength and orders intake gathers pace in interannual terms, hitting an increase of over 4% late 2016. Consumption of machine tools ended up 2016 at 16.6 billion euro and it is likely to gain momentum in the coming years at an expected growth rate of 3.5 - 4% per year.

The European machine tool industry has been able to keep its competitive position. It is embracing new technologies such as additive manufacturing (e.g. Powder Bed Fusion), enabling the boost of innovation and competitiveness. Digitisation improvements in the European manufacturing sector are making machine tools

European machine tool consumption, billion euro



exported by CECIMO countries more attractive. In addition, some previously postponed investments are positively influencing local machine tool sales. On a region-by-region analysis, it is worth to mention that CECIMO strengthened its position in Asia, with a market share above 33%, two percentage points higher than in 2015. Furthermore, CECIMO-based companies in the Americas experimented a similar but less accentuated trend. Exports from CECIMO countries to Americas decreased 3% in 2016, but its market share outpaced 36%.

Despite important uncertainties, the business climate is favourable and the prospects for the near future reveal optimism. According to the latest economic data, forecasts and surveys to enterprises, global economic growth is picking up but the recovery is still not robust. World gross domestic product is projected to accelerate and achieve real growth somewhere between 1.2 and 1.6% in 2017. This relatively positive outlook and expansion of the activity, which would also be the case for 2018 (1 - 1.4%), will affect the demand of machine tools too. The global MT-weighted output is expected to rise 2.5-3% both this year and the next one. ■

What was said:

"In spite of the still weak global context and growing uncertainties, the European machine tools builders are showing strength. Digitisation and high quality standards increase the attractiveness of the European MT portfolio in foreign markets."

Dr Frank Brinken
Chairman of CECIMO Economic Committee and Vice-Chairman Starrag Holding AG

Under the spotlight: Brexit unfolds

Following the referendum on 23 June 2016 and the vote of the UK Parliament allowing the government to begin Brexit talks, on 29 March 2017 the United Kingdom officially informed the European Council of its intention to leave the EU. The withdrawal process of the UK from the EU under Article 50 of the Treaty on the European Union formally started, and the UK will become a third country on 29 March 2019. Until this date, the EU treaties will apply to the UK as before. In case the withdrawal agreement is not concluded (EU's side: consent of the Parliament + qualified majority in the Council) by the end of this 2-years period, the EU Treaties shall cease to apply to the UK, unless the UK and the Council by unanimity decides to extend that period.

CECIMO, while keeping committed to open and fair trade, encourages both the EU and the UK to ensure as much certainty as possible to businesses and workers, and to achieve in a timely manner an ambitious and comprehensive trade agreement, which could require the ratification of all Member States' national parliaments. This deal would mitigate the damaging consequences on both sides.

The European machine tool industry above all aims at minimising any negative impact on trade, free movement of workers and convergence of regulatory environment. We fully believe that cooperation and a special friendship is the way ahead for this long-standing and close partnership.

Mexico: an attractive market for Machine Tool builders

by Manuel Escamilla, EU Public Affairs Economist

Mexico is a key market for the machine tool sector, and it is on the rise. Data speaks for itself: the country of Mexico is the seventh largest MT consumer in the world, just behind China, USA, Germany, Japan, Sourth Korea and Italy. Its consumption of MT represents 0.22% of its gross domestic product, which is the world's fifth greatest value. Most of the 2,350 millions of U.S. dollars MT consumption comes from abroad. Less than 5% of these MT are produced within the country (a mere 110 million euro), so Mexico broadly relies on imports, which almost doubled over the past four years. Between one fourth and one third of its total import of machine tool are sold by CECIMO countries, and, according to official Mexican statistics, three out of every five machine tools imported into Mexico originate from United States, Japan or Germany: 520, 440 and 345 billion euro respectively in 2016. South Korea, China, Italy and Spain are other main MT suppliers of Mexico. Regarding exports, the Mexican foreign trade on this sector is highly concentrated.

The Mexican export-driven economy is the second largest one in Latin America, its GDP per capita increased 20% over the last 15 years and its Foreign Direct Investment is at healthy levels (26.7 billion USD in 2016). It is home of plenty of the best clients for machine tool builders, namely the automotive (including car parts), aerospace, electronic and household appliances sectors. For instance, practically all major European, Japanese and American automakers are present in the country: Mexico is the eighth global major producer of vehicles and the fifth one with regard to auto parts output. Foreign direct investments continue to flow into the sector: more than 11.4 billion USD between 2011 and 2015. It is worth to note the vital importance not only of the investment in absolute values but also of its multiplier effect (e.g. vehicles part production increase). Across all sectors, the EU is the second biggest investor is the country, with around 50 billion USD of accumulated investment, which is more than 10% of the total and it is only surpassed by the US.

Mexico needs machine tools to its continued industrialization, essential to feed their industries and keep suppling its clients with products and services. At present, one out of three machine tool imported into Mexico comes from one of the countries represented by CECIMO. Apart from short-term trends, the significant presence of MT consuming sectors in Mexico, together with cost and logistic advantages, has been attracting machine tool builders to internationalize their businesses, and makes Mexico a very attractive market. Mexico will surely top the rankings of MT buyers. The domestic demand for MT is projected to grow at an annual rate of 1% in 2017 and at 2-3% during the following years.

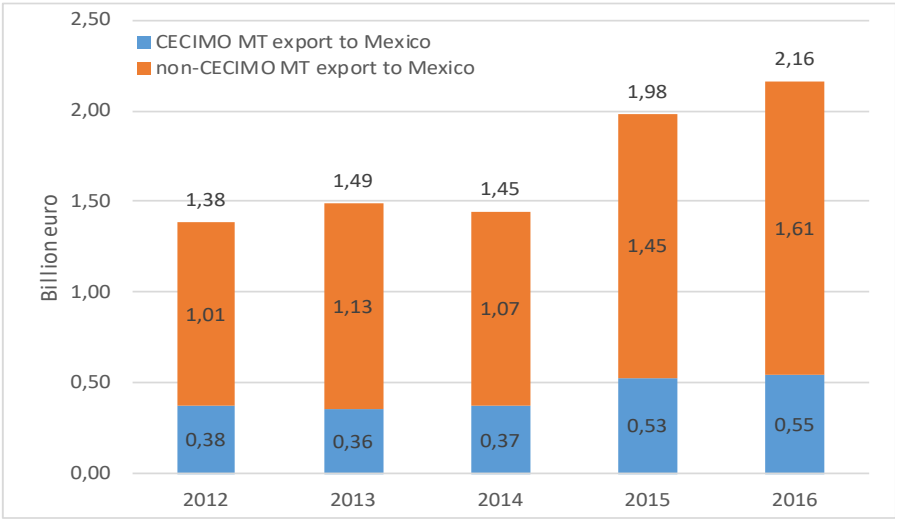
This country benefits from its strategically location in North America with more than 3,000 km of border with the United States. It is certainly not by chance that it is the third most important client for the United States, preceded by China and Canada. NAFTAs also play a crucial role by enabling Mexico

better access to the North American markets. However, it is precisely the risk of major tariffs on exports to the US that is negatively affecting the current economic prospects: Mexico is very exposed to this risk, as around 80% of its exports and almost half of its imports are made with the US.

One of the sectors which shows greatest dynamism is precisely the machine tool industry. Mexico is the largest consumer machine tool market for the US: it accounted for 30% of total export of machine tool from its northern neighbour. The European Union is also a long-standing partner and enjoy a flourishing relationship with Mexico, as its third-largest trading partner, just behind the US and China. Imports of MT from Mexico are really scarce. The current regulation framework is the EU-Mexico Global Agreement signed in 2010, whose review has been formally negotiating since last May. CECIMO, a strong supporter of free and fair trade, encourages the European institutions to amend the provisions within this deal to, at least, catch up with existing content included in the recently FTAs signed by both sides. With customs duties already at 0%, for our sector the priority is the lift of technical barriers to trade, the cut of red tape (an online platform is being developed), the protection of IP rights, the improvement of access to government procurement and the investment regulation to avoid inconsistencies in the treatment of EU investors in Mexico. Moreover, expanding the services agenda could benefit the digitisation of our sector. ■

Sources: Mexican Secretariat for Economy, Eurostat, UN, CECIMO.

Machine tool imports of Mexico



Mexico – some key macro indicators

	2014	2015	2016
Population, thousands	125,587	127,220	128,830
Average exchange rate – Peso per Euro	17.7	17.6	20.7
Current account balance, share of GDP	-2.0%	-2.9%	-2.7%
Foreign direct investment, millions of USD	20,281.7	22,126.6	23,682.4
Nominal GDP, millions of USD	1,296,450	1,150,723	1,044,694
GDP deflactor, Index 2008=100	125.2	128.9	135.2
Unemployment rate, %	4.8	4.3	3.9

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The world of metalworking

The broadest marketing tool

An interview with Carl Martin Welcker, EMO's General Commissioner

Why is an exhibition still important for machine tool builders compared to other marketing instruments?

Trade fairs have by far the broadest spectrum of functions compared to all other marketing tools. At a fair, exhibitors want to pave the way for deals and upgrade their corporate image. They are looking for partners, and are keen to progress their market research. Similar considerations apply for the visitors: trade fairs offer them optimal preconditions for obtaining an overview of the market, comparing prices and conditions, testing products, discussing possible applications, and not least signing contracts. So even in the online era, trade fairs have lost none of their importance. After all, digital information communicates only an abstract idea of the products on offer. At a trade fair, by contrast the products concerned can be experienced hands-on. Machines and systems, for example, are demonstrated in action. This is complemented by personal conversations, providing responsively individualised information. Increasingly, too, many products and services need to be explained in great detail; different application options render a purchasing decision more difficult. Here, the personal impression of a vendor's credibility and competence is still crucial.

How does the EMO differ from the other machine tool exhibitions?

The EMO Hannover is the world's premier trade fair for the metalworking sector. It scores very highly in terms of size and internationality among exhibitors and visitors alike. No other metalworking fair on the planet comes close to EMO Hannover in this regard. In addition, EMO Hannover is the most important international platform for showcasing innovations. Therefore machine tool producers are keen to present something new at the show. In fact, many epoch-making technical innovations were presented at the EMO Hannover for the first time and have begun their triumphal progress there. Flexible manufacturing concepts, high-speed machining, or the use of linear drives are only some of the keywords in this context. The EMO Hannover – as is only meet and fitting for one of the world's premier trade fairs - provides a comprehensive overview of new products. After all, production experts from all over the world will be meeting up here for establishing and broadening their networks, and exchanging all the very latest information from the sector and on the technology now available.

What will be the main highlight of the 2017 show?

Digitisation and networking play central role in any discussion about modern-day industrial production operations. The EMO Hannover will for the first time be showcasing comprehensive solutions and practical examples, since it's here that in future the greatest synergetic effects will be achieved. This is also reflected in the event's motto: "Connecting systems for intelligent production". Different supporting events demonstrate the progress in this field, e.g. the special show on Industry 4.0 and the symposium "Production for tomorrow" of the German Academic Society for Production Engineering (WGP).

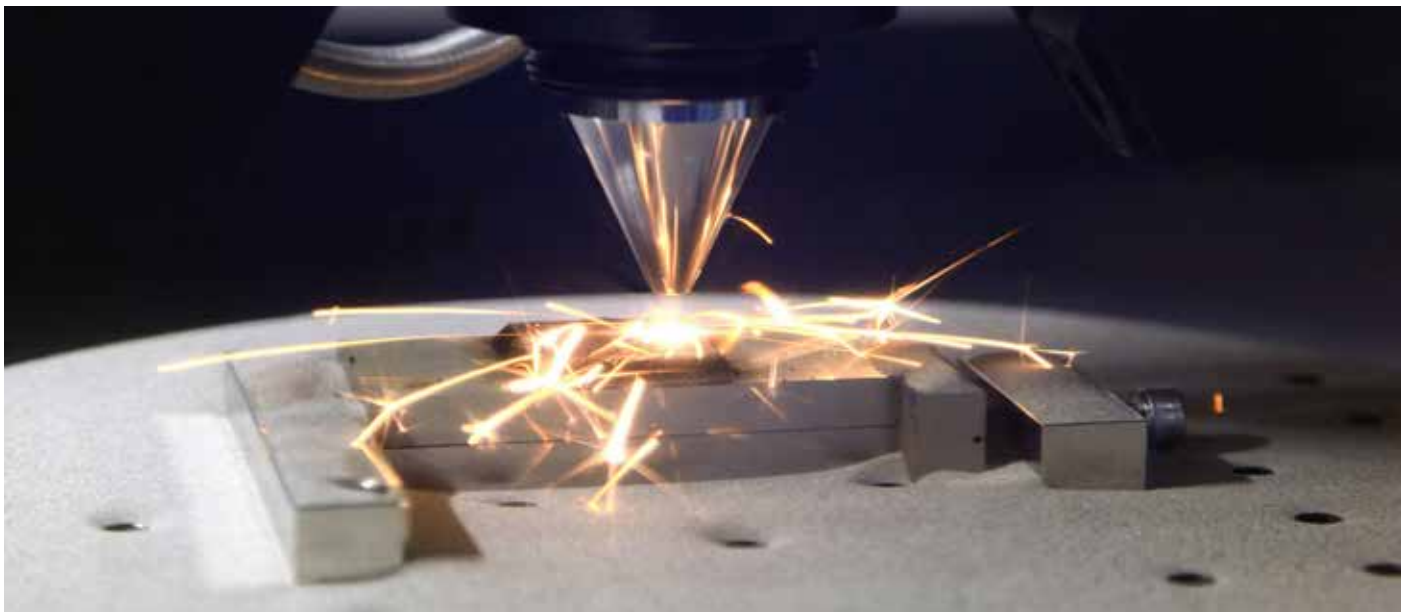
Does the EMO Hannover include a supporting programme? Can you give us some more details on it? Will you be focusing on a particular country?

The EMO Hannover is positioned as the world's premier trade fair in metalworking. It thus lays claim not only to showcasing the ongoing trends and innovations in the field of production technology, but also to mapping out future developments. The supporting programme for this year's event promises lot of excitement once again. Two keynote themes, Industry 4.0 and production operations for tomorrow, I mentioned already. There are others, e.g. the process chain in metal-cutting for the aerospace industry, additive processes, machine safety and youth recruitment. In addition, there will be an "India Day", spotlighting this high-growth market, the only one of the BRIC nations that's currently developing rather well again. ■

Carl Martin Welcker

METALS – MachinE Tool ALliance for Skills

European machine tool industry skills panorama presents the skills needed for additive manufacturing technologies. The METALS project, funded by the EC's Erasmus+ programme and led by CECIMO together with 9 other partners from Spain, Germany and Italy, has generated a skills panorama with a specific focus on additive manufacturing (AM).



The panorama focuses on skills required to use additive manufacturing technologies and shows how the AM workforce will be characterized over the next decade by a hybrid skills pool, comprising typical skills in subtractive manufacturing, new emerging skills specific to additive machines, as well as heightened soft skills in communication and presentation.

The European machine tool sector recorded a strong recovery in 2016 after the 2009 economic and financial crisis, mainly due to the rise in exports. As a result of focusing on advanced and sophisticated products, the combined output of a leading club of European countries[1] amounted to 24.2 billion euros in 2016. The figure for 2017 is forecast to be above this level. The machine tool sector has entered a new era, characterized by the emergence of new industrial technologies, and one of the most important is additive manufacturing (AM), otherwise known as 3D Printing. Several reasons account for the rising attention of machine tool builders on AM: the opportunity to better customize final products, localize the manufacturing process, minimize waste in production and bring down inventory costs. While such technology is not yet at the level of widespread industrialization, it is part of a continuously expanding industry. Indeed, the global value of the AM market is set to rise three-fold between 2004 and 2018, and hit 21 billion USD by 2021[2]. This trend highlights the need to address possible implications in several aspects of AM, including skills. This is a particularly important variable for key application industries of AM systems such as aircraft, medical devices and automotive. A workforce of world-class standards represents one of the cornerstones of Europe's leading position in advanced manufacturing.

The analysis conducted by the METALS project on skills requirements in AM technologies yielded a clear conclusion. As AM will move closer to series production in the period leading to 2025, the relevance of workforce competent in additive production methods is set to rise in the European machine tool sector. The skill set will gradually evolve into a hybrid one, where conventional competences in subtractive manufacturing will be coupled with new skills specific to the manufacturing process with additive machines. These new competences will be in particular concentrated in stages such as design, STL[3] conversion and file manipulation, post-processing, testing and maintenance. Moreover, greater soft skills in communication and presentation will be part of this evolved skill set. They will become more acute as growing

Co-funded by the Erasmus+ Programme of the European Union

competition in manufacturing will put greater and greater emphasis on marketing opportunities.

New competences needed to enable AM's design freedom

The production of the part needed begins with virtual design. Current practice in this stage of the AM process is to create an optimized design of the 3D model by using conventional CAD tools and topology optimization software. An initial design space is created, based on a range of loads and boundary conditions given by the software user. Topology optimization is then applied to this initial model. It allows for the identification of irrelevant material for the part to be produced, leading to an optimized distribution of material in the design space generated. The improvement of the part's performance through topological optimization paves the way for the final design of the part. This requires the conversion of optimization results into a mathematical CAD representation.

The opportunities that are opened up thanks to design methods in AM are multiple. Although software technology is still under development, the advantages it offers in reducing the type of geometry restrictions that conventional, subtractive machines face in design are clear. For these reasons, skills in proper design will be increasingly in demand. They will be possessed by specialized designers who will surge in importance in the AM workforce. They will need to possess knowledge of AM materials and processes, and have competences in free surface modelling, structural calculus, topography optimization and computational thermal fluid dynamics. These will be skills employed for conducting activities such as understanding the needs of the client by identifying requests of the part to be designed, as well as choosing the appropriate AM material for production.

