



## Whitepaper

Employment, training and qualification needs of the European industry – a perspective from the joining sector

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## Executive Summary

Europe is the birthplace of the industrial revolution. Although services have taken into the spotlight as a growth area for the continent as a whole at the same time that industrial production has taken a less visible role, manufacturing is still a hallmark of Europe and an area of ample wealth generation and employment opportunities. And to support the competitiveness of European manufacturing in an increasingly complex and competitive global market, welding and joining<sup>1</sup> should be regarded as essential cross-sector technologies that are in increasing demand. The special process of welding, that is its quality cannot be determined by inspection after the joint has been made, demands special competence in those who apply it, both in special educational provisioning as well as in effective assurance of personnel competence. Welding also represents a cross-generation profession, with employment and career opportunities for both younger individuals entering the profession, as well as for the most experienced who have been within it for some time. To ensure the competitiveness of industrial output in Europe, innovations in processes and products and advanced knowledge have become two critical components to ensure the continued success and transformation of the industrial sector. Furthermore, the whole perception of joining needs to be addressed, transforming this industrial process to be more human friendly, for which more new processes in training and in the industrial/workshop practice need to be developed.

The economic importance of industrial activities is much greater than suggested by the share of manufacturing in GDP. Industry<sup>2</sup> accounts for over 80% of Europe's exports and 80% of private research and innovation. Nearly one in four private sector jobs is in industry, often highly skilled, while each additional job in manufacturing creates 0.5-2 jobs in other sectors<sup>3</sup>.

Europe has signalled that industry plays a critical growth area for the region as well as of key importance for Europe's economic recovery and competitiveness. This relevance has been highlighted by the Commission's [Industrial Renaissance in Europe communication](#) as well as, amongst other initiatives, the launch of the **Technology Platform "Manufuture"** and, more recently, the creation of the **Joining Sub-Platform** within **Manufuture**. The Technology Platform Manufuture aims to address the needs of the knowledge-driven economy of the future, by proposing, developing and implementing a strategy based on Research and Innovation, capable of speeding up the rate of industrial transformation, securing high-skills employment and winning a major share of world Manufacturing output. In spite of this vision and long-term positive prospects for welding and joining, the sector has seen a worrying trend in which the number of youngsters embracing the profession has dwindled in the last decade, while retraining of current professionals has followed the same route. This trend could potentially hinder the growth and competitiveness of manufacturing industries in Europe.

<sup>1</sup> – Joining can be described in the following way – Creating a bond of some description between materials or components to achieve a specific physical performance; <sup>2</sup> - Rueda-Cantuche, José M.a, Sousa, Nb., Andreoni, Va. and Arto, Ia. "The Single Market as an engine for employment growth through the external trade", Joint Research centre, IPTS, Seville, 2012. In this Communication, manufacturing refers to Section C and divisions 10 to 33 of NACE Rev.; <sup>3</sup>. Industry refers to a broader set of activities including also mining and quarrying and energy activities.

Putting this information into context for the euro area (EA19), and with the most recent data from Eurostat, unemployment rate remains high, at 11.2% in January 2015, down slightly from 11.8% in January 2014. In the EU28 alone, unemployment rate was 9.8% in January 2015, also down from 10.6% in January 2014. Still, even in face of this high unemployment, the renewal process of specialized welding professionals does not support market needs. Even more worrying, and specifically for the younger generations, economists predict that today's youth faces the very real prospect of ending up worse off – materially, professionally and socially – than their parents because of the high unemployment in Europe, so industries with job needs should be given special attention to attract future professionals.

Putting the issue of employability potential into perspective, in Europe alone there are around 1,9 million full-time-equivalent joining specialists, according to the study “The Economic Importance of Welding and Joining in Europe (\*). On one side, experienced welders are getting old and are retiring, according to the natural cycle of life. On the other side, the entrance in the labour market of new welding professionals does not meet its current needs. So, in summary, in order to maintain the quality level in manufacturing and the engineering sector at large, and to prevent future issues with professionals' shortage, it is fundamental to invest in people's training and qualification.

