Training Needs Report

RESTART Partnership Survey of 4.0 Digital Technologies

RESTART 4.0

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PROJECT:

Restart - Digital Training Toolbox to FosteR EU'S IndusTry 4.0 RevoluTion

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Introduction

This project has an ambition to provide a high level 4.0 Digital Training programme to local employers. To achieve this the partnership, need to be confident of current levels of digital technologies, and what businesses need to make effective use of such technologies to grow their organisation and to realise their full economic potential.

This report presents the key findings from the 2018 the RESTART Digital 4.0 Survey. The partnership from Spain, Italy, Scotland, Greece, Bulgaria and Malta conducted the research to carry out an initial Digital Business Assessment to attain the level of Digital Skills within local and national companies and to measure the skill level of personnel digital skills.

The aim of the survey was to establish a baseline on both the current level of digitisation by local partner businesses and to allow digital progress to be measured and training necessary to increase digital competences.

Scope of the Survey

To establish the baseline of where businesses currently stand in their level of digitisation; to allow the digital progress to be measured the RESTART Partnership agreed a brief of the following work components:

- Gain an understanding of the current level of Digital competences in local and national companies and industry
- Conduct a survey at national level to prepare an Evaluation of the current workforce skills and potential Digital 4.0 training and develop an integrated training plan
- Survey the effectiveness current digital training policies of each partner country and identify future training needs
- Prepare a survey Report in January 2018 highlighting the findings to help inform the training of the project

The RESTART 4.0 Survey was conducted by the 8 partners across the 6 partner countries. Each country conducted desk research and took information from local and national sources and leading manufacturing and engineering companies. The survey explores the current training skills, needs and patterns which benefit company horizontal and vertical value chains. The findings will assist the partnership identify a suitable training model and programme to help secure company competitiveness in a new digital world of production and working. Companies included: Engineering, Digital and Electrical Production and Manufacture, and all sectors within the reports suggested that shall see a far greater demand for digital skills in the future with 65% + looking to increase these skills within the workforce by 2020. All would hope to see an increase in production and revenue with a small decrease in production costs within the next 3 to 5 years.

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Structure of the Report

Survey Description

This Training Needs Analysis Survey was set to explore the current use and uptake of Digital Technology and E-Skills and the benefits of Digital Technology through training in Traditional Industries with a view of increasing service and product portfolio and production in each partner country. The Training Needs Analysis Questions were broken down into 3 sections and consisted of 3 basic; but important questions in each section.

The term Industry 4.0 is seen as the fourth Industrial revolution, sometimes referred to as the E_Revolution in many sectors. Other terms include; Industrial Internet; Digital factory or Digital Enterprise. Regardless of the term expressed it is the moving into a new age of Industrial Technology.

For companies to compete and generate additional revenue and increased production it is necessary to move with the times. This means that companies need to keep abreast with new Digital Technology and the skills to success in this new Digital age. This may mean a change to production innovations, a commitment to invest in training and be prepared to focus on Digital transformation across the company services.

Digitisation means many things and we do not offer a solution to all aspects of the new merging skills necessary to meet all demands. We, the partnership, currently see Digitalisation of Servicing and Production as including the expansion of existing methods of production through smart use of various devices and training to increase company capacity and how they serve customers.

Key Findings

This is the reflective section of the report and assesses the performance of the project through findings from the survey based on the evidence gathered across the project partnership.

- The level of VET Digital Skills varies greatly across partner countries
- There is a large difference in the type of training providers, from private Digital Skills providers to government Digital Skills providers such as Further and Higher Education establishments
- There is a VET Digital mismatch between training available and employers' needs
- VET Digital skills vary considerably based on the manufacturing sector
- Shop floor employees have less formal Digital qualifications
- Many companies (30%) report difficulty in recruiting higher skilled employees
- Employees receiving in-house Digital training vary greatly
- Larger companies provide a greater level of employee Digital training
- ICT specialist Digital Software training is in demand by companies
- Digital training is not keeping up with demand
- Transferrable skills level varies greatly across the partnership and the EU
- Most companies identify EQF Level 5 as necessary for their shop-floor employees
- STEM skills are increasing, some EU partners identify local initiatives to support STEM skills
- Specific programmes maybe necessary to target STEM skill training at un-skilled or semi-skilled workers
- Overall the STEM skills within workforces vary considerable across the partnership
- STEM skills need regular up-dating
- STEM skill levels vary across sectors, high in Engineering and in larger companies due to the pool of staff available