New phase of the manufacturing process: STL conversion and file manipulation

The occupation of the AM specialized designer will rise together with that of the worker in application engineering, with whom it will coordinate closely. The latter's main activities will focus on the stage of STL conversion and file manipulation. They will entail exporting the CAD model to STL file format by triangulation. This will be followed by part positioning and orientation, as well as setting parameters. If needed, support structures on the build plate will be generated and added. Afterwards, slicing software will convert the file into a specific code with commands for the machine to read and execute.

The worker in application engineering will then be an occupation requiring knowledge of AM materials and understanding of features of Computer-aided manufacturing (CAM) software. This occupational profile will be characterized by individuals with extensive soft skills in decision-making and problem-solving and, crucially, with sufficient practical experience to oversee the whole production process.

Safety will be critical in vocational operation skills, a certain extent of which will be retained in the transition from subtractive to additive manufacturing

Centered on the activities of software and hardware set-up, monitoring of process parameters and extraction of the workpiece, the operation stage will be characterized by enhanced safety standards.

Safety procedures during loading and unloading operations will need to be strictly observed. The AM operator will be a safety-minded specialized worker with basic knowledge of materials, competent in emergency management and capable to handle minor deviations of the process parameters. Operation is also a stage where

AM-driven automation is set to make redundant certain competences. The fact that today software is well-developed at this stage of AM technology, as it is wired into the machine and managed remotely, will make knowledge of software a less central need for operators. The additive machine functions independently in production, with little need of manufacturing process monitoring.

Changes in skills for post-processing are concentrated mostly on a specific aspect

Post-processing, which takes place once operation is completed, is another area of the manufacturing process where skills will evolve between now and 2025. To this extent, workers in AM will need new vocational skills for removing and recycling redundant metal powder around the part fabricated, a task peculiar of the AM process. Metal cutting, surface finishing and heat treatment, other activities to which the part produced is subjected in post-processing, are activities relatively common also among conventional machines.

Knowledge of AM materials fundamental in the testing stage

The identification of defects of the fabrication process in the stage of testing product and production cycle will become more important over the next years. This activity will require expertise specific to additive machines, and is conducted by using computed tomography. Knowledge of AM materials and processes is essential in this respect. Controls of the fabricated part, instead, generally follow the path delineated in subtractive manufacturing. As a consequence, the occupation of the metrologist, in charge of these tasks, will remain equally important between now and 2025.

Maintenance skills will be distributed along two core areas

Concerning the maintenance stage, the time frame analyzed by this project will be long enough to capture the evolution of maintenance practices as a result of the gradual deployment of AM at industrial level. For the additive machine to be used on the shop floor, one has to routinely clean it up and upkeep it. The machine is also subjected, approximatively every six months, to extraordinary diagnostic work in order to solve any potential non-functioning or failure. All these tasks require knowledge and competences specific to the AM space. Alongside operation, maintenance will be a stage of the AM process where safety standards in the workplace will play a prominent role. Indeed, there are risks linked to the use of metal powders, such as powder particles' inhalation and the reaction with oxygen and subsequent combustion of materials like titanium. These add a new specific dimension to maintenance of additive machines, which translates into an evolved set of competences. Keeping high safety levels is especially relevant in maintenance tasks such as changing filters used during production to capture gases potentially harmful for human health and detrimental to the process efficiency. Similarly, safety is the main driver for carefully handling and storing feed materials, and guaranteeing a safe and clean work environment. In the case of extraordinary maintenance, the end-user of the machine will need to rely on specialized AM maintenance personnel sent by the supplier to the manufacturing facility where the machine is located. About ordinary maintenance, tasks will instead be conducted directly by the specialized technicians of the end-user company. The role of the additive system supplier, and particularly the vocational skill set of its shop-floor level workforce in maintenance, will therefore be crucial. Needed training and specific instruction on ordinary maintenance of the machine will need to come from the supplier.

Not only hard skills are set to evolve with the emergence of AM techniques: certain soft skills will be equally affected

Between now and 2025, predictions of growing market competition are expected to trigger greater emphasis on the marketing dimension of the business. Manufacturers will pursue more and more opportunities to showcase and demonstrate their latest products. To foster the use of AM technologies, machine demonstrations will multiply in trade fairs. Workforce in AM will therefore improve abilities in showcasing the machine in the exhibition's premises. This will entail interaction with potential users interested in it, and coordination when answering questions from potential customers. Competences of this sort will also be essential when reporting customers' inputs at the end of exhibiting activities. Better soft skills in communication and presentation will thus be needed by the AM workforce to successfully cope with more developed and exhibition-oriented marketing strategies. ■

1. Figure taken from CECIMO. The countries included are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden Switzerland, Turkey and the United Kingdom.
2. Accounting for products & services (all materials). Source: Wohlers Report 2015.
3. Acronym for Stereolithography.

CECIMO Campaign on Digitisation

What is it?

The main objective of our campaign is to accelerate the uptake of the digital solutions provided by the European machine tool industry. This requires the industry to share with its user sectors the benefits and added value of using digital solutions developed by machine tool builders.
Through the campaign, machine tool users, as well as the European machine tool industry itself, will become more conscious of digitisation's potential and gain confidence in the application and added value of digital technologies, business processes and new business models. Policy makers will also be encouraged to work together to support digitisation projects in the machine tool sector.

What's next?

We will publish in June a compendium that collects twenty-four best practices around Europe. You will be able to read it on paper and online. We will spread it among the industry itself and within the European Institutions.

The companies

Social Media and Machine Tools

by Giorgia Zia, CECIMO Communications Officer

Social media revolutionised our daily lives, from how we manage our relationships to the news we read. Industry, banking, services and even governmental institutions could not be left behind and they started modifying their approach towards clients and citizens.

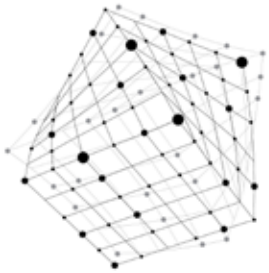
Such a transformation couldn't be discarded by communication and marketing strategies, and B2C companies might have an easier life. The web is swarming with useful tips and advices about best practices: what's the best time to post, or how attracting social media influencers, so to reach a broader audience. They even explain you how to organise a competition with a final prize to appeal to more clients. But what happens when you're a B2B company? You will not award a bulldozer. Your customers are other companies, which rely on a long-term business relationship, who want to see how the machine works and to understand the full potentiality. Is social media apt to this part of the industry?

Experts and blogs will tell you that, if social media work and you have never invested in them, then you lost a great opportunity. While this might be true, not all social media networks will improve your position in the market.

We took a look at some big machine tool companies on different platforms, i.e. LinkedIn, Facebook, Twitter and YouTube. Numbers vary from one company to the other, still small SMEs cannot reach the figures of big companies. At the same time, multinationals' accounts score different numbers, as their branches in USA notch impressive data compared to the European ones. Among all the networks, the best performances are seen on YouTube. Some videos have the same number of views as a European newspaper. We can deduct that MT costumers need to see the machine in action and a simple description or picture may not have the same impact. LinkedIn is another platform where MT companies perform well. The network is a valuable resource to target mid-level and senior workers, because the average user is aged between 35 and 50. So, promote on LinkedIn your company for corporate responsibility, efficient resource management and innovation. The other two platforms do not perform exceptionally well, even if USA branches seems to continue increasing the interactions on their pages.

This small exercise can teach us that a company should pick up its social media channel, on the basis of its targeted audience. Once you know who will likely interact with you posts and videos, your marketing department can focus on social listening, promotion of your product and even customers support.

Last, a small advice: never forget your website. It is still your business card and social media are created to drive traffic to this landing page. So, don't forget to adapt it to new trends and technologies, try to publish constantly and make it user-friendly. ■



ADDITIVE MANUFACTURING EUROPEAN CONFERENCE

7 June 2017
European Parliament, Brussels

organised by
cecimo
European Association of the Machine Tool Industries

"Boosting the competitiveness of the European industry by supporting the adoption of additive manufacturing"

Event hosted by Anthea McIntyre (ECR) and Cora van Nieuwenhuizen (ALDE), Members of the European Parliament

Otherwise known as 3D printing, additive manufacturing is set to become one of the next most important disruptive technologies. Freedom in the design of parts, minimization of waste in production and reduction of inventory costs are just some of its key advantages at industrial level. Europe has a strong know-how in additive production/3D printing solutions. But it needs to overcome a series of policy and market challenges to bring this technology into the industrial mainstream.

What is holding down the growth of additive manufacturing? What can the EU do to unleash the full power of this technology? AMEC will gather together industry leaders and senior policy-makers to focus on barriers for the industrialization of additive manufacturing and discuss measures to bring them down.

Draft Programme

Session I
Untangling the path to industrialize additive manufacturing: Where do we stand today and what's the EU role in tackling technological and regulatory challenges?

- Mr. Jean-Camille Uring – CECIMO Immediate Past President and Chairman of AddUp
- Ms. Anthea McIntyre – Member of the European Parliament (ECR, UK)
- Ms. Cora van Nieuwenhuizen – Member of the European Parliament (ALDE, NL)
- Dr. Peter Dröll – Director for Key Enabling Technologies at DG RTD of the European Commission
- Mr. Pascal Boillat – Head at GF Machining Solutions
- Mr. Nikolai Zaepernick – Senior Vice President Central Europe at EOS GmbH
- Mr. Jon Porter – Business Development Manager at Renishaw
- Mr. Ulli Klenk – Principal Key Expert for Additive Manufacturing at Siemens Power and Gas

Moderator: Dr.-Ing. Bernhard Langefeld – Partner at Roland Berger

Q&A

Session II
Talent for an additive world: How do we capitalize on Europe's skilled industrial workforce?

- Ms. Patrizia Toia – Member of the European Parliament (S&D, IT) (tbc)
- Mr. Paul Rübig – Member of the European Parliament (EPP, AT) (tbc)
- Dr. Slawomir Tokarski – Director of Innovation and Advanced manufacturing at DG GROW of the European Commission
- Mr. Marcus Burton - Director at Yamazaki Mazak UK Ltd

Moderator: Mr. Onno Ponfoort Practice Leader 3D Printing at Berenschot Consulting

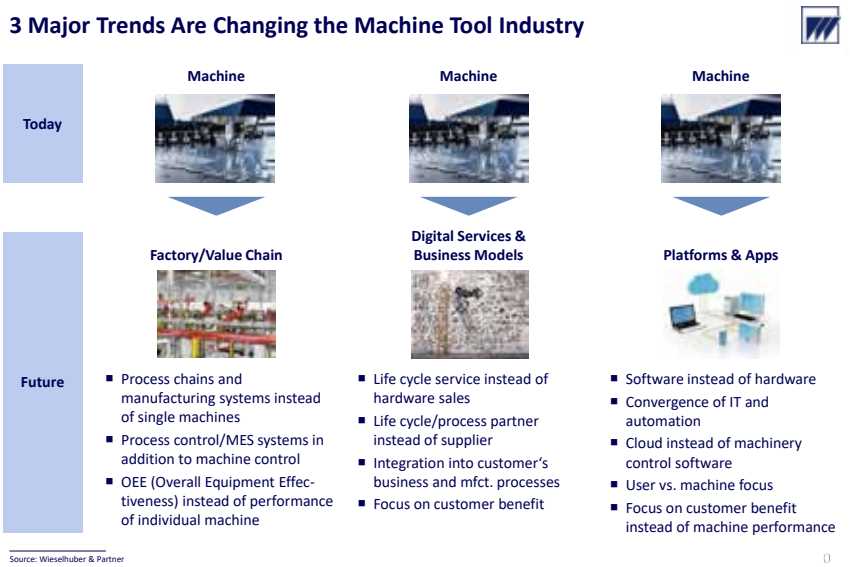
Q&A

Concluding remarks: Mr. Filip Geerts – CECIMO Director General

Updated information can be found at www.cecimo.eu/site/additive-manufacturing/amec/

Digital services in the Machine Tool industry

by Volker Bellersheim, Head of Industrial Goods Division, Member of the Management Board Dr. Wieselhuber & Partner GmbH



Major Industry Trends and Paradigm Shift – Process Solution Partner vs. Machine Supplier
Three major trends are currently driving the change in machinery building industries and especially in the machine tool industry. Customers are increasingly asking for comprehensive solutions to optimize their entire manufacturing process, including digital life cycle services and innovative human machine interfac-es. Many machine tool companies have reacted to this challenge and have started to transform from a pure machine supplier to a "process solution partner" of their customers. The key question for many ma-chine builders is: "What can I do to help my customers increase production efficiency?"

Digital Services
Systematic analysis of the machine operator's production processes, value chain, and already available machinery, process, and order data reveals numerous applications: predictive maintenance, quality, or capacity are quite obvious but are often limited to optimizing individual machines. Performance im-provement consulting based on data analysis as a service to optimize the OEE (Overall Equipment Effec-tiveness) of the entire process chain generates much higher customer benefit. Automated consolidation and analysis of data for documentation, quality control, supply chain (spare parts logistics, service techni-cian dispatch), optimization, simulation, remote commissioning, and training purposes could exploit fur-ther potentials.

Volker Bellersheim

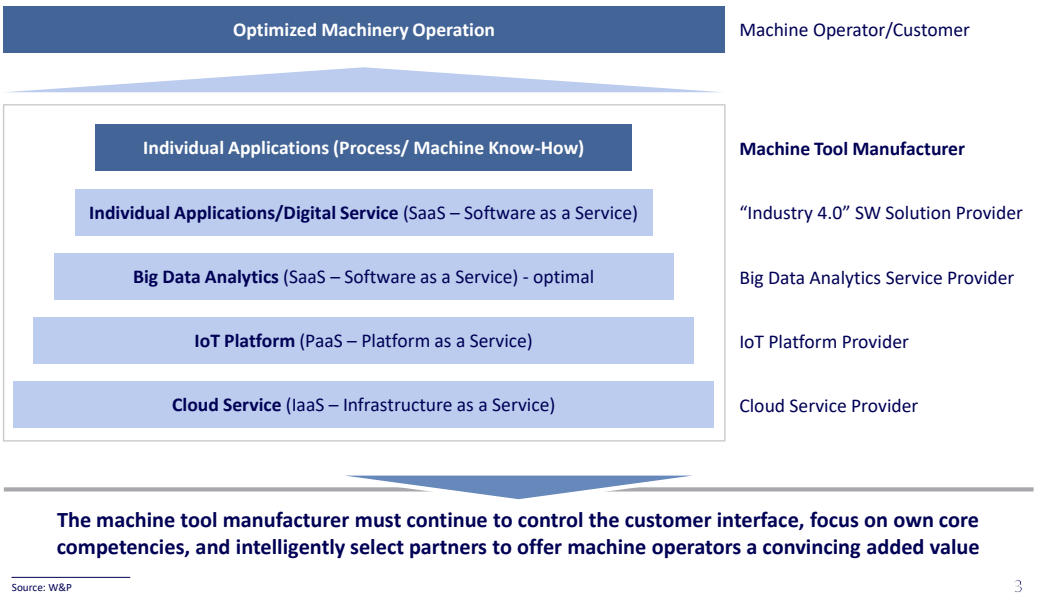
Benefits are two-fold: Internal efficiency increase and improvement of service levels (e.g. faster spare parts supply) or higher service quality (e.g. predictive maintenance models continuously improved through live data from global machine population).

While up to 50-60% of machinery companies are already offering these digital services or are planning to offer them within 3 years, the remaining 40-50% of customer have no such plans—even for the foresee-able future. Average revenues with digital services accounted for 2% of total revenues in 2015; for 2020 10% are targeted.

Long term, a much higher revenue share seems to be possible. Digital data is a perfect entry point for machine tool companies for tools, forms, and fixtures, as well as for consumable business. The digital twin of the work piece can be used for online design and configuration of forms and fixtures, simulation and optimization of the production process, and acceleration of the entire design and logistics process.

IoT (Internet of Things) Platforms
Within the last 12 months, IoT-platforms (and solutions from different types of players, respectively) have gone online. Some of the new arrivals have started to operate their own cloud, while others rely on generic services of big players like Amazon Web Services (AWS) or Microsoft Azure, focusing on software and service layers closer to the specific applications. Besides software and Internet companies, industrial conglomerates (e.g. Siemens, Bosch, General Electric) and mid-sized automation companies, several ma-chine builders have also entered the playing field. Clearly the most advanced is machine tool company TRUMPF with its dedicated subsidiary Axoom. Axoom offers an open platform other machinery compa-nies can use, also for manufacturing processes other than 2D sheet metal processing. While this business is in principle completely independent from TRUMPF's machinery business, up to now other manufactur-ers have focused on platforms to support operation of their own machinery (plus

"Industry 4.0" Strategic Positioning of Machine Tool Players



complementary ma-chinery and periphery from partners).

The Way Forward for Mid-Sized Machine Tool Companies

Typically, mid-sized machinery companies will not have the budget and resources to develop proprietary solutions. Furthermore, their customer base is usually too small to support an economic platform opera-tion. Nevertheless, they need to offer their customers a solution in order to avoid being sidelined.

The most important issue for machine builders is to continue to control the interface to their customers. It is absolutely fundamental that "new" Industry 4.0 players, i.e. the different types of service providers (application focused software, big data analytics, IoT-platform, cloud services), are not able to establish their own relationship with the machine operators. Machine builders should focus on their core compe-tencies and intelligently build partnerships to bundle all the elements needed for a secure and high per-formance IoT-solution and digital service offering. In any case, they should resist the temptation to enter new fields of business which require completely new competencies. Reinventing the wheel is not the right approach.

Collaborating with eco-system partners is a new critical competency. Also, developing successful digital services is quite different from the traditional product development approach: Sequentially developing a technical solution, testing it with lead customers and then launching it as a free service makes it almost impossible to get paid for the service later. Rather, for digital services a simultaneous development ap-proach is needed: Use cases, customer benefits, the technical solution, and the monetization model need to be developed in parallel. This minimizes the risk of failure and ensures the necessary speed to capture market share.