### **The role of the training and qualification stakeholders**

This whitepaper aims to provide solid information to all of the relevant stakeholders on how welding and joining can contribute to fulfil the objectives of Europe's industrial growth, as well as the challenges it faces today. To provide further support to Europe's industrial competitiveness, this document highlights the need for more welding and joining professionals. It also highlights the relevance that increasingly sophisticated distance-learning technologies can have within a global qualification offering, increasing its reach and attractiveness to younger, more technology-savvy, audiences.

EFWJ, as well as other relevant players in the industry, is actively working to raise awareness amongst all of the potential professionals about the increasing opportunities that exist on the manufacturing sector. For EWFJ specifically, the focus has been on developing relevant initiatives, ranging from recognition through awards for young welders, best welding coordinator and Lifetime achievement to implementing innovative teaching methods, including implementation of Virtual Technology in education of welders and welding specialists as well as through the launch of the Welding Dictionary app, currently available on the Apple App Store and in the implementation of distance learning in welding / joining technologies.

Given its relevance in Europe, EWFJ is also involved in responding to the needs of the welding industry focusing on SMEs projects, being part and leading some of the innovations that will move the industry forward.

(\* ) [Value Added and Jobs resulting from joining technology in Germany and Europe, 2013](#)



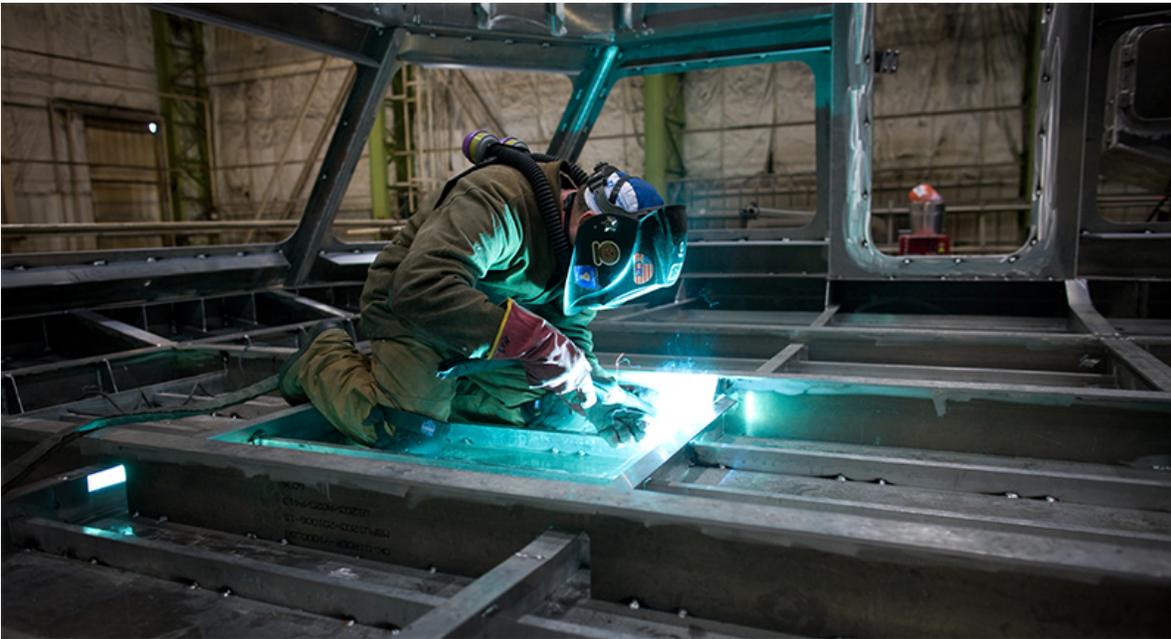
## Industrial challenge

Europe's economies have grown on a thriving industrial base, which has reduced its relevance in the most recent decades. New players have emerged in the markets, as well as new materials and new technologies. Europe's industry, albeit still a powerhouse, needs to reinvent itself to regain competitiveness and leverage new growth opportunities. Enabling technologies, such as joining, can play a pivotal role in its future.