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- Trainers need a wide level of skills; management of productivity, analytics, industrial automation, communication, production logistics, organisation modelling, IT skills, Big Data Processing, production flows, digital technology, CAD, cloud based systems, virtual reality, programming, Internet of Things, Lean Training, TQM, Crowd Sourcing, Robotic Training, Marketing, Software Development, Info-Structure Training, £D, Cyber Security and Digital Awareness
- Trainers should be trained at a minimum level of EQF L5
- Digital performance is high in importance to compete at both national and international levels
- Digitalisation would increase productivity in most Engineering and Manufacturing companies
- There is a huge demand on employees to gain Digital skills at all levels
- Digital training is more in demand in SMEs
- Companies require lower costs and higher production through process improvements
- Enhanced Digitalisation skills are necessary to increase production and outputs
- Although across the partnership some countries have no National Policy toward Digitalisation there is a move for Government support towards Digital Skill improvement, a number of partner countries list large national and local investments in the Digital Infrastructure and support towards specific Training and Digital and Manufacturing research
- There is an upward demand for new Digital skills across the partnership countries at all levels of employment
- Soft skills are also in demand from companies and employers
- There is a lack of skilled workforce in advanced ICT technologies in many sectors
- There is a mismatch between demand and supply of necessary Digital skills
- Companies still report a low level of Digital competences which need addressed
- There is a lack of software skills, i.e. web development skills, digital marketing skills, AutoCAD skills, general software application skills, web developers, cloud, cyber, big data skills, etc.

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National Reports.

This section includes the results of the National Desk Surveys and Research across the partnership, each question is presented and followed by partners' response.

Existing VET Training Methodologies

What level of VET Digital Training exists currently within industrial workforces; Basic, Intermediate, Higher or Expert. How does this vary across industrial sectors, EG: production/manufacturing services, etc.

Spain: 41.7% of the employees of the industrial sector have attended university, while 34.4% has only received primary education. These two collectives represent 3 out of 4 jobs of the industrial sector. Regarding the employees who have received VET Digital training, the studies show that they are 23.9% of the employees, while in Europe they represent a 48.4%. As can be seen, there are big training differences between the Spanish workforce and the ones from the rest of Europe in the industrial sector. In a medium and long term, this will create a gap between the necessities of the companies and the offer of existing professionals in the labour market.

Italy: The *Excelsior survey 2017* identified that in Italy the difficulties of companies in finding the desired profiles increase when e-skills are more relevant for the performance of the work activity: almost 30% of the figures with high relevance of e-skills are difficult to find. The market requires highly qualified professions with technical and soft skills: complex technological changes in the new labour market requires communication skills, flexibility, ability to work in team and to solve problems, etc. In particular; the electric-electronic and chemical-pharmaceutical industrial ones, as well as the financial, IT and telecommunications in the Services segment are the most affected sectors by the request for these skills.

According the *OECD skills strategy diagnostic Report,* Italy needs to take prompt action to bolster growth and improve people's skills across the country. Skills demand is increasing and changing rapidly everywhere, as advanced economies adapt to globalisation, technological change and ageing. Italy seems to be struggling more than others to make the transition towards a thriving and dynamic skill-based society.

Malta: In recent years the Maltese government has invested heavily in the Digitalization of the country. One of the latest national strategies was Digital Malta 2014-2020. The World Economic Forum ranked Malta in 16th place out of 148 countries in the technological readiness index, and 28th out of 138 countries in the network readiness index.

VET digital capabilities vary significantly based on company and manufacturing activity. Employees employed in product development are typically highly trained including capabilities in CAD modelling, ERP systems and digital communication technologies. Employees on the shop floor typically have less skills but are normally capable of employing digital communication technologies.

Greece: According to Europe's Digital Progress Report (EDPR) 2017, Greece ranks third to last at the DESI (*Digital Economy and Society Index*) even though digital skills and competencies are more and more present in everyday life. Nevertheless, the digital skills gap is extensive and has led to a long-lasting skills mismatch in the ICT industry's needs and the skills provided by formal education. As it is, VET digital training has a more expert approach in VET institutions of higher education that are in most cases private, while in secondary vocational lyceums (EPAL) students can choose the general professional area that they would like to pursue later (e.g. Energy, Environment, Geotechnical, I.T. etc).