Conclusions & Hypotheses

We expect that technological and data security issues will be resolved in the near future and that use cas-es with real customer benefit will be demonstrated in the many current pilot projects. Data-driven ser-vices, i.e. digital services, will capture the main share of the "Industry 4.0" profit pool, while the pure sup-ply of "Industry 4.0 Ready" equipment will not be a sustainable business model in the long term. Com-moditization will ultimately also reach this market. Machinery customers will increasingly demand solu-tions and contributions to enable efficiency increases in their production processes.

Therefore, machine builders need to change and transform from a pure machine supplier to a "manufac-turing process partner" of their customers. The ability to develop new digital services (and business mod-els) will become more important than incrementally improving machine performance and functionality.

Considering the current speed of development in the IoT/Industry 4.0 playing field, now is certainly the right time to analyze opportunities and risks, and to start specific and customized activities to secure the own company's future. ■

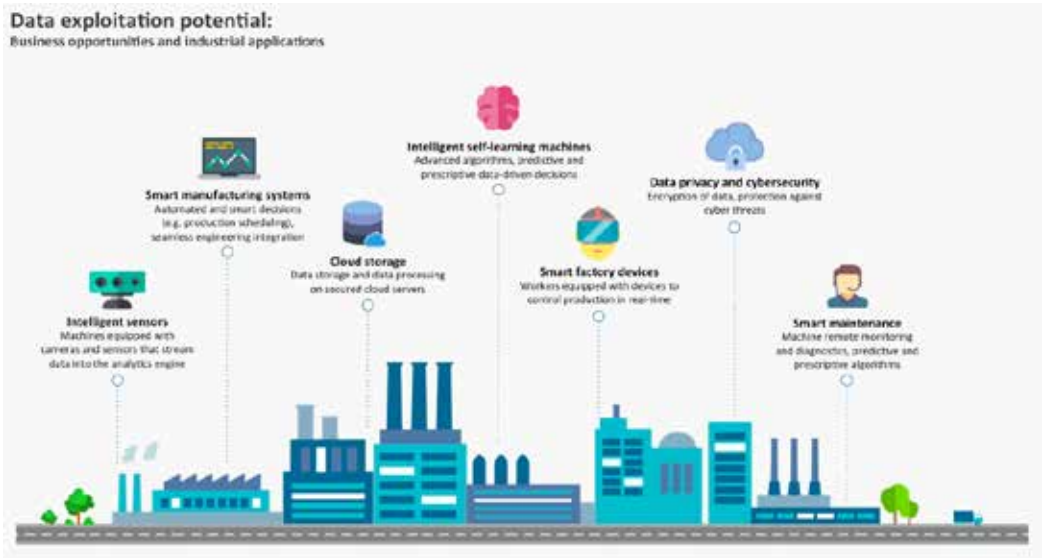
What was said

"Industrial data is becoming a crucial competitiveness element for advanced manufactures. To remain competitive in the long-run, machine tool builders will need to generate new solutions for customers, by converting complex machine-generated data into insights for decision-making and overall process efficiency."

Bruno CATHOMEN
CEO Mikron Group

Tangible exploitation of Big Data: how can we make an optimal use of data exploitation?

by Valeriia Boldosova, Project researcher, Prima Power



Over the past decades, industrial production has become driven by Big Data, digitization and Industry 4.0. Yet, the process of exploiting data and deriving meaningful insights from data remains one of the biggest challenges faced by many organizations across different industries. Even though there is a variety of data exploitation solutions available on the market, how should machine tool builders manage ever-increasing sets of complex data, and transform it into useful insights for decision-making? Where do we start with the tangible exploitation of data?

Data exploitation strategy

The Big Data exploitation process starts with building a data exploitation strategy. A clear understanding of what data the organization is generating and should be collecting helps to understand how this data can be leveraged. A data exploitation strategy should be aligned with organization's business goals and strategy, aiming to create new business opportunities, satisfy customer needs and deliver business value.

Business value from data exploitation

In the past years, more and more companies have been realizing the growing importance of business value behind the large sets of data, which, accumulating over time, supports the decision-making and creation of new business opportunities. There are numerous areas where organizations can make tangible use of data and derive value: 1) Cost reductions, 2) Improved efficiency, 3) Faster and better decision-making, 4) New products and services, and 5) Enhanced customer service. Collection and storage of historical data over time result in transparency of information, reduced internal production costs and identification of more efficient ways of doing business. With today's technology, organizations are able to utilize data analytics to support real-time decision-making, acquire valuable insights and resolve issues faster and more efficiently. Customer analytics provide organizations with the ability to satisfy customers' needs, innovate and increase customer satisfaction by creating new products and services. Monetizing collected data is a crucial part for companies to outperform competitors and survive in the digital age, and there is a variety of business practices and monetization models for machine tool builders to choose from, such as: 1) Pay-as-you-use, 2) New subscription services, 3) Pre-emptive service agreements, 4) Product-as-a-service etc.

Big Data exploitation challenges

Data management and exploitation is not an easy task and it poses multiple challenges in front of companies undergoing the process of digitization. One of the first challenges is related to the investment in the technology processing large volumes of information with data analytics. The development of data storage plan is essential to ensure historical and real-time data collection. Raw data is useless, unless it is analyzed and processed into knowledge. Existing data analytics techniques on the market vary from descriptive analysis of data to predictive algorithms.

Secondly, in order to get the most from data, it is important to change organizational culture and internal mindset towards data-driven decision-making and new opportunities. Simply collecting data is not enough and organizations are facing with the lack of skills to process data and use insights effectively. As a result, organizations are developing new set of analytical skills or recruiting 'data translators' with complementary competences in computer programming, economics, finance and/or marketing. ▸▸

Valeriia Boldosova

What was said

"Industry 4.0 will have a huge impact on machine tool builders' skill-set. European machine tool industry, to stay competitive globally, will need more competencies pertaining to data analytics and computer programming on top of production technologies."

Juha MÄKITALO
President FINN POWER OY

Another data exploitation challenge, companies face with, is concerned with validity and reliability of collected data. Appropriate testing technologies are necessary to ensure that collected data is complete and data analytics accurately reflect the reality. As a part of developing a data-driven organizational culture and mindset, companies should assure that employees trust the data collected online. This, in turn, positively affects how quickly employees realize the full potential of Big Data and adopt a new technology into the daily routine.

Finally, digital technological advances are changing the way customers work and the way customers are expecting manufacturing companies to work. To enhance their products and optimize production, customers are using digital technology to collect data on their products themselves. More and more customers become no longer interested in giving an online access to their equipment to machine tool builders; instead, they are seeking for advanced analytical tools to derive meaningful insights from their assets. As a result, manufacturing companies should be flexible in developing both internally- and customer-oriented data-driven solutions and applications.

Data privacy and security

Alongside the data capacity growing exponentially, organizations are facing with arising data privacy and security issues. The process of collecting and processing sensitive data comes with an obligation for manufacturing companies to protect personal information and avoid unauthorized use. From a customer's perspective, data security and privacy are critical issues. This is why it is vital for manufacturing companies to receive third-party provider certifications, comply with local and international legislation and actively communicate transparency and accountability to customers.

Prima Power approach towards Big Data exploitation

Following the fourth industrial revolution digitization trend and focusing on connectivity and interaction between machines, people and production, Prima Power is improving operational efficiency by connecting machines to a single platform, enabling seamless production information flow and maximizing machine performance.

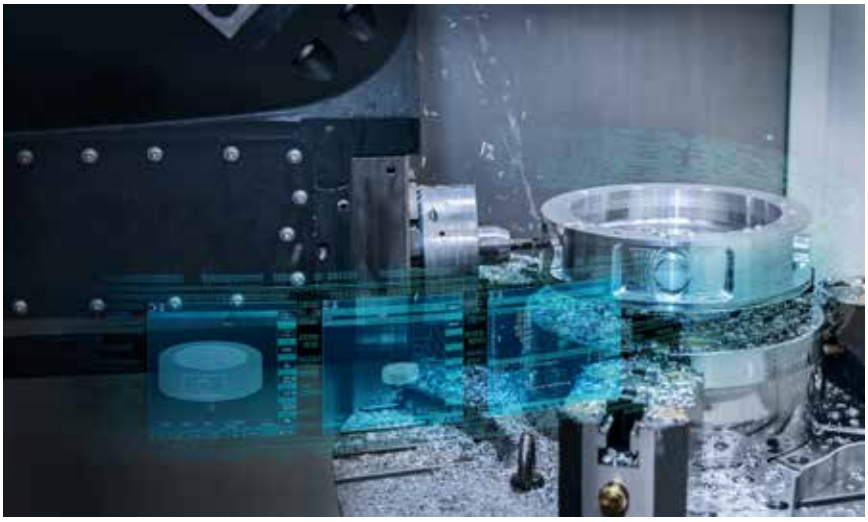
Prima Power offers customers a leading edge technology – Remote Care service, which is essentially built upon the data exploitation principles. Remote Care condition monitoring provides systematic and planned maintenance and speeds up troubleshooting and problem solving. The remote monitoring system collects machine data, records operation history, as well as logs data of component usage and alarms and stores it in Prima Power database. Collected data is used to produce efficiency reports, containing a breakdown of total idle time and analyses of alarms and machine condition. On request, Prima Power specialists will analyze the material, make a summary and recommend actions for improving overall efficiency of the manufacturing process. A picture is worth a thousand words and Remote Machine Care has a live video function of monitoring of the equipment. Thus, for example, a damaged component can be seen directly and any delay avoided in ordering the correct spare part. In case of a critical issue, the customer is contacted in time to prevent the machine intervention.

Key takeaways

The majority of manufacturing companies see data exploitation as a tool for unleashing business potential, improving revenue, strengthening customer relationships and building competitive advantage. Investing in data analytics and Industry 4.0 solutions supports executives in gaining greater insights into smart manufacturing, new product and service development, optimization of operation costs, reduced equipment downtime and unscheduled maintenance. To reap multiple benefits of Big Data it is essential for executives to integrate data exploitation techniques into the current and future strategies to compete in the digital age and head their companies into the future. ■

Paving the road towards smooth digitisation: standardization

by Dr Alexander Broos, Director of Research and Technology, VDW - German Machine Tool Builders Association



Picture © Siemens

Alexander Broos

Digitisation is nothing new in the machine tool business. With the advent of the CNC controlled machine in the 1960s, software entered as a new player into the machine design process. With it, the continuing demand for connectivity entered, too. Finally, this leads to the overwhelming development we today call Industrie 4.0 or Internet of Things.

The machine tool industry has come a long way since. Initially, the major challenge was to get CNC programs onto the machine controller. Punch tape may seem like a dinosaur now, but it revolutionized manufacturing because it enabled offline programming. Machines could operate and earn money, and the downtime for programming could be reduced, increasing productivity. From there, it is a consequent way into the connected world we have today, where machine tools communicate with each other, with their environment, e.g., handling and automation systems, and deliver data into management systems.

A new terminus technicus coined by the IoT community is the cyber physical system. It means a physical structure that senses its surroundings, interacts with it, has a decentralized intelligence and reaches out into the digital network sphere. As a matter of fact, machine tools can be seen as an already existing incorporation of such cyber physical systems, even though one might imagine something fancier.

The benefits of an interconnected world are painted in bright colors. Vertical integration from components and sensors via the machine to the shopfloor and enterprise management level enable predictive maintenance. Digital twins of the machinery lead to sophisticated simulation of the machining process. This reduces setting times. Also, it increases quality because possible deviations and errors can be predicted. Augmented reality leads to better serviceability of the machines. Horizontal integration leads to lean processes and transparency. Machines interconnect and negotiate free capacities. The ultimate vision is the workpiece navigating itself the ideal path through production.

There is, unfortunately, a major obstacle to overcome when connecting all sort of physical devices to networks. The seemingly borderless realm of the internet has some very physical limitations: interfaces. Wiring a system to another to establish data exchange is one thing. Making them understand each other is something totally different. In our daily lives, we are accustomed to a fairly "easy to use" setup of our personal digital gadgets. But just as well, we are used to encounter many frustrations if something does not work at it is supposed to.

In the industrial world, however, things have to work. If they don't, you lose money. If you're not able to fix it, you lose customers. You need to ensure the safety of complex technical products and the security of data. But the world that builders of machinery face is even more heterogeneous. IT infrastructures have wildly grown over the past decades. Even new machines with different controllers are not able ▸▸

What was said

"Standards will remain important. But we need to reconsider if the traditional standardization process is suitable for future challenges in the IoT world."

Klaus FINKENWIRTH
General Manager Liebherr Verzahntechnik, Kempten

What was said

"There are some common obstacles all machine tool manufacturers face when developing connectivity solutions. So, we need to team up, pool resources and gain speed in setting our own standards. This reduces the effort and increases acceptance."

Georg JOUSMA
Head of Electric and Software Design, GROB-Werke, Mindelheim

to exchange but a few very basic data. Integrating old machines is a greater challenge. Doing this on the premises of a customer's IT heritage makes it even worse. This requires increasing competence in software development, which usually is not the key skill of a machine tool builder. So, the dependency of suppliers for controllers and software is ever increasing.

Consequently, this leads to the need of standardized and open interfaces. Let's first consider how standards are introduced. One approach is negotiating them between stakeholders, i.e., suppliers and customers. This leads to the standardization processes the industry is accustomed to. It might take a while to reach consent, and that might not be much more than the least common denominator. But if standards are finally published, they are a very solid base for global trade.

A totally different way is standard set by dominating market forces. Everybody knows USB connectors, MP3, PDF, BluRay discs etc. A fairly small group of dominating producers dictates to the mass of customers and sub-contractors. As a matter of fact, machine tool builders face a similar situation because there is only a small number of suppliers for the core component of an interconnected machine tool, the controller. Fortunately, in the B2B environment much depends on negotiating terms with the customers, so there is some balance with customer demands. Still, the machine tool industry has a sandwich position. Furthermore, new players enter the turf. Traditional IT companies see new business models. Although they do not have experience with the peculiarities of manufacturing, they have resources to acquire them. And they have the knowledge of data handling, which is the foundation for future business.

Undoubtedly, there is a threat that machine tool manufacturers might be reduced to suppliers of exchangeable commodity items, i.e., hardware. Then, functionality and quality would be dominated by software, which is the realm of some very dominant market players. Fortunately, the business of manufacturing requires very specific know-how, which is the realm of the respective machinery makers. Even copying machine designs does not lead to their efficient operation.

Conventional standardization processes are too slow in this fast-revolving world. The heterogeneous machine tool sector, even if well coordinated through associations, moves too slowly. It does not have the leverage to set and enforce dominant standards through the consent-based way. Speed is a matter. So is collaboration. There is a lot of basic things to be done which in no way touch competitiveness. Machine tool manufacturers should team up, pool resources, and develop these together. Also, where feasible, follow the way of software business by deploying not fully engineered, but viable solutions as early as possible. Many software solutions are already out there, and they are available at low cost, if not for free. Build networks, outsource anything that somebody else can do better, but protect your core competences: building that precision machine, and operating it efficiently. In the end, it still requires well-designed and well-operated machinery to produce the physical parts the world needs. They cannot be downloaded from any cloud. ■

Picture © Siemens

Data-driven business models: a hybrid skills-set is needed more than ever

by Emir Demircan, CECIMO EU Public Affairs Manager

Machine tool builders transform their business digitally. By analysing industrial data deriving from the machine tool used by customers, they improve the performance, energy and resource efficiency as well as safety of their products, and develop predictive and prescriptive maintenance solutions. A survey conducted with CEOs of European machine tool builders participating in the CECIMO General Assembly Meetings reveals that indeed data-driven business models, such as predictive maintenance, will be very high on the agenda of the European machine tool industry over the next 10 years. One of the key pillars of monetarizing data-driven business models is a new and hybrid skill set that combines expertise from various fields including production technologies, software and data analytics and, as an overarching pillar, communications.

Data-driven business models and implications for the workforce

Data-driven business models mainly imply converting high-volume, high-velocity and high-variety data into insights and foresights for decision-making and process efficiency. This includes collecting data through sensors and other data collecting devices; streaming data into the analytics engine; storing encrypted data on secure clouds; and finally generating predictive data-driven decisions, remote diagnostics, assistance, insights and foresights on better using machine tools. Such a business model has a great impact for instance on maintenance workers.

The role of maintenance workers is expected to become more and more service-oriented. The worker needs the skills and knowledge to remotely interpret the data into maintenance solutions. The result will be that maintenance workers require greater skills in customer service and a broader understanding of the application of manufacturing equipment. As production processes become more international and a greater level of integration takes place along the value chain, communication skills will be crucial. The maintenance worker will be expected to communicate with colleagues in different factories and clients in different countries, with the help of smart devices.

Low-skilled jobs are disappearing from the machine tool industry

New business models are likely to have a large impact on the entire manufacturing workforce as well. The technological progress made by automation systems, robots and servitisation will keep eliminating some jobs that include manual work. For instance, CEDEFOP's (European Centre for the Development of Vocational Training) skills panorama forecasts a 5 to 10 percent decrease by 2025 in some occupations including operators and machinery workers. On the flip side, the global market for advanced manufacturing industry is forecast to be worth over 750 billion EUR by 2020. This is associated with an increase in the number of high-skilled jobs in the sector. For instance, the number of jobs in manufacturing

What was said

"Digitisation helps our industry reduce low-skilled jobs and create new positions with significant added-value. Cyber-Physical Systems is, for instance, an emerging domain, where machine tool builders will need more professionals with critical skills."

George BLAHA
Chairman of CECIMO Communication Committee and General Manager Schneeberger Mineralgusstechnik

requiring high-level qualifications is projected to rise by 1.6 million or 21 percent by 2025. In particular, very strong employment growth of science and engineering professionals is expected in the manufacturing industry. These professionals will work on the development and maintenance of advanced machinery, smart factories and cyber physical systems. At the vocational education level, the advanced manufacturing industry will increasingly need workers that need to set up, monitor and maintain customized machines requiring sophisticated skills. As a study done with manufactures in Germany illustrates, the industry believes that technologies such as additive manufacturing and cyber physical systems will drastically change vocational skills.