Europe's economy cannot survive in a sustainable way without a strong and profoundly reshaped industrial base, in an environment where new technologies have dramatically changed our life and our economy in the past 20 years. In this short timeframe, the landscape has changed, with new companies and countries competing in the markets, as well as new materials, new technologies and workers who are better skilled than ever. We have also witnessed the rise of new economic powers with strong industrial sectors. Briefly stated, the winds of change are blowing at a time when Europe is going through a long period of very slow economic growth (even negative growth in some countries), with high unemployment and social unrest. But this situation and the disruptive forces it brings can also be seen as an opportunity.

The European Commission has clearly stated that the Council and the Parliament should adopt proposals on energy, transport, space and digital communications networks, as well as implement and enforce legislation to ensure the full operation of the internal market. Furthermore, industrial modernisation must be pursued by investing in innovation, resource efficiency, new technologies, skills and access to finance, accelerated by the use of dedicated EU funds. The goal of this strategy is to promote a more business-friendly Europe through actions to simplify the legislative framework and improve the efficiency of public administration at EU, national and regional levels. Other key issues include easier access to third country markets through harmonisation of international standards, open public procurement, patent protection and economic diplomacy.

On a more specific area, the Commission considers that a strong industrial base will be of key importance for Europe's economic recovery and competitiveness. **The importance of industrial activities** cannot be understated, as it is much greater than suggested by the share of manufacturing in GDP. **Industry accounts for over 80% of Europe's exports and 80% of private research and innovation.** Nearly one in four private sector jobs is in industry, often highly skilled, with each additional job in manufacturing creating 0.5-2 jobs in other sectors. And EU industry is resilient and still highly relevant worldwide, having a strong contribution to the region's economy, as can be witnessed by the EUR 365 billion surplus of manufactured goods, generated mainly by a few high and medium-technology sectors. These sectors include the automotive, machinery and equipment, pharmaceuticals, chemicals, aeronautics, space and creative industries sectors, and high-end goods in many other sectors, including food. In many of them, enabling technologies and processes such as joining, are a key competitive advantage for European companies overall.



One key lesson from the recent crisis relates to the importance of the real economy and a strong industry. Industry's interactions with the rest of Europe's economic fabric extend far beyond manufacturing, spanning upstream to raw materials and energy and downstream to business services (e.g. logistics), consumer services (e.g. after-sales services for durable goods) or tourism. Industrial activities are integrated in increasingly rich and complex value chains, linking flagship corporations and small or medium enterprises (SMEs) across sectors and countries.

Notwithstanding its strength and resilience, 3.5 million jobs have been lost in manufacturing and its share in EU GDP has fallen. Also EU's productivity performance continues deteriorating in comparison to that of our competitors. But given the evolution of the manufacturing sector, to become ever-more technology-intensive, new qualifications are and will increasingly be required for the professionals on this field, thus posing a challenge to current levels of the professionals on this field.

To increase the competitiveness and performance of the industrial sector in Europe, a long-term strategy has been defined, one that focus on creating lasting competitive advantages for Europe's industrial sector at large. Those are the pillars of the **Horizon 2020 Program**. For industry alone, this means leading in enabling and industrial technologies, providing access to funding and ensures innovation on the SMB (Small and Medium Business) space. So, the perspectives for the manufacturing sector look promising, furthermore with initiatives such as **Manufuture**, which aims to place Europe at the forefront of the new industrial revolution, on four main areas:

- Competitiveness in manufacturing industries;
- Leadership in manufacturing technologies;
- Eco-efficient products and manufacturing;
- Leadership in products and processes, as well as in cultural, ethical and social values.

With Joining being the most important fabrication technique used in manufacturing, joining technologies represent the central challenge in modern process chains, as they are often a factor that can run up the costs, as well as have the potential to be a cost-saver. As stated before, since the Manufature Technology Platform has identified Joining as a key enabling technology to manufacturing, a Sub-Platform with the purpose of developing a strategic approach in the field of Joining was created.