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Scotland: As part of the UK is included in European Digital reports as 1 country and there is little specific evidence relating to Scotland as a single entity. Digitally overall in European ranking UK is relatively high at around 6th/7th. When we look more closely at Scotland it is evident there is wide variety of Digitalisation across many sectors of VET training. Particularly in SME's and in basic Engineering and Automotive, with larger companies investing greater in digital improvements than small sector companies. Approximately one third of companies are progressing at a steady rate through VET and development, however Scotland suffers from a shortage of skilled ICT professionals. While employment of ICT professionals in the UK and Scotland has grown significantly in recent years, supply is not keeping pace with demand. Companies are currently not fully taking full advantage of the possibilities of digital technologies for business.

The percentages of businesses using technologies such as electronic information sharing (ERP – 17%) and RFID (1.6%), are very low; the UK and Scotland and rank third to last and second to last in the EU for these two indicators. Around 25% of company employees have basic Digital Skills with 50% having above average Digital Skills. ICT Digital specialist are in demand within companies with a need for advanced competence training in software related skills. Overall industry Digital skills are on average basic to intermediate levels. EQF L4/L5

Bulgaria: In terms of digital progress (as measured by DESI) Bulgaria belongs to the low performing cluster of countries, ranked 27th in EU-28. Low performance in digital skills is one of the brakes for Bulgaria's digital economy and society further development. It is very difficult to discuss what level of VET Digital training exists in Bulgaria as at this moment data can be found only for specific subjects related to digital technologies and eSkills taught in HEI's Bachelor and Master programmes, where one Master programme was found specifically designed for skills needed for Industry 4.0 but not for a particular industrial sector, EQF level 7.

VET Digital trainings as such according to the approved list of VET trainings provided by the National VET agency cannot be found. There are numerous training centres offering ICT trainings varying from programming, to software engineering, coding, etc. but those on one hand are specifically designed as short-term trainings and are usually serving the needs of a particular company (in most of the cases foreign IT companies operating in Bulgaria urgently needing programmers). The positive about those trainings is that they are very practically oriented, the negative is that most of them are not officially recognised as Vocational trainings and are not listed in the List of vocational education and trainings.

A Centre for digital innovations in industry was founded several years ago (as part of the Bulgarian Industrial Chamber) with the aim to serve as a remote Centre providing trainings, consultancy and support to companies in the digitisation process. However, there is no information whether the centre is still functioning.

What is the level of the existing transferable skills identified (communication, cross disciplinary, sustainable, STEM skills) within the various industrial sectors? EG: Manufacturing, Automotive, Electronics, Transport/Logistics, etc. At what EQF Level?

Spain: Due to the industrial revolution Spain is going through the workers of the industrial sectors have been witnesses of how the skills and competences they were asked for years ago have started to change into something quite different.

Nowadays the worker will turn from a worker to a problem solver (hardware and devices), among his/her competences he/she will have to take decisions and be innovative. In not planned and unexpected situations it will be the individual, with its cognitive capacities, the one making decisions and will have to concentrate in the managing of the problems affecting him/her.

There are two other main factors that will befall on the worker, which are flexibility and resilience, a term first in physics which, is applied nowadays to the business and people when describing their capacity of adapting to the changes and face adversities, trying to get the best of it.

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Italy: According to the *OECD skills strategy diagnostic Report,* skill mismatch is pervasive in Italy. Around 6% of workers in Italy are under-skilled, while 21% are underqualified. Surprisingly, despite the low average levels of skills proficiency, skills surpluses are also present, reflecting the low demand for skills in Italy. Over-skilled (11.7%) and over-qualified (18%) workers represent a substantial part of the Italian workforce. In addition, around 35% of workers are working in fields that are unrelated to their studies.
Bringing skills supply and demand into better balance requires more responsive educational institutions and training providers, more effective labour market policies, better use of skills assessment and anticipation information, as well as greater efforts on the side of the private sector to collaborate with the public institutions in charge for education, training, career guidance.

Malta: The shortage of workers with the available qualifications has constrained the government to come up with new strategies so that these shortages are tackled. The government is supporting enterprises by setting up ICT training programs for their employees. These programs target the un-skilled or semi-skilled workers and prepares them for the digital age by improving their productivity, mobility and employability.

Effort is also being made to align the supply of workers with STEM skills to the demands of the industry. Currently the percentage of technicians and associate professionals is 14.9% of the total workforce.

Until September 2017 with regards to digital skills, Malta shows a mixed picture. On the one hand, individuals with basic digital skills (49%) stands below EU average (56%). On the other hand, the percentage of ICT specialists in the labour force is now slightly higher than the EU average (3.6% compared to 3.5% in the EU). At the same time, the share of STEM graduates (Science, Technology and Mathematics) is also below average.