Paving the way for a hybrid skills pipeline

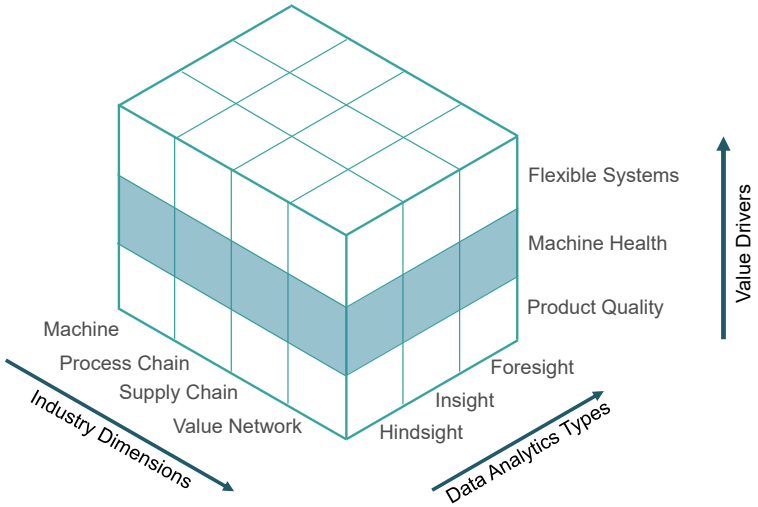
European machine tool builders that are willing to launch new business models will need to strengthen their relations with education providers in the fields of software, computing, information systems and data analytics to attract new graduates to their business. New business models based on industrial data will also require setting up small teams composed of software specialists, data analysts and production technologists. Machine tool builders should also bear in mind that in the manufacturing sector, learning is best achieved in the real working environment as building and maintaining sophisticated machines and providing services is innovation itself. Therefore, machine tool builders should invest more in work-based education and ensure that our workforce is trained in real working environments. The workforce of new manufacturing will then become familiar at early stages with the latest technologies that companies are dealing with.

Education policies will need to adapt to the new normal

From a public policy point of view, the education system in Europe should be more flexible. There is an increasing need to create an education system, which builds joint-degrees and allows transfer opportunities between different disciplines, matching the changing skills needs of manufacturers. In addition, the advanced manufacturing workforce needs more time spent at work supported by shorter training programmes in the classroom. Finally, machine tool SMEs already take the large share of the burden by delivering training to young employees who otherwise would not be operational. Nevertheless, digitisation brings specific challenges for the manufacturing SMEs. SMEs have limited financial resources which make them vulnerable to new complexities. The rising complexity of technology and integration of ICT solutions increases the training cost. This prevent SMEs from investing further in human capital and developing the new business models needed. Further incentives and government support should be provided to manufacturing SMEs that need to train their workforce on new business models in the era of fourth industrial revolution. ■

Disruption of value networks to create new revenue streams for machine manufacturers

by Dr Lina Huertas, Head of Technology Strategy for Digital Manufacturing, Manufacturing Technology Centre



Data driven value in manufacturing

In the last decade or so, digital technologies have opened unimaginable opportunities to the manufacturing sector. Through connectivity and intelligent technologies, data has become an asset that is already exploited in many factories to increase operational efficiency and improve products overall. There are different ways of extracting value from data, depending on the data and type of data analytics techniques used, the industry dimension and the application. Three types of data analytics are possible:

- **Hindsight** is used to extract knowledge out of historical and expert data;
- I**nsight** to extract knowledge out of real time data;
- **Foresight** to extract knowledge about the future from a combination of data.

Similarly, value can be extracted at different levels and by different actors depending on the industry dimension covered by a specific application. There are applications at:

- **Machine level** for process management;
- **Process chain** level for factory management;
- **Supply chain** level for logistics and supply management;
- **Value network** level for business model management.

Generally, the potential value of an application increases with the industry dimension as the number of actors involved is higher.

Finally, related roadmaps and industry consultation have repeatedly shown that three of the most valuable applications for digital technologies in manufacturing industry are:

- **Product Quality** aiming to achieve right first time and eliminating inspection;
- **Machine Health** optimising machine maintenance, repair and ownership strategies;
- **Flexible Systems** enabling product variance with reduced changeover time.

The opportunity for machine manufacturers

For machine manufacturers, machine health is the most relevant value driver from the commercial perspective, particularly at the value network level. At machine, process chain and supply chain levels, the application of data analytics for machine health can take the shape of different applications such as:

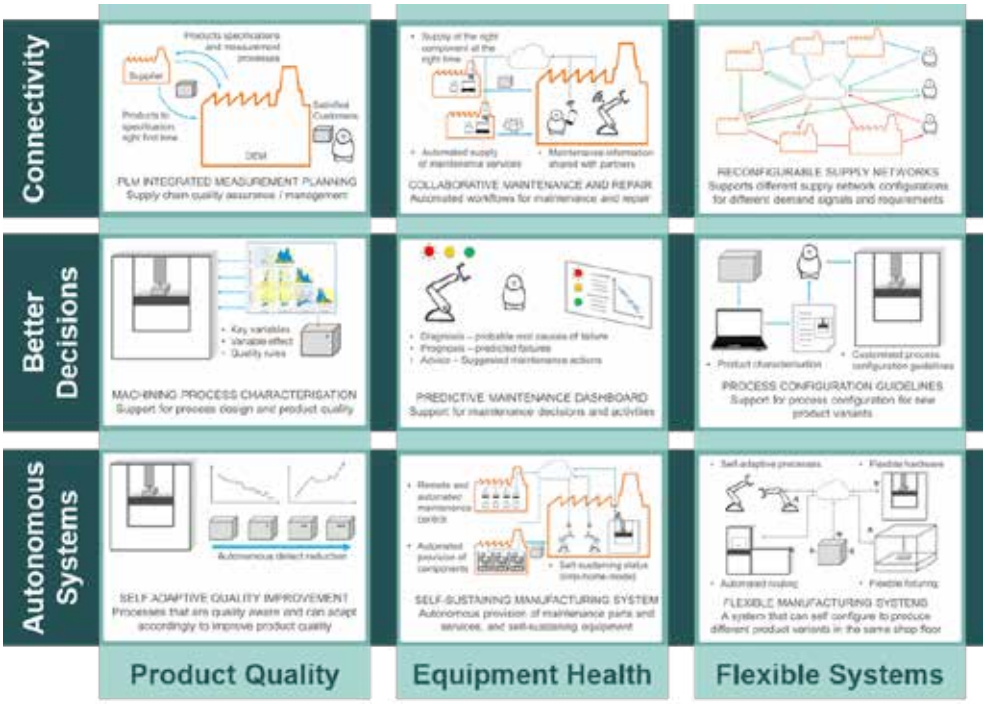
- predictive and prescriptive maintenance where potential failures are predicted and recommendations on the most appropriate maintenance or repair actions provided;
- dynamic factory optimisation to modify production plans in real time based on the status of different machines
- product fault investigation based on an understanding of the health of relevant machines throughout the supply chain.

In all these cases, manufacturers are able to benefit and extract value from data, primarily in the form of operational efficiency.

Using data to drive machine health at the value network level is game changing. Going beyond the supply chain opens the possibility of participating in data sharing and therefore value exchanging, to machine manufacturers.

Traditionally, machine manufacturers have operated a business model based on assets (i.e. machines). Assets are manufactured using ▸▸

Lina Huertas



internal manufacturing capability and a single-transaction revenue is earned by transferring ownership of the asset to the end-user. Even though this model has been successful for years, it requires a strong sales force to ensure a constant revenue stream. Furthermore, given the increasing manufacturing capability of emerging markets, machine manufacturers using this model are facing increasing competition.

Extending the reach of data exchange through value networks disrupts value exchange channels, creating new connections to the machine manufacturers, enabling them to access machine data and provide informed services to end-users. Hence, continuous revenue streams are ensured by the regular provision of services to ensure machine health. These services are usually related to maintenance and repair, but could also include self-healing and replacement. Given that servitised business models are based on IT and intellectual capabilities, competition is significantly reduced in the global landscape. Finally, to ensure maximum access to the data, the ownership of assets remains with the machine manufacturer throughout the machine lifecycle, even when the asset is physically with the end-user.

Barriers to machine servitisation and call to action

As valuable as new service based business models are, their adoption is still slow, particularly in SMEs and less innovative sectors. This is not just due to a lack of innovation in machine manufacturing businesses. Beyond business and innovation barriers, there are important technical barriers associated with the key principles behind servitisation: data sharing and analytics. The main barriers are:

- **Big Data Analytics** – To exploit the full potential of machine servitisation, machine manufacturers need the capability to process large volumes of data generated by production assets in operation. This demands specific storage, processing and big data analytics capabilities that are not typically available in manufacturing organisations.
- **Digital Skills** – Servitisation is based on the ability to use data to generate valuable knowledge about machines through analytics. Other important associated skills are equipment connectivity, instrumentation and software development. To achieve a business model change in this direction, it is essential that these skills are available in machine manufacturing organisations.
- **Trust and Cybersecurity** – The commercialisation of machine services depends on data sharing outside the factory environment. However, security is one of the main concerns precluding adoption of digital technologies beyond factory walls.
- **Digital Infrastructure** – Comprehensive and robust infrastructure is required to enable reliable service provision for end-users. While high levels of availability are not usually required for most applications, existence of the infrastructure required to communicate data on a regular basis in both directions is required.

For machine manufacturers to take a leading position in the debate of digitisation and the process of transforming the machines into smart objects supported by digital services, four aspects should be considered:

- **New Business Model Design**
  Machine manufacturers need to have a deep understanding of their customer base to develop an appropriate business model based

on specific requirements in terms of objectives, barriers and success factors.

- **Partnerships and Collaboration Models**
  The right partnerships and collaboration models are a key part of changing the business model with reduced levels of risk. Three types of partnerships are key to a change of business model from machine provision to machining services provision:
  - Innovation organisations who provide pilots, demonstrators, test beds and advanced manufacturing capability to de-risk technical solutions;
  - Technology vendors identified with the support of independent innovation organisations who can ensure that novel technical solutions can be exploited commercially;
  - Trade organisations and national/ regional policy makers to make sure that systematic barriers and market failures are addressed through sector or government intervention.
- **Development of Internal Capability**
  Machine manufacturers need to develop or acquire the right skills to drive changes in their business model as described above. This is also the case for relevant tools and infrastructure such as Big Data Platforms and High Performance Computing to support new data driven services.
- **Development of Smart Machines and Services**
  With the appropriate business models, partnerships and capability, machine health services and machines can be developed simultaneously, to produce smart objects that can provide the required data and respond to those new services. The key areas of development (and therefore of research) to achieve this are:

Machine servitisation

1. Sensors and instrumentation;
2. Networks and equipment connectivity (vertical and horizontal);
3. Big Data storage and management;
4. Big Data semantics and structure;
5. Big Data analytics.

Service applications

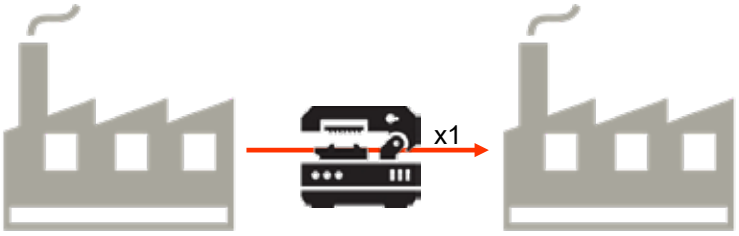
1. Intelligent root cause analysis;
2. Failure prediction;
3. Maintenance and repair strategy optimisation;
4. Dynamic maintenance scheduling;
5. Synchronised maintenance and production scheduling;
6. Self-healing.

As industry undergoes a widespread transformation driven by new digital technologies, a significant opportunity is available for those machine tool manufacturers that opt for disruptive business model innovation. Early adopters of this new model, shifting from makers and sellers of tools to providers of digital services, will get the chance to build strong relationships with a wider customer base and create more stable and reliable revenue streams. Machine tool manufacturers considering this path must not be bystanders and instead, should take the first step by designing their business model carefully, moving on to developing the right partnerships and capabilities to transform their machines into smart objects supported by digital services. ■

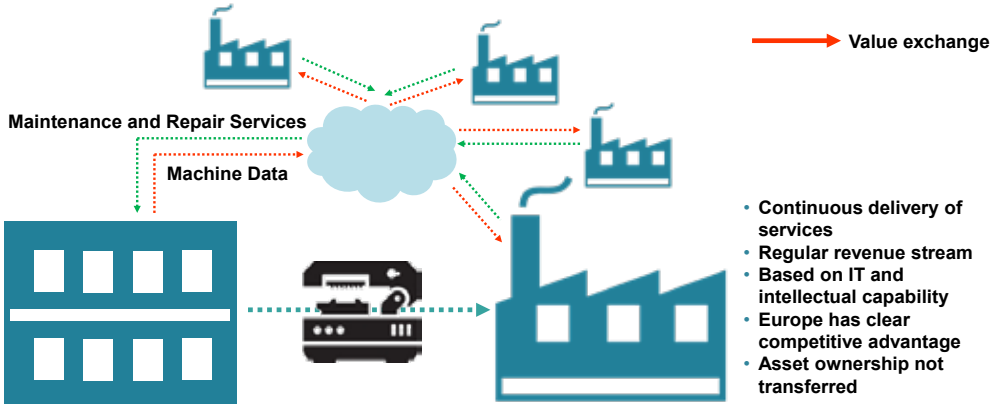
What was said

"Machine tool builders traditionally have generated their revenue on assets. Nevertheless, the manufacturing sector is changing. Collecting, storing and processing the data generated by machines will create new innovative business models for the machine tool industry."

Pascal BOILLAT
President GF Machining Solutions Management S.A.



Service-based for machine manufacturers (driven by data)



Hybrid additive manufacturing technologies

by Christian-Friedrich Lindemann, Research & Exploitation Manager and Direct Manufacturing Research Center, and
Gereon Deppe, Scientific Staff and Chair for Computer Application in Design and Planning

Christian-Friedrich Lindemann

Gereon Deppe

Additive Manufacturing provides an outstanding technological and economic potential for a wide range of industries. Particularly in the field of small series production with many product variants, the technology offers decisive advantages, such as reducing component weight, functional integration, complex parts or individualization. Today potential users struggle with the integration of this technology in their businesses. The production costs of this technology often seem too high compared to traditionally manufactured parts and many users seem disappointed with the performance of the technology. The reasons for that are manifold, but often Additive Manufacturing is considered only as an isolated technology.

The main goal of a hybrid manufacturing approach is to take two different technologies which both have assets and drawbacks and to compensate their downsides while exploiting the advantages for the optimal production solution in a more or less combined step. This can be either on a part-level when a conventionally produced base body is enhanced by Additive Manufacturing structures or on a machine-level where both technologies are combined in order to use their advantageous capabilities. This can be Additive Manufacturing's flexibility for producing complex shapes in combination with the accuracy of milling in one process step for example. This enables new part designs which would not be producible with acceptable effort by each of the technology on its own. Conventional tool builders can benefit from the fast manufacturing of tool inserts or by complex tool designs which enable new opportunities through e. g. integrated, optimized cooling structures that reduce the cycle time and produces better part quality. Overall, mass customization and small unit quantity tools can be realized much more economic with this production approach. For the conventional business AM is sometimes considered as "very advantageous wrought products". The necessity for post processing is in many cases the reason why the replacement of supply chains does not work yet, as most metal parts require some kind of traditional post processing. Therefore a better integration of traditional tooling and AM is necessary. This may be as process chains or in integrated hybrid machines. Some approaches are already on the market and have been presented at the Formnext in Frankfurt (e.g. DMG Mori or Additive Industries). Some of these approaches try to integrate thermal treatments of the parts, while others try to integrate cutting operations in order to achieve "direct manufactured" end use parts.

As the technology is still considered as being "slow", there are several suitable applications cases which cannot be realized due to economic issues. As detailed information about the

manufacturing speeds, these considerations may not be disproved easily. This can be soon overcome as there are many developments going on aiming at a higher output rate. At the same time this can be also critical due to the short renewal time of investments. On a technical level, the process stability still can be critical, affecting the part quality. Here, experience with this relatively new technology is key. For industries, where a certification is required this can become difficult to realize as there are currently no standard procedures available. But with a further technology evolution in the field of in-situ monitoring and quality assurance and maybe integrated cutting operations this will change. Additionally, multi-laser approaches will foster the productivity of Additive Manufacturing machines. Bigger build chambers will increase the quantity of possible part candidates and application fields and also higher output rates. Further material developments will support this. A multi material production is currently still an important development topic and will enable completely new opportunities. The overall industrialization of the machine operation is a development focus at the moment and will make the adoption and integration of the technology into existing processes much more effective.

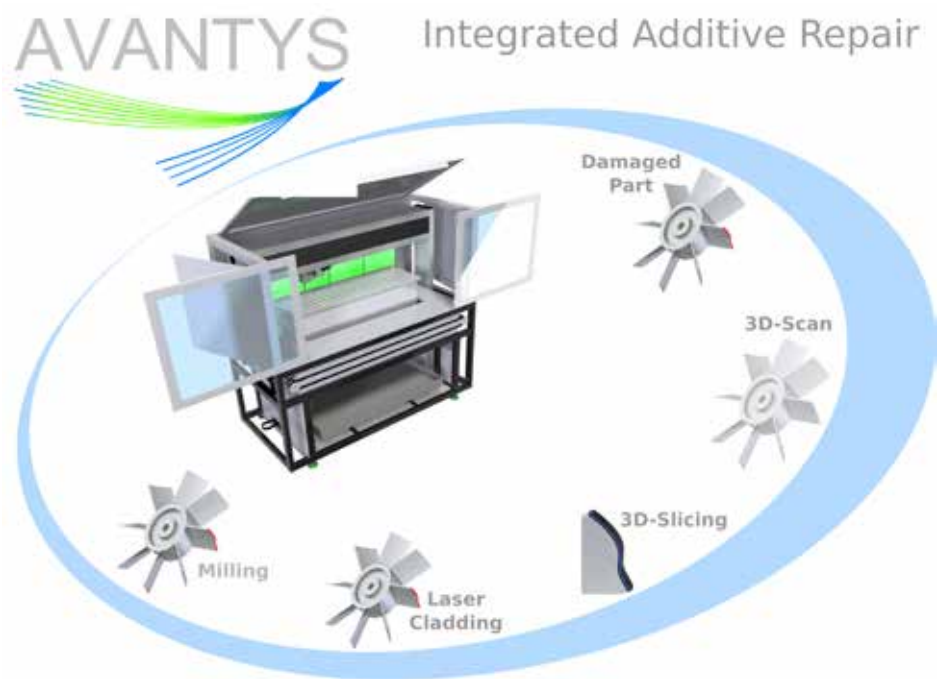
A completely new level of machining has been shown with a demonstrator in the European project RepAIR. The research project developed a control software for a 5-axis Additive Manufacturing milling machine that automatically detects the part in the machine, loads the original CAD file and compares the part's shape with the original geometry by scanning the part. It then automatically calculates the milling and Additive Manufacturing tool paths and restores the part's shape.