It is of utmost importance to address the challenges currently faced by this industry due to new materials that need to be joined and their requirements. It is often that modern functional materials are, on the one hand, difficult to join, but professionals and industry are faced with high quality demands of its results on the other hand. This leads to the fact that joining can be a relevant piece of the competitiveness of the manufacturing sector in Europe, by leading on the most sophisticated usage of the technology in the broadest range of materials, as well as by contributing to the overall competitiveness of the sector. As a result, this industry is going through a change to embrace all of the modern-day technological tools to keep abreast of the rest of the world. One such example is the Welding Dictionary developed by EWF in order to support field professionals in their daily tasks, which can be found in Apple's App store.



## New growth areas for joining industry and professionals

Joining technology is used for the manufacture of a variety of products in different sectors, from electronics to automobile industry. A cross-sector need is that of well qualified professionals that can ensure the quality of the end product.



Joining technology constitutes a cross-sectional technology, used for the manufacture of a variety of products across different sectors. The technology is applied to the most important industrial sectors worldwide, from metallurgical, electronic, automobile industry and civil engineering, which are all examples of industries where well qualified welding professionals are fundamental for the quality of the final result.

Its relevance is known to be significant, and as recently as 2013 a study was conducted by the European Federation for Welding, Joining and Cutting and DVS – German Welding Society to assess it. This thorough study, based on a collection of data, statistical analysis and modelling, led to results that show that the total added value generated by European joining industry is around 66 Billion Euros per year and that just over 1.2 million people work in welding and related technologies in the EU(28). For the purposes of the study, the following figures were identified, that are particularly relevant for the professionals on these areas. From an employment perspective, this is the current status:

- a. Welding currently employs **647,000** people as welders;
- b. **311,300** as welding coordinators, researchers, designers, trainers and robot operators;
- c. **165,900** in terms of joining-related personnel.

The study highlights the relevance of this industry in Europe as a means to increase competitiveness of EU(28) companies and provides further evidence to encourage its growth and create employment opportunities as part of the strategy to support the reindustrialization of Europe.

But the fact is that this is a profession that suffers from a lack of interest by young candidates that could both renew and increase the current set of joining professionals. And the aforementioned lack of interest to fill the available opportunities is in itself a great risk for the EU. In October 2014, 4.983 million young persons (under 25) were unemployed in the EU28, of whom 3.356 million were in the euro area. In October 2014, the youth unemployment rate was 21.6% in the EU28 and 23.5% in the euro area, compared with 23.3% and 24.0% respectively in October 2013. In October 2014, the lowest rates were observed in Germany (7.7%), the Netherlands (9.7%) and Austria (10.0%), and the highest in Spain (53.8%), Greece (49.3% in August 2014), Italy (43.3%) and Croatia (41.5% in the third quarter 2014).

To address the need for employment in the joining industry, education and training are a fundamental component. Since quality education and training fuel inclusive, sustainable growth, learning outcomes translate into the productivity and innovation of the working-age population. The case for education is not built on aspiration but on fact. The third edition of the Education and Training Monitor from the European Commission charts the evidence collected in a concise, digestible way, and offers policy messages for Member States. It demonstrates that Europe needs to strengthen its investments in education while at the same time it must look beyond the number of people with qualifications, boosting the inclusiveness, quality and flexibility of education and training systems.

And, as mentioned, the education of young professionals in joining technology and retraining of older workers is in high demand in Europe, as these technologies are key to a significant proportion of Europe's manufacturing output. In any case, it should be stressed that joining requires careful attention and control in order to avoid problems such as failures and overspends. Also joining technologies are in continuous innovation, examples are the change from manual to automation welding, the increased use of adhesives, or the evolution from conventional MIG/MAG welding to controlled variants using pulsed current, the increased use of laser welding, etc., thus the need companies have to hire and evolve the competences of their welding and joining personnel. This competence is achieved through proper education and training, as it is the case of EWF Qualification and on-the-job experience.

Also, as the industry evolves, new and exciting opportunities are created for professionals in this industry. A recent example is laser welding technology, which has seen a recent rise in adoption. To provide an accurate market assessment, the global market for laser systems for materials processing currently exceeds \$10 billion per annum (analysis by Optech Consulting, Taegerwilen, Switzerland in [The Fabricator](#)). Also, the macro materials processing market accounts for around \$1.5 billion of this total and the laser welding segment accounts for \$317 million in 2013 with an annual growth rate of 5%. This change, amongst others that will surely become more commonplace as technologies mature, requires a higher level of qualified personnel in this area.

## **New employment opportunities in Joining Training, Qualification and Certification**

Joining is a profession with increasing demand, both in terms of professionals as in terms of qualifications and certification of its professionals. And it is also cross-generation, with opportunities abounding for both the younger professionals as well as for the most skilled and mature ones. To ensure that needs are met, the latest education techniques should be leveraged to bring new professionals into the industry, securing its future

The Education and Training Monitor of the European Commission, on its third edition, represents an important analytical contribution to the implementation of the strategic framework for European cooperation in education and training (ET 2020). As a result, this framework is more closely linked to the broader Europe 2020 strategy. Framing the education challenges in Europe, data shows that the demand for medium level qualifications will remain high in Europe, (though progressively decreasing), estimating that high-qualified employment will grow by about 13% between 2013 and 2020 whereas low-qualified employment will shrink by 12%. This means that by 2020, about 31% of employment in Europe will demand high qualifications and only 21% will require low qualifications.

And with Welding and Joining being areas with clear qualification needs, standards are needed to ensure that professionals are equally qualified to achieve quality requirements. Hence, the need for certification of welding professionals (ISO 9606 for welders and ISO 14731 for Welding Coordinators). Because its relevance cannot be underestimated its relevance, since joining technologies represent the central challenge in modern process chains.

### **EFW's harmonized training, qualification and certification system**

In its current state, EWF manages a harmonized system for training qualification and certification of joining personnel. It is also responsible for the Certification System of companies using welding in Quality, Environment, and Health and Safety, with 31 European member countries represented by their national welding societies. This harmonized system means that the same qualification may be awarded in any country. EWF has further developed the system towards the certification of specific competence of personnel and towards the certification of companies complying with ISO 3834 requirements. The implementation of the first harmonised course for welding engineers started in 1992, and has grown since then with more welding and joining-related professions, always adjusted to the development of the industrial needs.

An organisation, recognised by the EWF national member society, is appointed as the **Authorised National Body (ANB)** for the supervision of the system for training, qualification and certification of personnel in each country. Representatives from these ANBs form the operational management within the EWF, and they nominate and approve Lead Assessors and Peer Assessors who ensure conformity of each ANB to agreed Rules.