Companies are well advised to start analyzing the opportunities and barriers, identifying potential application field and gaining experience. Subtractive manufacturers can use their knowledge in conventional manufacturing. They can expand their competencies and gain a new business area while being at the forefront of technology development. Additive Manufacturing will not replace traditional manufacturing but will acquire its own application field. Thus, it is reasonable to have it as a part of the portfolio already in the early stages of further developments as experience is key for exploiting the full potential. ■

What was said

"By combining additive and subtractive technologies in a single set-up, hybrid manufacturing expands the range of innovation solutions, especially for production in the aerospace and energy sectors. We must encourage support for additive and hybrid technologies across Europe."

Marcus BURTON
Director Yamazaki Mazak UK LtdUK Ltd



Building a European data economy: what are the needs of European Machine Tool builders?

by Emir Demircan, CECIMO EU Public Affairs Manager

Data is becoming the most important production factor for machine tool builders. By converting raw data into insights for decision making, pioneer machine tool builders improve maintenance quality, machining performance and environmental efficiency of their products and merge the physical and cyber spaces in one.

Data-driven business models, however, are often new to many European manufactures. Many of them, particularly SMEs, are still at the early phases of understanding the scope of data-driven manufacturing. According to a study[1], 92 percent of today's 64 million machines from across the world are still not network-connected, preventing access to and use of machine-generated data. Another research[2] reveals that only less than 20 percent of the European machinery industry have already implemented new business models (i.e. platform-based, product-as-service, IPR-based or data-driven solutions) and for more than one-third, new business models are not yet a strategic focus. Against this finding, many manufacturers expect a shift in profit pools from products to services in the future.

To build an economy allowing data-driven solutions to flourish, the European machine tool industry increasingly needs a forward-looking policy approach that is technology-neutral, putting SMEs at the centre, supporting a trusted cyberspace, upgrading its digital infrastructure and minimizing the digital divide between Member States.

Early intervention by policymakers can put severe barriers against new business models

Machine-generated data is increasingly receiving attention of European policy-makers. In early 2017, the European Commission launched the communication on "Building a European data economy". The Communication puts connectivity and manufacturing at the forefront and foresees a dialogue with stakeholders, aiming at exploring the possibility of an EU framework on access to machine-generated data, including legislative and non-legislative measures. European machine tool builders underline that new business models such as predictive maintenance that are based on processing machine-generated data are new to many manufacturers, and innovation cycles in the advanced manufacturing sector are getting shorter. Introducing legislative measures at this point would put severe barriers against the digital evolution of the European machine tool industry. To remain future-proof and technology-neutral, Europe should still avoid detailed regulatory measures on the access to industrial data. The industry reminds that access to data generated by machines is defined by bilateral contracts between suppliers and users, which work for now. Also, the sector favours industry-led international standards on the access, use and protection of machine-generated data, as well as non-legislative approaches, such as guidance on incentivizing business to share and co-access to data.

SMEs need to remain high on the agenda of policy-makers

While pioneer machine tool builders and large manufacturers are already generating data-driven solutions for the use of customers, SMEs often lack the resources and know-how needed

What was said

"Data-driven manufacturing is not a hype anymore. Industrial data is a real business issue for many machine tool companies. But to convert the potential of industrial data into even greater benefits, Europe needs to put the right framework conditions in place and particular attention should be paid to manufacturing SMEs. We need a policy framework that stimulates the uptake of data-driven business models in Europe."

Thomas HEDENBORG
Group CEO FASTEMS OY AB

to unlock the value from industrial data. There are two main reasons preventing manufacturing SMEs from making use of industrial data that is already available in the machines produced by themselves. First, European machine tool industry and its workforce is traditionally composed of mechanical engineers, while data-driven solutions require new skills that are not commonly found in the sector[3]. Second, many European manufacturers face difficulties in assessing the return on investment made in industrial data and find the investment needed for data-driven solutions costly, particularly at the times of increasing price competition.

Therefore, public support for manufacturing SMEs will be essential in building a European data economy. This implies that the European framework on machine-generated data should pay additional attention to manufacturing SMEs and make sure that lock-in situations for SMEs are avoided. SMEs that form the backbone of Europe's manufacturing (80% of the European machine tool industry is composed of SMEs) require practical guidelines, training and exchange of best practices to facilitate their involvement in the new business models. To this end, identification and dissemination of best practices by forerunner manufacturers should be supported by public authorities, with the involvement of sectorial representatives. Moreover, manufacturing SMEs' access to state-of-the-art facilities should be ensured. Hence, manufacturing SMEs' link with digital innovation hubs and technology centres should be strengthened at cross-border level, so to provide companies with testing new solutions, pilot production and demonstration, consultancy and guiding on new business models, and networking opportunities with customers and suppliers.

Cybersecurity is crucial for the uptake of data-driven solutions

Data-driven economy also comes with some security concerns over the cyberspace where critical data is stored and sensitive information is exchanged among businesses along the value chain. In addition to providing opportunities, the high connectivity between machines, systems and factories creates risks of cyber-attacks. According to a study conducted by IBM, the manufacturing industry is the third most targeted sector, when it comes to cyber-attacks. In the first Stakeholder Forum for Digitising European Industry in Essen, many industrialists, including strategic actors from the aviation industry, confirmed that European facilities are increasingly receiving cyber-attacks, threatening key processes.

The advanced manufacturing industry sees any cybersecurity concerns as a barrier against investment in data-driven business models. Manufacturers firstly need to be sure that they have the full control over data and trade secrets, and no information will be transmitted to another entity in a way that they are not aware of. For instance, machine tool users possess important trade secrets that are commercially valuable on the use of equipment and the critical parts machined, providing competitive advantage. It is, therefore, a pre-requisite for Europe to remove concerns pertaining to cybersecurity.

As a key principle, cybersecurity should be integral part of the entire life cycle of smart machines, from design to re-use. To this end, risk assessment during the product design stage and tests before the launch of the product are needed. A common way of enabling this holistic approach is security by design. Under this light, European policies and funding programmes on data economy should prioritize the principle of "start with security" and pave the way for a trusted cyber environment for manufactures that are working with sensitive machine-generated data.

An advanced infrastructure is a prerequisite for a data-driven economy

The availability of digital infrastructure allowing high-speed data flow is a must for a data-driven manufacturing industry in Europe. Most of the European machine tool builders are located far from city centres and need high-speed internet infrastructure, enabling fast response time and effective communication between machines, as well as systems. According to different sources, the network of physical objects at global level via embedded devices that collect and/or transmit information will include up to 200 billion objects by 2020, hinting at the increasing importance of the highspeed internet infrastructure in Europe. Against this potential, today's internet infrastructure in the EU is only a limited extent suitable for the concepts of data economy. Given that, the data economy will be a reality for European machine tool builders if Europe upgrades its broadband network into a gigabit optical fibre network, enabling manufacturers control data in real time.

A coordinated action at EU-level is needed

Finally, no data economy in Europe can be built at national level. Every second machine tool exported in the world originates from Europe[4] and Europe's manufacturing competitiveness is increasingly built on connectivity among systems. The European machine tool industry appreciates the EU's increasing intention to coordinate Member States' regulatory and non-regulatory actions. Yet, the EU should play a stronger pivotal role and provide pan-European key principles to Member States to minimize the digital divide between Europe's nations and any diverging national regulations in the future, that would block the uptake of data-driven solutions at the cross-border level. ■

1. Cisco, Out of the Cloud and Into the Fog; 2016
2. McKinsey&Company and VDMA, How to succeed: Strategic options for European machinery; 2016
3. See the article on skills page 23.
4. See the article on markets page 6.

Government incentives for Industry 4.0

by Alfredo Mariotti, General Manager of UCIMU

Alfredo Mariotti

For the first time after decades, the Italian government has implemented a remarkable and comprehensive programme of measures aimed at incentivizing investments in technology. Measures like these have been in force only minimally and just in few countries belonging to the Eurozone.

This programme, called National Plan Industry 4.0, has been conceived to encourage the strengthening of the Italian manufacturing system, so that it can be more competitive in the international market.

The fundamental cornerstones on which this plan is based are two provisions, each of them differently supporting and stimulating the competitiveness improvement of manufacturing enterprises.

The first pillar is Super-Depreciation at 140%. Thanks to this measure that came into effect already in 2016 and was confirmed for the whole year 2017, those who purchase new machinery may benefit from an incentive to renew and increase the number of total machines installed, which turned out to be very obsolete with regard to Italian factories, according to a recent survey conducted by UCIMU. About thirteen years is the average age of machine tools within the production facilities of the Italian mechanical industry. This is the worst result over the last 40 years! The incentive consists in the possibility of depreciating 40% more than the value of the purchased goods.

The second pillar is Hyper-Depreciation at 250%. In order to take advantage of this incentive, allowing to depreciate 150% more than the value of the purchased goods, the user must buy a machine or a system that is interconnected with other systems and machines within the same factory or with external systems. The crux is thus connectivity, digitalisation and interconnection of machines and plants, which becomes essential for the next future development of the Italian manufacturing industry.

Data collection and management, creation of digital identity cards for machines, remote control, vision and control systems regarding machining processes are only a few aspects concerning Industry 4.0, which, in many cases, have already been integrated into Italian machine tools and production systems.

With this incentive, the Italian government intends to stimulate the enterprises to accelerate their growth and development process by encouraging the widespread dissemination of these technologies in Italian factories, since nowadays the same technologies are becoming fundamental in the design of machines.

The Hyper-Depreciation provision really works as an incentive to support a digital transformation of the manufacturing industry, as only investments in digital, interconnected machinery and systems can benefit from this incentive.

With regard to the other types of investments, those for replacement of obsolete machinery or for increasing production capacity, it is possible to take advantage of the Super-Depreciation provision.

What was said

"The Italian Plan Industry 4.0 could serve as a good example to other European countries to foster technological progress and innovation"

Massimo CARBONIERO
General Manager and Partner OMERA SRL

In other words, Super-Depreciation and Hyper-Depreciation are not interchangeable, but they are complementary.

In this way, the Italian government offers the Italian enterprises a set of fiscal tools capable of fostering the development of their production plants and, with a much more interesting incentive, of favouring those who are ready to invest also in an organisation change.

Industry 4.0, digitalisation and interconnection are indeed synonyms of technological evolution and of company's organisation revolution, as they actually imply a change in the way of working within the factory.

This means that new tasks, new roles, new professionalism and consequently new skills will be required, according to an approach that is and will be more and more multidisciplinary.

If we consider young people, all this implies new employment chances, for which new complex and comprehensive skills will be required.

Also for this reason, in connection with the National Plan Industry 4.0, several "competence centres"– universities of excellence, such as for example the Politecnico di Milano – will play a crucial role in supporting the education and professional training of new resources to be employed in the mid-term, within industrial realities that are completely different from those of the past.

To go back to the provisions in the National Plan Industry 4.0, it includes other measures in which the Italian machine tool manufacturers can be interested, such as the increase from 25% to 50% of tax deduction for R&D costs and the re-financing of the New Sabatini Law, granting easy-term financing for machinery purchases also on lease.

UCIMU-SISTEMI PER PRODURRE actively took part in the Working Table, coordinated by the Ministry of Economic Development, which then gave birth to the actual framework of the Industry 4.0 Plan, included in the Budget Law 2017. Today the Association is organising a series of meetings, travelling operational workshops and special professional training courses for the enterprises of the sector, aiming at accompanying the growth and development process of Italian machine tool manufacturing companies.

With this programme, the Italian institutions brought back the manufacturing industry to the centre of the political economic agenda in Italy that has started again to invest in production systems since 2014.

Now the challenge is issued and it is the companies' task to be able to take it on. The market feedback is positive: there is a great interest and the "almost sold out" exhibition spaces three months before LAMIERA, - the next trade show scheduled to take place in Milan, from 17 to 20 May, dedicated to the specific sector of metal forming - confirm the user companies' inclination to invest. ■

How we address digitisation

An interview with Paolo Streparava, CEO of Streparava SpA

Paolo Streparava

New business models, in particular data-driven services, are high on the agenda of European machine tool builders. What are your company's planned activities to this end for the near future?
I think that chances are all around us and we all should look at data-driven solutions as a real potential for our customers. They can bring top and easy to use services, that can smoothly interact with the organization at all levels. Because there is a lack of digital knowledge within the companies, an easy solution can enable a first wave of digital approach: while having anyway a high level of complexity behind the first user interface, data can be used by the most skilled technicians.

Digitisation is a long and challenging journey and might require support from government authorities. What are the concrete needs and expectations from national and European authorities to underpin digital transformation and new business models?
First of all, this is a matter the European Union needs to take care of. Companies need a clear definition of the legal framework on how the data will be shared. This is a very sensitive information and companies need to trust each other in data exchange. On the other side, there is a lot of potential value to be extracted from the data and the question of their ownership is decisive. In order to have a free market, where companies can take their own decisions on digitisation, there is a need for an "open standard" on data exchange, which is not dependent on any single actor.
An additional issue is cyber-security: companies must be reassured that nobody will be able to steal their data. I think there is a demand for ▸▸

public authority to guarantee this. Another point, where the national authorities may have more responsibilities, is the necessity for a fast and reliable industrial Internet. The new digitised companies will rely heavily on seamless data transfer with their counterparts and with the cloud. Finally, a very concrete need is being filled by the Italian National Plan for Industry 4.0: companies require some help with the great amount of resources needed to make the "long and challenging journey" of digitisation. Incentives for the acquisition of Industry 4.0 machines – like the Hyper depreciation - will encourage companies to get resources for the other investments, like reorganizing the procedures and hiring new profiles.

Many say that digital transformation starts from top management. What is your personal view on this as a Managing Director of Streparava Spa?
I'm often requested to give my opinion on digitisation and Industry 4.0. My idea is that we should focus more on the creation of value, than the impact of digitisation: we shouldn't be concerned too much about the solutions, but we should understand completely the problems and be ready to serve the market with the most innovative solution. The market is willing to pay, because it recognizes the real value of the product. As for the top management, it must consider the impact of digitisation on the entire value chain of the organization. But we should be very careful. We have already seen mistakes made in the past under the call for "digital innovation". For example, the ERP (Enterprise Resource Planning) system was considered necessary and that, if a company didn't install it, its survival on the market was at risk.

How do you engage your team throughout this times of change?
I'm in contact with my people every day. Very often I go where they work, so to understand the problems directly where they begin. We also meet at meetings where anyone can bring his problem and everyone is asked to give his idea. Being innovative in Streparava starts with sharing knowledge as well as cooperation. Moreover, we organize technical meetings where we analyze details of a situation. In this case, we start with the questions: "What value we want to create for the customer? Is the customer willing to pay for it? Does the digitisation process add any value?"

You are an active participant of various industrial associations in Italy. What roles do associations play in the digital era and how do they support manufacturing companies' transformation?
Confindustria (the General Confederation of Italian Industry) is seriously taking care of the digital transformation, as we asked it to talk directly with the Italian government on behalf of the entire manufacturing system, including services' companies. We worked out a detailed planning with the strategic actions. It's on two levels: a national one, where Confindustria is directly dealing with both the Italian and European institutions for strategic competence centers, definition of the roles, its organization, fiscal and political topics and so on. The second level involves the regional associations that are asked to work with all the related stakeholders, such as university and other associations. Now we have to put in place a Digital Innovation Hub together with the other parties and define for those DIH a specific agenda. In our Association, we have already arranged a set of services strictly related to the digital transformation. ■

Merging of the physical and digital world

An interview with Peter Dröll, Director for Industrial Technologies, DG Research & Innovation, European Commission

Peter Dröll

Our sector is evolving: digitisation, Internet of Things, etc. This has a huge impact on the technologies we use and on our business models. We would like to know if these trends, to be followed to stay competitive, are reflected in the research projects funded by the EC.

The answer is yes. We need to have a broader look at the global trends, at all the ecosystem. There is an industrial revolution going on. Big data, digitisation, new materials, embedded sensors, photonics are revolutionising the way we produce. When you look at the EU funding, these trends are clearly reflected in our priorities. Commissioner Moedas calls it "the merging of the physical and digital world". For manufacturing and the machine tool sector, we can also speak about "manufacturing as a service". But it is not just adaptation to changes. We have a good combination of continuity and adaptation. Continuity comes from two elements: firstly, the programming cycle for EU research and innovation funding lasting 2 years– and secondly, the Public Private Partnerships, where we agreed on a 7 years' roadmap. These roadmaps are a good example of how to attract private investment due to a long-term public commitment to invest in a certain area, as for instance "Factories of the Future". Regarding the funding, we should not just look at Horizon2020 but also at the European Strategic Investment Funds (Juncker Fund) which is not yet sufficiently used by KETs companies. Moreover, we need to increase awareness of banks investing in new disruptive technologies.

The findings of a study we did with the European Investment Fund are striking: only if you have a profit well above 15 million euro per year, which means that you are already very successful, will banks give you money. But it's not just about money, it's also about ecosystems. If you look at our strategy on digitising the European industry, for instance, our activities range from networking national initiatives, issuing regulation and developing skills to supporting investments. We need all these elements to be successful in the industrial transformation.

Is there any attention given to SMEs? As you mentioned, money is a problem.

If you look at the key figures, the SMEs' share in the industrial pillar of Horizon2020 is highly above average. We have a 29% of SMEs participation, so the programme is attractive to them. Moreover, 90% of newcomers are industries.

The challenges that SMEs face in the current industrial transformation are particularly high. Only 21% of SMEs use cloud computing. One in five companies is highly digitised and I think the percentage of SMEs is even lower. We have a clear responsibility to support SMEs in this transition. Our tools are what we call pilot lines or innovation hubs. Pilot lines are demonstration facilities run by universities or public research organisations or companies, open to SMEs to test their ideas in a specific and technical domain. Hubs are going one step further: they can help going to the market. Over the next three years of Horizon2020 , I would

like to fund several of these hubs, especially so SMEs across Europe can benefit from new sciences and technologies. There is one element which is particularly important and it's about business models. If we compare ourselves with the USA, we are not doing too badly. But the USA are excellent in innovative business models. If you have a great product or a fantastic technology, we in Europe tend to think that the market would love it and invest. But innovative business models are equally important to be successful in existing and to create new markets.

So, what can we do under Horizon2020? We started a project for innovation in business models: it's called "Business Make-Over". It's a public funded project, open to every company. It offers simple ways to check what kind of business model innovation you could use and which one you can adjust to your company needs. It's an open website with an active forum, information and documentation. Innovation of business models often comes from transferring information from one sector to the other.

From these projects, does the European Commission take some lessons, in order to adapt the regulatory framework?

The hubs are a direct consequence of lessons learnt and of previous investments. But we want to go further and use them for wider policy. We published a paper on "Better regulations for innovation-driven investment at EU level" a year ago. Contrary to the overall perception that legislation is the biggest barrier to innovation, it often turns out to be a driver, notably if we talk about energy efficiency and environmental performance. The biggest barrier was uncertainty: how regulation is applied. So, we are now testing the Innovation Deals, where we commit with all relevant authorities to establish what is allowed and what is not allowed under a given legislation. We're testing this in the field of environment. I would want manufacturing to be one of the next areas.

Can you share some success stories?

With great pleasure! Optician2020 is about 3D printing frames for spectacles: opticians can produce the frame on the spot and adapt it to the needs of the client. Currently most frames are produced outside Europe and we hope to bring back production through this project. It's a high-tech product combined with a new business model. Another example more focused on manufacturing as a service, is Manutelligence, a platform where we provide support to companies: Rolls-Royce does not sell engines anymore but flight hours. Manutellingence covers a range of sectors, for instance ship builders. Customers can go through a virtual space showing the future cruise ship, to visualise how a compartment will look like. The customers, who will buy the ship, will see the ship, explain their needs and the design can be adapted on the spot. This is a big change that we're noticing everywhere: users' direct involvement in the production process.

These are just small examples. Manufacturing in general is the European strength. We are global leaders, including in the area of machine tools production. Perhaps we have the impression that manufacturing is declining. We have indeed examples of companies closing, like Caterpillar recently in Belgium. But: industry is indispensable for the future of Europe. One of five jobs is in industry. And, if you look at medium and high-tech industries, employment is steadily increasing. This is a strong basis for a promising future.

Indeed, 40% of MT production is still European and new technologies, like Additive Manufacturing, are creating jobs.

Yes, technologies have led to more jobs than they replaced. All this goes hand in hand with skills development. We need constant learning because all the predictions say that between 40-60% of today's jobs will no longer be available in the next 30 years. The trend is so clear that we need to adapt. ■

Digital transformation of European industry: a recognised yet untapped opportunity

by Michael Berz, Policy Officer for Digital Transformation, DG Internal Market, Industry, Entrepreneurship and SMEs, European Commission

Michael Berz

European companies are increasingly adopting digital technologies, but there are still high disparities between EU countries. Also the new wave of technology adoption will be even more challenging. These are the compelling findings presented by the European Commission in the Digital Transformation Scoreboard 2017.

For EU and national policy making, it is crucial to understand differences in digital transformation between Member States and sectors of the economy. It has become more and more important to understand the impact of digital transformation on enterprises' performance, how the enterprises' environments influence their innovativeness, and how policy measures can contribute to making innovation happen. This is why the Commission issues the Digital Transformation Scoreboard. Its objective is to assess and monitor the performance of the 28 EU Member States in the digital transformation of their industries and enterprises. The Scoreboard survey provides evidence and key insights on the level of digitisation in the automotive, mechanical engineering and healthcare & pharmaceuticals sectors.

The vast majority of European companies have adopted a first wave of digital technologies. 75% regard digital technologies as an opportunity and 64% of companies investing in digital technologies have generated positive outcomes. The adoption of digital technologies has enabled businesses to reach strategic impact in terms of growth through the development and commercialisation of new or improved products and services, the conquest of new clients and markets, and the conversion of existing clients towards new products and services with higher added value. Nevertheless, many SMEs still struggle to embrace the Industry 4.0 revolution.

Mechanical engineering: a slow digital adoption pace

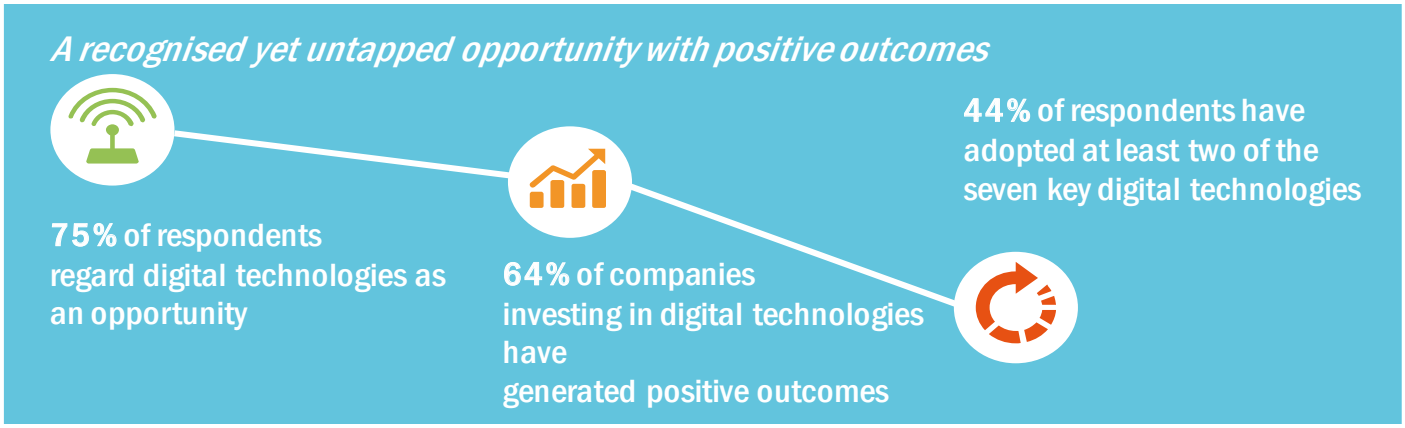
The pace of digital adoption processes differs quite significantly across industries in Europe. In the mechanical engineering sector, only 30% of businesses are aware of the importance of the digital economy and have already integrated specific digital technologies such as social media, big data analytics, cloud technology, mobile services, cybersecurity solutions, Internet of Things, and robotic and automated machinery. Considerable disparities also prevail when it comes to the specific technologies adopted.

Digital technologies: a threat or an opportunity for job creation

The implications of digital technology integration by businesses on the EU workforce structure remain fairly hard to quantify and to anticipate with certainty, but a positive impact on jobs can be observed: 18% of mechanical engineering companies have increased their number of employees and 60% have managed to maintain their number of employees. However, about 1 in 3 companies struggles to find the necessary skills to exploit the opportunities offered by the digital era. There is no doubt that digital transformation will disrupt the labour market, but it seems that specific tasks rather than occupations are at risk of automation.

Digital Officers are still not perceived as critical for digital transformation

Digital transformation does not seem to follow a top-down strategic perspective. Only a small share of businesses (12%) in mechanical engineering



What was said

"One of the key challenges against digital transformation of manufacturing SMEs includes difficulties assessing the potential return in investment. We can overcome this bottleneck by sharing best practices of digitisation from the advanced manufacturing industry with the help of trade associations at national and European levels."

Andoitz KORTA
General Manager KORTA GROUP

appointed a digital leader such as a chief digital officer. An important share of businesses confirmed having integrated new digital technologies within their innovation strategy, while almost half (49%) recognizes having set up collaborative processes to source ideas and apply these technologies. Young businesses tend to prefer internal collaborative processes to harness the implementation of digital transformation rather than relying on external ventures with third parties.

Investing in the integration of digital technologies and accelerating access to technology & business support structures
74% of mechanical engineering companies made investments to adapt their infrastructure, organisation and governance approaches, but the capacity of European businesses to raise funds for the implementation of their digital transformation strategies is quite limited: only 18% raised funds to invest in digital transformation and public investment only adds up to 5% of annual revenues. Access to technology infrastructures and support services are key to help business leaders ease and accelerate technology adoption and commercialisation, but only 7% in the mechanical engineering sector have benefited from such supports, so access to support services is still very low.

Strategic impact of digital adoption on company performance
More than 80% of businesses have benefitted from strategic impact in terms of growth. In detail, 26% gained new clients, 22% moved their customers towards new products and services and 19% brought innovative or improved services and products to market. 38% highlight that their annual turnover grew by up to 20% during the last three years, and 47 % recognised higher efficiency by up to 20% of productivity gains. Operational costs increased by up to 20% for 40% of the companies, probably due to the fact that companies have to ensure that their organisation, infrastructure, and operational processes are aligned with the organisational requirements of digital transformation.

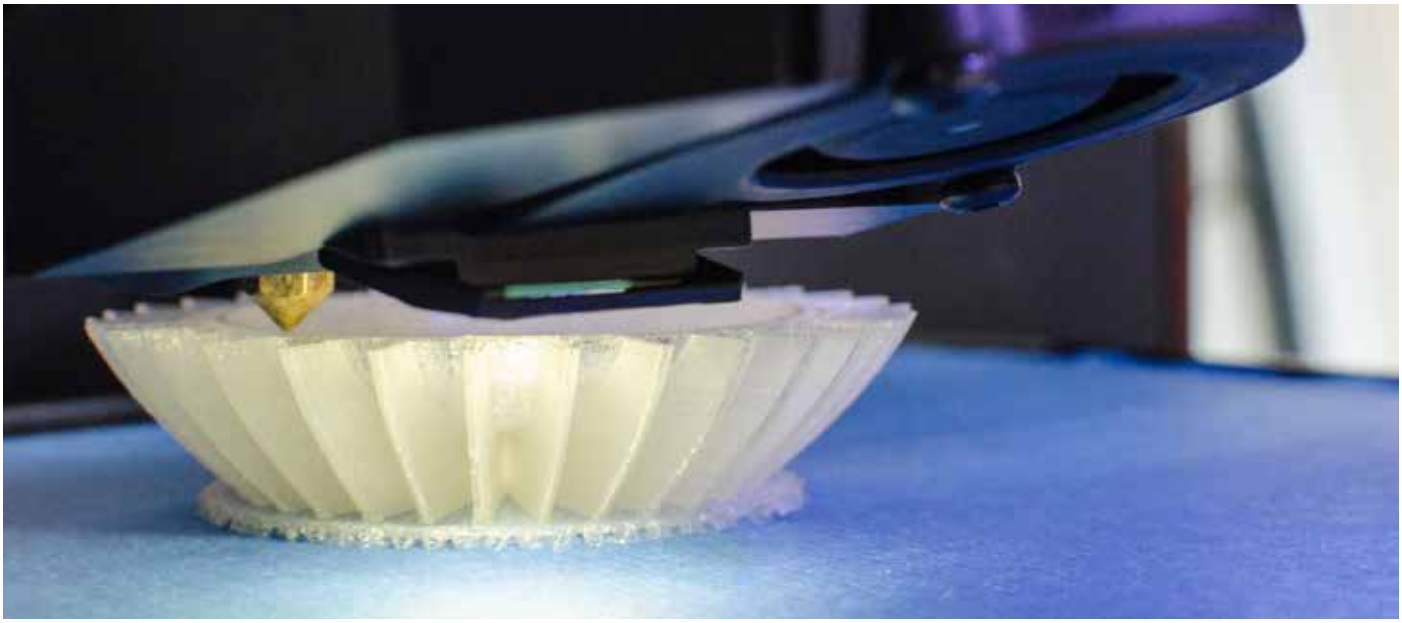
National initiatives for digital transformation: need for better cooperation
First analyses of various Member States initiatives on digitisation show an interesting and fragmented picture with different strategic approaches across Europe. Results demonstrate that there is definitely a need for more and better cooperation between national initiatives in Europe. With value chains increasingly distributed across Europe, the further digitisation of industry brings challenges that can only be resolved through a collective EU-wide effort. Better cooperation could positively help to speed up the transformation from strategic design to implementation, to commercialise R&D outcomes, to bridge the skills gap or to internationalise beyond the EU. The 'European Platform of national initiatives on Digitising European Industry', launched by the Digitising European Industry (DEI) Initiative at the Digital Day in Rome on 23 March, will ensure a continuous EU-wide dialogue between representatives from the Member States, industry, employers and employees and stakeholders from the full digital value chains.

Completing the implementation of the Digital Single Market (DSM) Strategy will remain high on the agenda of the Commission in 2017 and beyond. As part of its overall strategy, the Commission supports the deployment of Digital Innovation Hubs, aimed at offering better, more coordinated services to EU businesses to help them digitise their business. We also stimulate joint investments into industrial modernisation. To help create regional partnerships for investment between public and private actors, we have set up a Smart Specialisation Platform on Industrial Modernisation. The action "Transforming regions and cities into launch-pads of digital transformation and industrial modernisation" will support cities and regions to build up innovative and digital ecosystems and reinforce pan-European networking with the view to develop cross-regional partnerships in digital transformation. WATIFY, our pan-European awareness campaign supports the technological transformation of European SMEs and supports regions and cities in their digitisation efforts. Last but not least, our Start-up and Scale-up Initiative is part of the strategy to make a deeper and fairer single market, creating opportunities for consumers and businesses and helping SMEs and start-ups to grow. ■

Disclaimer: the opinions expressed in the article are given in a private capacity and may not necessarily represent those of the Commission.

A European strategy for additive manufacturing

by Vincenzo Renda, CECIMO Projects Coordinator



A great variety of emerging technologies have been sprouting up over the last years and are being adopted at factory level. Among these, additive manufacturing (AM), or so-called 3D printing, comes as one of the most relevant. AM pushes the boundaries of parts' design, makes easier the production of many different parts at no extra cost, minimizes manufacturing footprint and reduces inventory costs. Expectedly, a new era will be heralded to those supply chains capable of employing AM.

Signals that additive techniques are not just hype are multiple, and go beyond figures pointing at the continuous growth of the AM market. In its metal segment, established manufacturers mastering conventional processes remarkably decided to embark on additive machine production. Their investments to enter this industry can be surely interpreted as a strong endorsement of the AM potential for series production. In sectors like the aerospace, the use of additive techniques is increasingly common for generating engine components.

Europe is well-positioned to capitalize on the competitiveness gains brought by this technology. Reliant on strong engineering know-how, it has been so far a key actor in pushing AM forward. Yet, the adoption of AM by European end-users' industries is currently slow. Indeed, cost-effectiveness represents a relevant consideration for manufacturers, and remains reasonably inter-connected with the speed at which technical developments will be achieved. Gradual reduction of the price for additive equipment will, over time, facilitate the industrialization of AM in Europe. But technical considerations are not the only ones to bear in mind to assess the pace of its uptake at factory level. CECIMO's studies reveal that AM industrial deployment can be boosted by addressing existing policy measures, the regulatory ecosystem as well as the business context in Europe. All in all, policy-makers must legitimately ask not only what they can do to accelerate technical advances in AM, but also where attention must be put in the non-purely technical domain. The results of the studies point to a clear conclusion. To get into the European industrial mainstream, AM would greatly benefit from a robust, coordinated strategy at European level. A decisive EU approach would stimulate innovation at technical level and reduce further commercialization barriers for this technology.

CECIMO identified in total 7 areas where an EU strategy would speed up AM uptake. These are: education and skills, standardisation, IPRs, R&D, access to finance, ICT and health and safety regulations.

First, skills are a critical factor for the use of additive machines. The EU must support a greater involvement of industry actors in the educational context. As this is a fast-evolving field, their engagement will be critical for educators and VET[1] providers to be updated on the latest technological developments. In the short-term, skills gap may be successfully addressed by tools like an EU-wide online database conformable to

What was said

"Additive manufacturing has the potential to create a wide range of highly skilled jobs on the shop floor. We need to support it in becoming mainstream and an integral part of engineering and design."

Anthea McINTYRE
Member of the European Parliament

privacy regulations, where competent workers can be identified and move across borders. For VET, the EU should encourage sharing best practices between countries, so to make teaching programmes more effective.

Second, European policy-makers should favour the coordination of standardisation efforts. The industrial uptake of AM critically hinges upon common standards. Streamlining the interaction between the existing technical committees would be beneficial to a faster qualification and certification of parts.

Third, the EU should tackle the lack of clear interpretation in areas of the IPR framework, such as infringement and liability. Issues, like design rights and the extent of copyright protection of a CAD file, need to be clarified. In the patent field, too, reduction of costs would incentivize patent applications. Studies show that, due to the high costs, EPO[2]-granted patents are validated only in about six or fewer of the largest EU countries[3].