**ANBs are responsible at the national level for:**

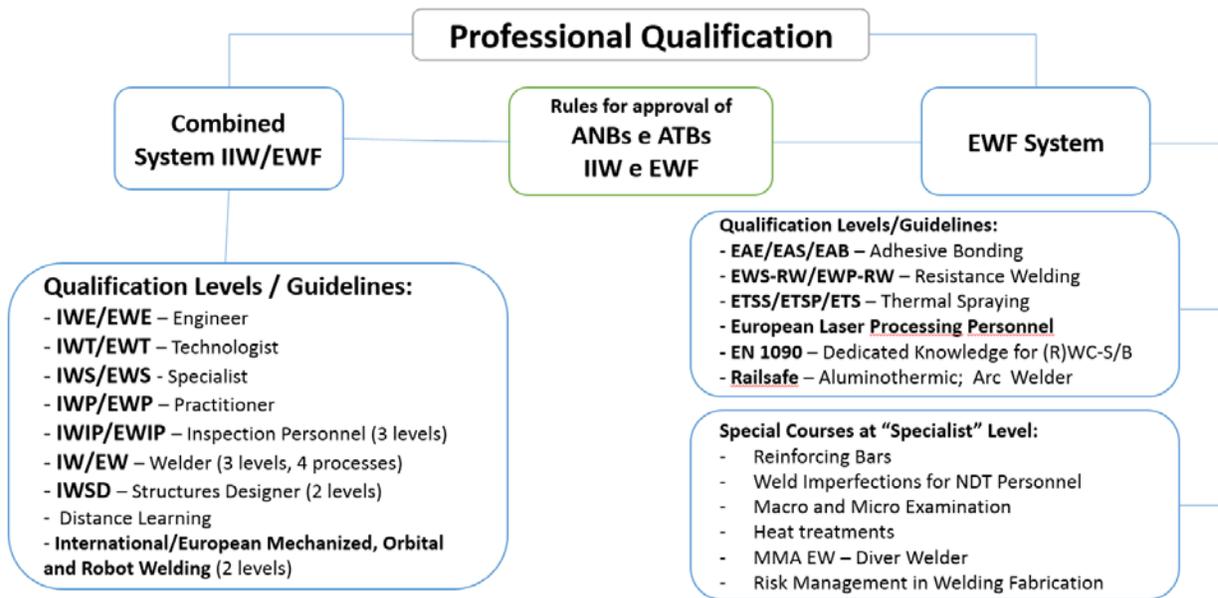
- The assessment and monitoring of Approved Training Bodies (ATBs);
- The conduct of examinations;
- The assessment of applicants for certification;
- The issue of Diplomas and Certificates.

There are now 45 countries that have joined this system with **an Authorised National Body**, as follows: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, R.P. China, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, India, Indonesia, Iran, Italy, Japan, Kazakhstan, Macedonia, Netherlands, Nigeria, Norway, Poland, Portugal, Romania, Russia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, Ukraine, United Kingdom and USA.

This International Training and Qualification system used in Europe (and outside Europe through The International Institute of Welding – IIW), comprises **Guidelines for the Education, Examination and Qualification of Welding Personnel and Rules and Procedures for the Management of the Quality Assurance System**. The Education, Examination and Qualification Guidelines include :

- Personnel with Responsibility for Welding Coordination (International / European Welding Engineer – IWE/EWE, International/European Welding Technologist – IWT/EWT, International/European Welding Specialist – IWS/EWS, and International/European Welding Practitioner – IWP/EWP);
- International/European Welding Inspection Personnel – IWIP/EWIP - International/European Welder – IW/EW;
- Distance Learning (covering IWE, IWT, IWS, IWIP);
- International Welded Structures Designer – IWSD;
- Adhesive Bonding personnel (Engineer -EAE; Specialist -EAS; Bonders- EAB)
- Thermal Spraying (Specialist - ETSS; Practitioner – ETSP; ETS - European Thermal Sprayer)
- Plastic welders. (Certified European Plastic Welder –CEPW)

The complexity and depth of the harmonized qualification system of EWF and IIW can be better grasped in the following image

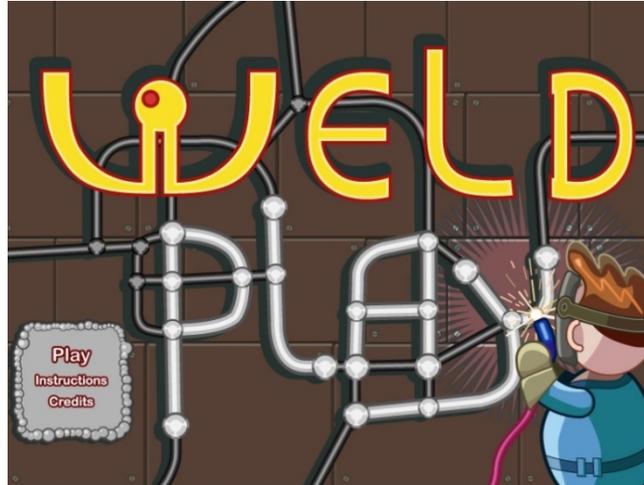


### The evolution of the system to address employment challenges

The reputation of the EWF system is growing and more countries are joining the system every year. Also, EWF has been a pioneer in implementing a harmonized qualification and certification system for welding professionals. Given the importance of the mobility of labour within the worldwide community, requiring the best and most comprehensive harmonisation, both EWF and IIW have engaged on enabling this harmonization through processes such as the approval of questions by Teams of International Experts, the translation of the questions into the several Members mother languages, automatic generation of harmonised exams, generation of statistics regarding the questions used on the exams and automatic exams scoring.