Fourth, institutions at European level should ensure long-term funding commitment to AM technologies, especially as discussions over the post-Horizon 2020 multi-year financial programme loom ahead. Greater resources will also be needed for high-TRL[4] level projects. Europe excels in basic research, but doesn't bring so many research findings into the market.

Fifth, new end-users of additive machines, especially those with limited resources, would emerge if access to finance conditions improved. European SMEs receive five times less funding from capital markets than in the US. Initiatives such as a "Pan-European Venture Capital Fund-of-Funds" are welcomed to narrow this gap. They aim at coupling more EU public sources with greater volumes of private capital. This would strengthen the yet underdeveloped European venture capital market.

Sixth, European authorities should encourage security in storing, transferring and executing AM models and data throughout networks. The recent EU cybersecurity directive is a first step in this direction. And in line with the Europe 2020 strategy goals, policy-makers should also foster the development of fast broadband.

Seventh, EU-level institutions must bring regulatory certainty in health and safety aspects linked to the use of additive machines. Issues, such as storing metal powder and managing elements supplied with high voltage during maintenance, require clearer legal provisions. Indeed, the adoption of new rules from scratch will not represent the only possible option in all circumstances. Existing provisions for traditional machines may prove suitable also for additive ones. If that were the case, the path of AM adoption by end-users will be smoothed out. ■

1. Vocational education and training.
2. European Patent Office.
3. Granieri, M. & Renda, A. (2012). Innovation Law and Policy in the European Union: Towards Horizon 2020, p.125.
4. Technology readiness level.

Scoring on the ecodesign

by Kamila Slupek, CECIMO Manager Technical Regulations

Ecodesign is an overarching word for the various legislative proposals that are leaving European Commissions desks. It got reflected in the Circular Economy Package adopted in December 2015, as well as one year later in the Clean Energy for All Europeans Package, known also as Winter Energy Package 2016. One may get an impression that it is used even easily too but the fact is that with highly ambitious environmental targets of reducing the EU greenhouse gases emissions of 40% by 2030, nobody has an excuse but to perform at its best. And so does the machine tool industry.

What was said

"The European machine tool industry covers the whole machining spectrum and thus addresses a huge number of varied applications. The sector exports over 50% of its products and thus is very global. European machine-tools are highly customized, very precisely aligned with costumers' needs. Our highly engineered machining solutions also substantially contribute to our customers' global manufacturing environmental performance. In consequence, we need a "soft approach" linked with international standards when it comes to eco-design dossier in the machine tool business."

Jean-Camille URING
Chairman AddUp and CECIMO Past President

Efficient production worldwide as a hallmark
People not familiar with the machine tool industry may not know that our hallmark is efficient production worldwide, i.e. highest productivity with a minimum use of resources. Each new machine tool generation consumes less energy and auxiliary supplies per produced workpiece. Enhancing production efficiency on a continuous basis is an everyday core commitment for both machine tool industry and its customers. However it cannot be neglected that the sector is extremely heterogeneous and heavily faceted, exporting over 50% of its products.

Where does the ecodesign dossier for the machine tool stand at?
Work on the ecodesign for machine tools started as early as 2009. Gathering more and more details over this group of extremely complex products did not bring clear, universal answer. In fact it is worth to recall the conclusion from BIO by Deloitte (BIO), a consultant who was preparing the study to establish the 3rd Ecodesign Working Plan[1], who clearly expressed doubts against applying the Energy Related Products Directive (ErP Directive 2009/125/EU) to complex industrial products. The justification was the experience gained with machine tools and industrial furnances. The consultant claimed that the conceptual framework of the ErP Directive is unsuitable for complex industrial goods as in its current state, it is rather aligned to consumer goods and mass-products articles. Nevertheless the works were advancing and the European Commission (DG GROW) launched a study on applying a point system that could relate to complex industrial products under the ecodesign requirements.

Point system study[2]
The study started in December 2015 and up to now there were two stakeholders meeting organised (June 2016 and March 2017). Initial timeline to conclude the project was expanded from February to end of April this year.

At first the consultants[3] prepared a report reviewing all the existing point systems schemes, however some of them were not adequate to make a good reference to the two products groups that are under the scope of this study, namely enterprise servers (also called Data Storage Devices - DSD) and machine tools (MTs).

The following report focused on developing the point system approach method for those product groups and the next ones presented study cases on each of them. The Commission and consultants repeatedly underlined that the case studies are illustrative and informative, looking at archetypal problems - not a definitive recipe for 'where the Commission will go next'.

Machine tool industry reaction to the case study is that it doesn't demonstrate a full real life complex machine tool therefore missing an approach how to deal with variants (i.e. different spindle power, modified drive systems, different coolants units, etc.). In fact if those variants would have to be analysed in a way presented by consultants the effort for machine tool builders, who built largely customisable machines, would increase exponentially. Subsequently, the whole method and all calculations are based on the fact that modules have to be assessed via measurements. However, the measurement and other valid and reproducible assessment is often not possible especially at the early stages like design, thus making method not applicable in the field. Besides that, the energy impact was referred to as a standalone criterion without reflection on the cost, productivity and quality of produced output which are crucial for the machine tool users and cannot be neglected.

The consultant proposed as well to introduce various forms of verification of introduced measures via: self-declaration (allocated the lowest weighting factor: 1), internal documentation (medium weighting factor: 2) and third party certification (maximum weighting factor: 3). At this moment an immediate reaction is that rating the realised energy efficiency feature three times higher when it is certified by a third party than when it is declared by the machine tool manufacturer would cause a major discrimination. Doing less but getting more credit for paying third party would rather establish a new business model for those providing certificates than it would contribute to the aim of the ecodesign directive. Lastly, the method referred as well, albeit not correctly to the ISO 14955 series on ecodesign for machine tools what triggered also reactions from the ISO Technical Committee TC39 where the standard is developed.

ISO 14955 series

In the view of the above it seems that it could be the easiest if the consultants' efforts would be replaced by the prescriptions of the ISO 14955 standard. Unfortunately, there is still a lot of work to be done before the standard will be completed. Already published Part 1 (design methodology for energy-efficient machine tools) underwent editorial changes due to the fact that the woodworking machine tools joined the scope. Good news is that Part 2 (methods for measuring energy supplied to MTs and its components) will proceed to the publication as the official international standard. For the Part 3 (principles for testing metal cutting MTs with respect to energy efficiency) and Part 5 (testing of woodworking MTs) 2nd working drafts are being prepared. Part 4 (principles for testing metal forming MTs) will go to the stage of the 2nd DIS (draft international standard). The next meeting is foreseen in September in the UK.

Way forward

The Point System Study will perhaps encounter preparation of an additional task that would be running a real case study on data storage devices/machine tools as the consultant claimed to have some additional funding left in the project budget. Another challenge is also a translation of the method into a quantifiable system that could be used by the market surveillance authorities. How the final result of the study could be translated or implemented in any ecodesign legislations, remains a question mark. In general it seems highly probable that the Commission would be moving towards proposing ecodesign implementing measures for machine tools. At first setting a 'soft' approach comprising of information requirements and material efficiency aspects. Linking to currently developed ISO14955 standard could of course be envisaged but it depends on the progress achieved.

In any case any proposal would have to go typical regulatory path: scrutiny and potential amendment via the Consultation Forum and the Regulatory Committee. Lastly, it is worth to mention that the Commission still haven't finished its Impact Assessment that is conditional to propose the way forward that by all means shall be supportive and not detrimental to the machine tool business. ■

1. At that point in time the 3rd ecodesign Working Plan had a timeframe of 2015-2017, however due to some delays in the process it was changed to 2016-2019.
2. https://points-system.eu/welcome
3. Consortium consisting of VITO, Waide Strategic Efficiency, Fraunhofer, Viegand Maagøe and VHK - Van Holstelijn en Kemna

Overview of the MT industry in the USA

An interview with Douglas Wood, President of the Association for Manufacturing Technology (AMT)

Douglas Wood

What is the current state of the MT Industry? How did you wrap up 2016 and what's looking good for 2017?

While the market for capital manufacturing equipment experienced a down year in 2016, other positive indicators for manufacturing have begun to emerge, suggesting an upturn in 2017. The PMI from the Institute for Supply Management had its sixth consecutive month above 50, indicating expansion in manufacturing. Capacity utilization for manufacturing has made strong improvement over the last several months. Cutting tool consumption has been on the increase, an indicator of expanded manufacturing activity, while several major capital investment projects have been announced, including major multimillion-dollar expansions from Toyota and Pratt & Whitney.

As for USMTO trends, what has been happening with ebb/flow of equipment? How is the regional activity and is there an increase in automation?

In the overall market for capital equipment, horizontal machining centers continue to expand their share of total market for manufacturing technology and have nearly supplanted transfer lines in all but the highest volume or most unique production situations. Presses enjoyed a renaissance throughout the second half of 2015 and all of 2016 as servo motors became a dominant trend in mechanical presses, leading to order backlogs for the technology. The expansion was driven by some of the new materials offered for consumer products such as car skins and stainless steel appliances. For that reason, the retrofit business is booming as customers waiting for new presses with servo motors work to get their old products fitted with servo motors while they wait for delivery on new equipment.

There has been an uptick in replacement equipment investment from the job shop industry, and capacity expansion jumped at the end of the year. This is significant, as the job shop sector is often first to respond to a recovery in manufacturing.

For the regions tracked by the U.S. Manufacturing Technology Orders report, the East North Central remains the dominate region for manufacturing technology orders and shipments, but the Southeast is the fastest growing thanks to its diverse market in aerospace, HVAC, medical equipment, automotive, and appliances.

Meanwhile, the Southwest region is edging back with increased activity in the energy sector but greater growth in automotive, food processing equipment and consumer electronics. The West made a significant move in growth over the past quarter though still short of historical averages.

What was said

"Globalization has been one of the key drivers of growth for the European machine tool industry. Our supply chain is getting diversified with actors from across the world. Both in Europe and in key industrial markets, machine tool businesses need public policies supporting free trade and foreign investment."

Selcuk BAYDAR
Chairman
EAE MAKİNA A.Ş.

As for MTConnect, what has been the impact of the standard and OPC UA companion specs?

Although both MTConnect and OPC were conceptualized to serve global manufacturing technology markets, adoption was highest for each in their respective home markets. At this point, demand for digital manufacturing is undeniably worldwide; thankfully the groundwork for implementing OPC UA and MTConnect together was laid years ago with the companion specification model. The OPC UA framework and MTConnect are both growing wildly in popularity and demand for each technology reinforces demand for the other.

The OPC Unified Architecture (UA) is an overarching framework for integrating many other standards and specifications, a concept that was ahead of its time in manufacturing when OPC UA was released in 2008. OPC UA, as with any framework, is broad-reaching but shallow in scope; it depends on standards like MTConnect to provide detailed data for specific industry verticals.

OPC UA doesn't provide any data dictionary (aka semantic definitions) for manufacturing equipment, but MTConnect does. Facilities with existing OPC installations use MTConnect to supply more robust, detailed data without having to write custom, one-off definitions and translations for every piece of equipment. Those custom definitions and translations aren't a big deal when there are only a few pieces of equipment, but are prohibitively expensive when there are more machines. MTConnect avoids that expense.

What have the new administration and Congress been focused on in terms of U.S. manufacturing?

Consumer confidence soared in the aftermath of the election, reaching a 17-year high in early March. Small business confidence also surged on the President's promise to enact fundamental tax and regulatory reforms. President Trump issued two executive orders aimed at regulatory reform immediately upon taking office, and the House of Representatives passed the REINS Act, which would require that regulations with an impact of more than $100 million be approved by Congress before they take effect.

Meanwhile, the first efforts toward tax reform hit a roadblock even before legislation has been introduced due to disagreements within the Republican Party on the border adjustment included in the proposal. Under current law, U.S. corporations pay one of the highest marginal tax rates in the world. The tax reform plan under consideration would dramatically lower rates and would move the United State to a territorial, border adjustable tax system comparable with the rest of the developed world. President Trump has criticized the border-adjustment provision as too complicated but has not offered an alternative.

New legislation that can strengthen U.S. manufacturing has been introduced on Capitol Hill. Members of the House and Senate manufacturing caucuses are seeking to establish a U.S. Chief Manufacturing Officer in the Executive Office. The bipartisan, bicameral America's Small Manufacturers Act aims to help small manufacturers obtaining greater access to credit. Finally, the Energy Savings and Industrial Competitiveness Act would encourage energy efficiency through stronger building codes, business initiatives and other measures.

It remains to be seen whether the early action in Washington will deliver tangible results that lead to a stronger manufacturing sector and increased economic growth. ■

The strategic framework for additive manufacturing deployment in Europe

by Dr Paula Queipo, Director External Relations, Parque Científico Tecnológico de Gijón

EUROPE is on the global race of Additive Manufacturing (AM). Both at political and industrial levels, it possesses great potential to become a world leader in the development and deployment of these technologies. However, despite the existing ecosystem, support and capabilities, the global picture for European competitiveness is being threatened, due to aggressive strategies and important investments made by other countries.

In view of this, Europe needs to put together the fragmented AM community, combine its resources and capabilities, and act in a coordinated manner. In order to do so, the effective implementation of a clear European AM strategy for the short, medium and long term with concrete objectives is needed.

"AM-motion" H2020 project came up to contribute to this target and it tries to answer the following questions:

- How to better use the available knowledge?
- How to keep on going from technology to manufacturing?
- How to capture the value and gain competitiveness/leadership?

Key words are:

- to provide clear directions and goals
- to accelerate smart networking and cooperation.

These aims require the development of a common vision that goes beyond technology aspects, identifying competitive advantage, bridging complementary capabilities, setting strategic priorities and making use of smart policies to maximise the knowledge-based and business development potential.

Paula Queipo

The approach includes the development of a roadmap describing existing bottlenecks on both technological and non-technological aspects (i.e. standardisation, education…) that can constitute barriers to AM adoption and exploitation, around specific value chains for the health, aerospace, automotive, consumer goods, electronics, energy, industrial equipment and tooling, and construction sectors.

Moreover, a one-stop shop for mapping the AM ecosystem in the form of e-tool has been created and it is being populated. The tool combines a project, stakeholders and regions database with cluster functions along sectors, value chain segments (i.e. modelling, design, materials,...), AM process and materials. It is free to use and will be maintained after the project ends.
Critical for the project success is the involvement and engagement of players, especially from industry. In fact, the project, coordinated by the Spanish technology center PRODINTEC, counts three key industrial partners in the field: Siemens, Airbus and Materialise.

Among the other activities, five Experts groups will be created and involved in different tasks and events of the project. Furthermore, the lack of industrial best practices that can motivate the implementation of AM in more traditional sectors or investment on these technologies will be addressed with the development and validation of a set of success models for business collaboration.

Finally, AM-Motion intends to encourage social and market acceptance of these innovative technologies by wider dissemination, availability of educational tools (mobile application-App) or skilled-based training activities, as a summer school for students. These are just some examples of the coming outcomes from this project to the whole AM community and beyond. ■

In AM-motion, we connect, because AM Matters!

More info: www.am-motion.eu

What was said

"Additive production methods fit well with the needs of the aircraft sector. But there are still bottlenecks, like in the qualification and certification of additively manufactured parts, which in part hinder the benefits in time saving that this technology offers. By laying out concrete proposals to develop common standards and tackle other barriers, AM-Motion looks into core issues of the additive manufacturing debate in Europe."

Ignacio Zamora GÓMEZ
Head of Airframe RFE Research & Technologies & ALM at Airbus

What was said

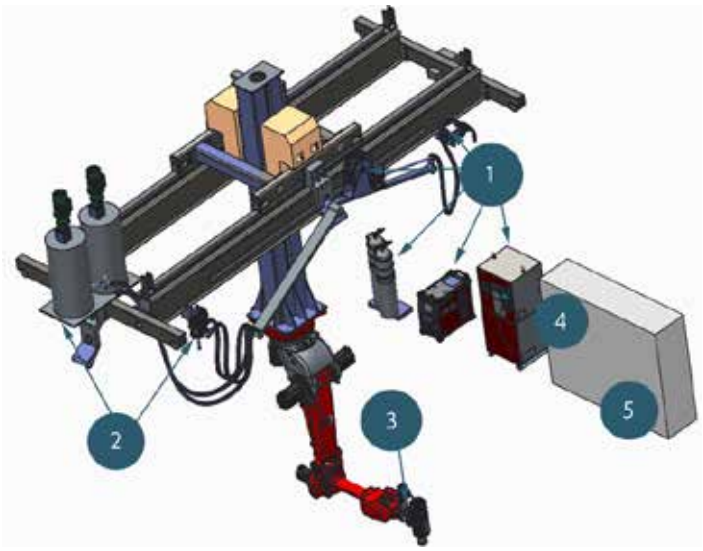
"There is a need to collect more market intelligence for the European additive manufacturing sector. Europe has still a large reservoir of untapped potential in mature and less mature application areas. Getting a sense of where we are really standing today is very helpful for the industry and the policy community. AM-Motion is certainly a helpful tool to serve this purpose."

Michel JANSSENS
Researcher at Materialise

This project is co-funded by the European Union

KRAKEN: the unique hybrid automated machine

by José Antonio Dieste, Engineering Manager, AITIIP Centro Tecnológico



1-Additive Metal Equipment
2-Additive Polymer Equipment
3-Substractive manufacturing head
4-System controller
5-High level control interface

Cracking the details

In the KRAKEN project, new additive technologies, which target large areas and use aluminium grades as well as thermoset materials, will be validated at the lab scale and then integrated for demonstration in industrial relevant environments.

Moreover, KRAKEN will collaborate to the consolidation of the hybrid manufacturing value chain through a consortium selected with the aim of linking research results to technological necessities in the fields of software, monitoring, automation, materials, standardization and end-users.

The future success of KRAKEN, in obtaining large, finished, functional components directly from the Computer Added Design (CAD) in only one machine, requires working on several technological challenges, which can be summarised as follows:

- Creation of the high effective additive system for large metal parts by developing AMHT (Additive Metal Hybrid Technology) for aluminum grades
- Preparation of new polymer-based additive manufacturing system for large parts allowing formulation of new materials.
- Optimization of the removal rates and accuracy, requiring new tools and high speed milling concepts.
- Adaptation of the machine behavior to the specific material or situation supported by sensors and robotic controller.
- Creation of new algorithms in CAM systems for hybrid manufacturing, including planar horizontal layer strategies, and new direct 3D free-form approaches.
- Full integration, validation of the all-in-one KRAKEN machine and its demonstration in three real case industrial scenarios, involving automotive and construction sectors.
- Definition of commercial paths and strategies (standardization requirements, market analysis, users acceptance, green procurement procedures, regulatory issues) for the implementation and exploitation of KRAKEN.
- Demonstration and quantification of savings on raw materials and energy due to the efficiency of the novel hybrid manufacturing processes.

Machine tool industry explores additive manufacturing

Participation of various relevant businesses is the key strength of the project. KRAKEN consortium brings together partners from the industry (having a good balance between large companies and SMEs), research organizations and industry association representing machine tools industry.

The interest of the latter one in participating to the project is driven by the fact that the machine tool industry has always been looking ahead and finds R&I-generated solutions as a good recipe for the future development of its companies. Additive manufacturing is one of the Key Enabling Technologies (KETs) closely followed by machine tool manufacturers because it can lead to increased efficiency, accuracy and speed, as well as reduced costs and environmental impact in line with the expected results. Hybrid machines, increasingly demanded, offer additional possibilities by marrying subtractive and additive manufacturing, and facilitate production of geometrically complex parts.

Expected results

The future prediction is that the KRAKEN machine will be an affordable solution for the customised production of large size functional parts. It is expected to see a decrease in time (40%) and cost (30%), and an increase of productivity (at least 25%) in comparison to the typical manufacturing. Moreover, a 90% reduction of the required floor space is estimated because the machine will include a ceiling installation broadly used in the industrial applications. ■

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José Antonio Dieste

This project is co-funded by the European Union

3D PRISM
3D Printing Skills for Manufacturing

3D priting skills for manufacturing

by Dr Graham Small, CPD Training Manager, AMRC, University of Sheffield

The 3DPRISM project is funded by the European Union's ERASMUS+ programme and has the objectives:

- To support VET provision on 3D printing skills with guidelines, resources, OERs and a hands-on training methodology.
- To identify new occupational profiles in the manufacturing sector, to facilitate & accelerate the integration of new skills and qualifications in VET.
- To contribute to the implementation of EU policies on qualifications, transparency, mobility and a European industrial renaissance, creating secure & sustainable jobs.

The project is led by the UK's University of Sheffield Advanced Manufacturing Research Centre Training Centre (AMRC) with consortium members from Belgium (CECIMO), Spain (FLORIDA), Greece (EXELIA) and Italy (CIMEA). It is scheduled for completion in February 2018.

Using a methodology developed early in the project, an extensive survey was made of the requirements of industrial end-users across Europe. Personal interviews, focus groups, on-line questionnaires and desk research were used to define occupational profiles for technicians operating 3D Printing technologies at entry level and experienced level. Skills, competencies and knowledge required by these two categories of technician have been defined as a basis from which to prepare suitable training materials to be used by VET providers across Europe. These requirements have been evaluated against existing EQF & ESCO frameworks.

In late 2016 a survey was made of all existing training materials and other documentation suitable for the preparation of on-line e-training modules to meet the needs identified in the earlier training requirements survey. These materials are now being used to construct a full suite of e-training modules covering the wide range of additive manufacturing processes, materials, software and hardware variants currently used in industry. These modules will be incorporated into a massive open online course framework (MOOC) by August 2017. A programme of demonstration / evaluation workshops is foreseen in the UK, Belgium, Italy, Spain, Greece & Germany in the final quarter of 2017. ■

For further details of the 3DPRISM project, please visit our website at http://3dprism.eu

Graham Small

Co-funded by the Erasmus+ Programme of the European Union

Technology Industries of Finland

Technology industry is the largest and most important business and export sector in Finland, creating the basis for the Finnish welfare state. The technology industry makes up 50% of Finnish exports and 70% of R&D investment in the private sector. The sector employs almost 280,000 people directly, and 700,000 people in total. This equates to about 30% of the entire Finnish labour force.

Technology Industries of Finland is the lobbying organization for the sector and its member companies. We promote competitiveness and the operational preconditions for the technology industry, which comprises five main sub-sectors: Electronics and electro-technical, Mechanical engineering, Information technology, Consulting engineering and Metals industry. The federation was established already in 1903 and has today about 1,600 member companies.

Branch groups and associations
The Federation's branch groups and branch associations form an extensive collaborative network among our members. We currently have 10 branch associations and 25 branch groups, in which some 1300 companies participate. The branch groups and associations operate independently according to their own strategic plans, while taking account the joint goals of the entire technology sector. Each group has an own variety of activities like:

- Lobbying for better business environment, rules and regulations for the sector.
- Exchange of statistics and knowledge, experience and best practices.
- Development of business and technology competence.
- Research and development programmes.
- Education.
- European cooperation.

Machine tool manufacturers
A branch group for machine tool manufacturers was established 1986 and it joined CECIMO ten years later in 1996. It has only 10 members and the production share of the total CECIMO production is less than 1%. Most of the companies provide rather fully automated and sophisticated production lines including the controlling software than individual machine tools. Digitizing the customers´ manufacturing processes makes life cycle services a more and more important part of the offering. Nevertheless, the companies and our delegates to CECIMO have been active during all the past 20 years in different roles in CECIMO Committees and Board. They have found the European cooperation and networking very useful and they appreciate the value created by the active CECIMO team.

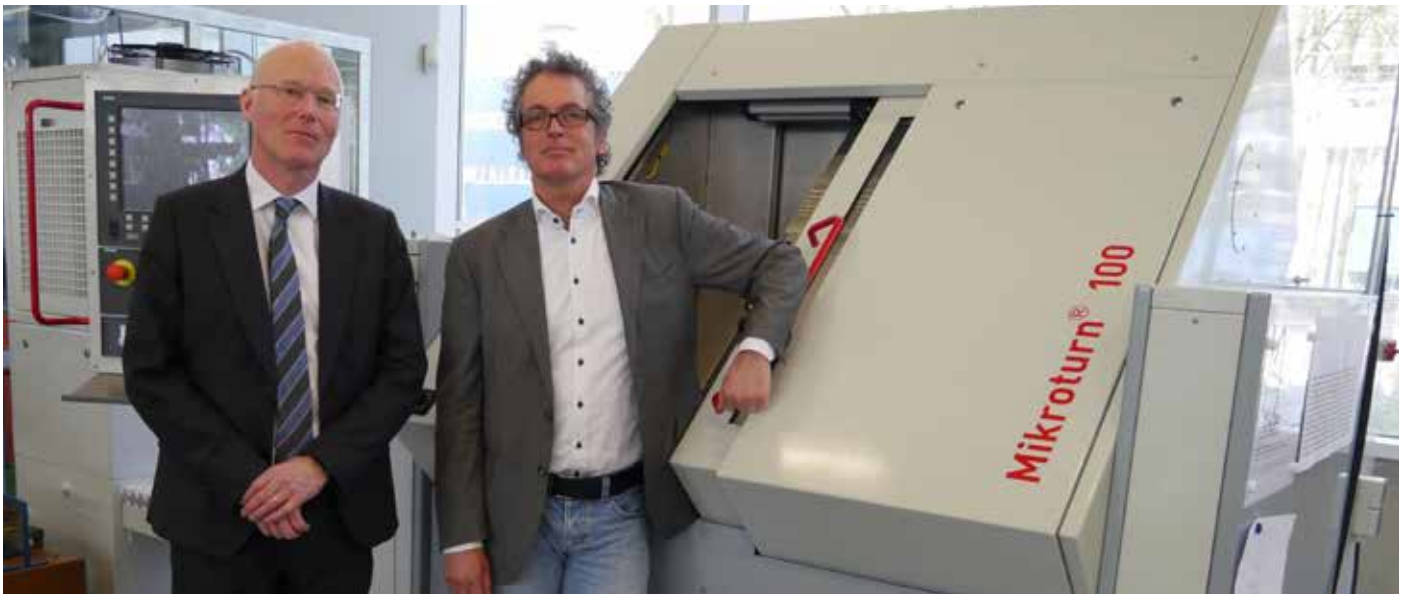
Manufacturing Performance Days 29.05.2017 - 31.05.2017 in Tampere
Technology Industries of Finland is a strategic partner of the event and we are happy to invite our European colleagues of companies, associations and other stakeholders to the conference. Last time in 2015 there were over 600 participants from 25 countries, which is of course a minimum target also this time. The event is free for the participants, but you need an invitation with a registration code. If you have not got an invitation yet, do not hesitate to ask us or the other partners. More information on the event can be found on www.mpdays.com. Manufacturing Performance Days is an executive and visionary conference for manufacturing industries, researchers and technology and service providers worldwide. This highly appreciated event will bring together internationally recognized experts and academia to discuss and represent industrial best practices and operational excellence, novel business concepts as well as scientific and technological breakthroughs in the field. In 2017 the theme will be Towards Outcome Economy. More information on the event can be found www.mpdays.com. ■

"We would like to see a new industrial strategy including an action plan, not only at the EU level, like it was done with the Joint Declaration of different European Associations, but also at the national level. Some of the actions, like those in the field of skills and education, must be done in the member states and close to the companies. Digitizing the industry is a good example where we already have many national initiatives, but also coordinated actions at the EU-level.
The internal market is very important for a small country like Finland and we really hope that the elections this year will not bring more bad news, like it was Brexit last year. It is too easy for the politicians to blame the EU for all the mistakes and unsuccessful politics. Actually, we should provide them with success stories of the EU and evidence proving the connection of our welfare and growth with the single market."

Ilkka NIEMELÄ
Director, Technology Industries of Finland

Meet a CECIMO Delegate

An interview with Robert Nefkens, CEO of Hembrug Machine Tools



From left to right: Robert Nefkens (CEO of Hembrug) and Dick Harms, Director of the LiS (Leidse Instrumentenmakers School), to whom Hembrug donated a machine to raise students' skills.

Hembrug Machine Tools is based in the outskirt of Amsterdam and Robert Nefkens has been its CEO since 1996. CECIMO conducted an interview with him on different aspects of the Machine Tool industry.

Why to be a CECIMO delegate and what are its benefits?
The purpose of an organisation must be relevant to its members. CECIMO fulfils this requirement in many ways.

Machine Tools companies are mainly family owned SMEs. We have difficulties in reaching the European institutions and have our voice heard. Moreover, the EU officials are not familiar with our sector and what are our needs and challenges. People do not even know what's a machine tool - they think of a Black & Decker. I can say that CECIMO has proved to be excellent in presenting us at the international level and that's already a sufficient reason.

CECIMO is also important for providing regular statistics and projections. It helps a manager making choices for the future, especially in markets like China and Asia. For example, I became a CECIMO member in 2008, when the crisis erupted. The forecast of "Peter Meier" helped us coping with it and formulating a strategy in the long term. Membership keeps also my mind sharp. I discuss topics relevant to the sector with colleagues and our close contacts give us inspirations. At the last General Assembly, we looked at the future of the automotive sector. About 40% of the machine tools are sold to the automotive sector and changes in the sector in the next years, even decades, will affect us. Our industry has a strong dependence on the automotive and it is important, both for the individual machine tool builder as for their representative organisations to have a clear vision about the direction of the changes.

What are the new challenges set by digitisation? How do you think the European Commission can help the machine tool industry cope with it?
It's a very broad topic and it's difficult to cover everything: CNC, KETs, CAM modelling, studies of dynamics, and so on. Though, how can we be an active part of such changes? We don't expect the European Commission to be of significant help in this area. We must do it ourselves and build a network together with researchers, universities and suppliers to come up with new ideas and face challenges set by digitisation. It's important that people within the EU ease these links with R&D and customers.

For example, a main issue linked to digitisation is that customers do not allow the MT producers to connect to the machine. The reasons are many, like the machine is connected to the internal system, but all of them show one concern: they do not want to give direct access to the machine as they are afraid of sharing information. Sometimes, it can also be they don't want you to know what you're making.

How do you attract young talents to your company and what are the skill gaps you face when recruiting?
It's indeed a challenge to attract and keep them. One reason is that the image of the industry is still dirty and noisy. We need to communicate that it's not like that anymore. We do the maximum to keep our locations clean and silent, especially to decrease the noise. CECIMO is doing an excellent job in promoting a different image.

We do offer internships through universities and high schools, so we can see the skills available - whether they can become potential employees. Once we hire them, we make sure that they keep learning via internal and external courses. We offer them an education, so they will grow into mature workers in their profession.

The skill gap problem is that young persons start without specific knowledge and, depending on the job, it might take years to train them. In the Netherlands, we do not have specific curricula for the machine tool industry, so in some cases we need to send our employees abroad.

Do you fell competition from big enterprises?
Sometimes we do. Big enterprises can offer a wider range of jobs and seem to offer a clearer career path. On the other hand, we also do have our advantages. Employees in smaller companies can have a clear and quick influence and their jobs are less narrow. They are also closer to the final product, they can see the end result with their own eyes.

R&D too is done inside. It's an interesting process, because we materialise the project in-house within a couple of years. When possible we like to work with our customers. We are hesitant about looking for EU-support. The lead-time from start applying for a grant and the actual starting time of the project is too long. Especially if you have a project with good market potential, you do not want to wait.

How do you see the development of the Machine Tool sector in the coming years and how can CECIMO contribute to it?
There are so many things that will affect the Machine Tool sector: industry 4.0, changes affecting the automotive sector (i.e. swift from gasoline to electric cars, or autonomous cars), energy transition from traditional biomass to renewable resources, and so on.

Let's look outside the EU. Are the USA going to be more protective in the coming years? If so, what will be the impact on our industry? We need to have a level playing field: machines from the United States need to have the same treatment as machines imported from Europe. CECIMO shall keep the finger on the pulse to see what happens, inform us of new trends, and pressure the EU to keep the level playing field. This principle should also be applied to export licences from Europe to other countries. For example, if a German company gets an export license, a Dutch or Swiss should also be able to get it. A database which covers not only the refused export licenses, but also the granted, will be helpful. We must ensure the same rules. ■

Joined CECIMO in 2016-2017

BELGIAN DELEGATION

Marc Van Opstal
Managing Director
Nedschroef Herentals N.V.

DANISH DELEGATION

Rune Jacobsen
Senior Advisor
The Manufacturing Industry - a part of the Confederation of the Danish Industry

PORTUGUESE DELEGATION

Gonçalo Lobo Xavier
General Director
Associacâo dos Industriais Metalúrgicos, Metalomecânicos e Afins de Portugal

SPANISH DELEGATION

Juan Andueza
General Manager
DIMECO, S.A.

SWEDISH DELEGATION

Calle Beckvid
General Secretary
MTAS (Machine & Tool Association of Sweden)

TURKISH DELEGATION

Mustafa Kiliç
General Manager
Erkekoglu Pres Makina Ltd. Sti.

TURKISH DELEGATION

Ahmet Özkayan
General Manager
Ermaksan

CECIMO SECRETARIAT

Manuel Escamilla
EU Public Affairs
Economist

CECIMO SECRETARIAT

Giorgia Zia
Communications Officer

Upcoming Events

Additive Manufacturing European Conference
7 June 2017 - Brussels

CECIMO's 2017 Spring General Assembly
17-20 June 2017 - Rotterdam, The Netherlands

EMO Hannover
18-22 September 2017 - Hannover, Germany

CECIMO's 2017 Fall General Assembly
21-22 November 2017 - Brussels, Belgium

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Publisher
Filip Geerts

Editor
Emir Demircan

Contributors
Volker Bellersheim
Michael Berz
Valeriia Boldosova
Alexander Broos
Emir Demican
Gereon Deppe
José Antonio Dieste
Peter Dröll
Manuel Escamilla
Lina Huertas
Christian-Friedrich Lindemann
Alfredo Mariotti
Robert Nefkens
Ilkka Niemelä
Paula Queipo
Vincenzo Renda
Kamila Slupek
Graham Small
Paolo Streparava
Carl Martin Welcker
Douglas Wood
Giorgia Zia

Copyediting and production
Giorgia Zia

cecimo

European Association of the Machine Tool Industries

Avenue Louise 66,
1050 Brussels, Belgium
Tel: +32 (0)2 502 70 90
Fax: +32 (0)2 502 60 82
www.cecimo.eu

Member Associations

Austria: FMTI
Fachverband Metalltechnische Industrie
www.fmti.at

Belgium: AGORIA
Federatie van de Technologische Industrie
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Svazu Strojírenské Technologie
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a part of the Confederation of Danish Industry
ffi.di.dk

Finland: Technology Industries of Finland
www.teknologiateollisuus.fi

France: SYMOP
Syndicat des Entreprises de Technologies de Production
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Federatie Productie Technologie / Sectie VIMAG
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Portugal: AIMMAP
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www.aimmap.pt

Spain: AFM - Advanced Manufacturing Technologies
Asociación española de fabricantes de máquinas-herramienta, accesorios, componentes y herramientas
www.afm.es

Sweden: MTAS
Machine and Tool Association of Sweden
www.mtas.se

Switzerland: SWISSMEM
Die Schweizer Maschinen-, Elektro- und Metall-Industrie
www.swissmem.ch

Turkey: MIB
Makina Imalatcilari Birligi
www.mib.org.tr

United Kingdom: MTA
The Manufacturing Technologies Association
www.mta.org.uk

cecimo is the European Association representing the common interests of the Machine Tool Industries globally and at EU level. We bring together 15 National Associations of machine tool builders, which represent approximately 1500 industrial enterprises in Europe (EU + EFTA + Turkey), over 80% of which are SMEs. CECIMO covers more than 97% of total machine tool production in Europe and more than one third worldwide. CECIMO assumes a key role in determining the strategic direction of the European machine tool industry and promotes the development of the sector in the fields of economy, technology and science.