Through European projects such as **Virtweld (Virtual Systems for welders training)**, **E-Weld (Distance learning course for welding coordinators)** and **Weldiction (dictionary of welding terminology)**, EWF has been innovating in training methodologies, meeting the learning patterns of the more tech-savvy younger generations. The positive impact of these projects will be measured by the interest of potential new professionals, and EWF will continue to look proactively for new opportunities to reach out with the most recent technologies to entice new professionals to start working in joining, never losing sight of its current workforce and its need for regular training and qualification, as joining technologies and requirements evolve.

Also looking at raising the attractiveness of the profession for youngsters, EWF members created a project aimed at the development of a game, **Weldplay**, which is being used in secondary schools and universities in many of the EWF member countries.



The aim of these improvement projects is to respond to market demands: for example reaching more markets and more remote areas, whilst maintaining the recognised quality of the systems. Furthermore in order to support EU initiatives, the EWF is creating partnerships for European Projects with the aim of aligning the EWF qualification system (namely for the welder level) with the EQF, the European Qualification Framework regarding the ECVET, European Credit for Vocational Education and Training.

## Conclusions

Industry plays a pivotal role in EU competitiveness and growth opportunities moving forward, as it has been reinforced by the Commission and the guidelines of Program Horizon 2020. To reignite Europe's growth, fostering competitiveness to sustain and strengthen the recovery and achieve the goals of the Europe 2020 agenda have become the top priority for the Commission and EU Member States. As a key enabling and pervasive technology in all manufacturing processes, joining is a cornerstone of manufacturing success and competitiveness.

Welding is a special process that requires careful attention and control in order to avoid problems such as failures and overspends. Thus the need companies have to assure the competence of their welding personnel. This competence is achieved through proper education and training, for example by showing a EWF Qualification and by on-the-job experience.

European standards, in some cases backed by EU Directives; International standards; and client specifications are placing increasing emphasis on the proper control of welding and on the competence of welding personnel. The harmonised international EWF training, qualification and certification systems described in this paper provide manufacturing companies worldwide and their workforce with a convenient, comprehensive and convincing way of demonstrating compliance with EN ISO 3834 and EN ISO 14731, as well as the most recent EN 1090 and EN 15085, which is a mandatory requirement to obtain CE Marking and, as such, entry into all European Union Markets. These systems have achieved considerable maturity and recognition, and are being continuously improved.

Hindering its growth potential lie the lack of interest from future professionals as well as the need to retrain and keep up-to-date the current workforce. That is where the EWF has been focusing its attention, developing new programs and projects that can entice new professionals, as well as improving the system to include the design of more flexible courses, structured in modules with new paths, based on skills demonstration through exams and practical tests. Work is also going on regarding the introduction of more distance training modules and new / innovative training tools.

To ensure the long-term success of the profession, further initiatives are required, such as working closely with EWF members to qualify existing workforce and get them up to speed on the new technologies and materials used in joining. Also, looking ahead, reaching out to secondary school students, reinforcing the distance-learning modules, creating new mobile programs and solutions that respond to current and future workforce needs and methods, as well as to technological evolution. These challenges are the cornerstone of future evolution of Joining technology and where EWF will be working in the future to develop its programs and initiatives.

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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE  
EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - For a  
European Industrial Renaissance;

European Technology Platform Manufuture <http://www.manufuture.org/manufacturing/>

European Technology Sub-platform Joining <http://www.joining-platform.com/>

Value added and jobs resulting from joining technology in Germany and in Europe; DVS – German  
Welding Society and GSI – International Welding Technology Company.