39.4% of the responses from the National Employee Skills Survey stated that only MQF levels 1-3 were need for jobs such as Plant and machinery operators and assemblers. 33.9% of recruiting personnel state that they expect at least MQF level 4.

Greece: During the last two years, the percentage of the Greek population with a basic level of digital skills has raised from 44% in 2015 to 46% in 2016. Also, Science, Technology, Engineering and Math (STEM) graduates remain at large figures which is reassuring for Greece's digital future, while at the same time regarding ICT specialists in the workforce, it has the lowest percentage in the EU (1.2%), which is the case with most industrial sectors.

Scotland: The level of STEM skills various across manufactures (more so between larger companies and smaller companies). Larger companies tending to have a greater pool of experience employees with a greater qualification level. Smaller companies tending to recruit more at local level tend to recruit local people, with many in need of re-training or up-grading of skills (including STEM skills). STEM workers are more available in larger companies, Rolls Royce, BEA System, etc. than is smaller companies. STEM through the Scottish Modern Apprenticeship Programme has given rise to the number of employees with above average STEM skills.

STEM skills are more in demand; many organisations still lack staff with STEM competences. The Scottish Government is addressing this issue through the development of a STEM Strategy to increase STEM skills in local workforces. The supply of STEM individuals in Engineering is below demand by the sector; EQF L4.

The UK Commission for Employment and Skills (UKCES) consistently reports shortages in STEM skills linked to innovation. The CBI reports that around 40% of employers already find it difficult to recruit such people and that the STEM recruitment situation will worsen over the next few years. However, STEM supported Employment in ICT and digital technology is predicted to increase substantially (84,000 to 150,000) by 2020.

The profile of the current workforce is ageing and the proportion of 16 to 24 year olds working in Scotland as IT and telecoms professionals is half that of other occupations. Forecasts suggest that there could be as many as

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11,000 job opportunities each year in ICT and digital technology. 2017/18 seen 10,200 STEM related apprenticeship places support into employment.

Bulgaria: Transferable skills are included as separate subjects both in the secondary and higher education programmes which means at EQF level 4,5,6 and 7. However, having them as separate disciplines within an educational programme does not in all cases mean that they are conformed to the specific needs of the concrete industrial sector. There are some educational programmes designed to cover this gap, such programmes could be found as Bachelor programmes in some HEIs – EX: "Industrial management", EQF level 6 and 7.

As for STEM skills – A decline in the share of STEM VET graduates is the predominant trend at the national level where Bulgaria is among the EU countries experiencing the sharpest decrease. According to the Global Competitiveness report 2017 – 2018, in the Higher education and training pillar, the Quality of math and science education, Bulgaria is ranked 81 out of 137 countries with a declining trend in the Quality of this education.

However, these skills are identified as critical to innovation and are included as one of the priority educational goals in the national plans and strategies for Digital Bulgaria. There are many sporadic initiatives and projects for promoting STEM skills as attractive among secondary, VET and HE students.

Locally and Nationally what existing VET Industrial Technological skills do trainers have to meet the demand for the future development of local and national industry through new 4.0 activity?

Spain: The enterprises from the Spanish industrial sector have identified six main competences that the trainers will have to train their students on for the future due to the 4th industrial revolution. These skills are:

- To have a more qualitative approach on the management of the products' life cycle
- To incorporate intelligence and connectivity to the products to enable the interaction with individuals, machines, and other connected elements
- To use analytics in order to obtain information that supports the decision making
- To speed the production fostering the industrial automation
- Choose a service-based business model
- To create and coordinate ecosystems with clients, technological partners, suppliers, education world and other stakeholders.

Italy: According to the *Observatory on digital skills,* in the next few years the shift towards Industry 4.0 will be the priority of many companies in the manufacturing sector. The initial departments impacted by the digital shift have been: mobile and social media, marketing, communication, customer support. Today, the focus is on
R&D, Design, Sales, Production, Logistics. Industry 4.0 represents a convergence of all the technological trends which enable digital transformation, not just an introduction of new technologies. It implies new productive formats, the affirmation of new governance and organisational models in a company; it requires significant investments in research and development, new skills and the evolution of those already present. Technological fields requiring the introduction of new skills are especially IT and Big Data processing. Trainers will therefore have to combine both communications skills and multi-disciplinary technical skills, be aware of the existing production flows, organisational models, and of the benefits and threats brought by Industry 4.0.

Malta: Whilst providing training in typically digital technologies such as CAD and similar technologies, existing VET trainers are not providing the required skills to the manufacturing work force which will be required for new 4.0 activities. There is no training in level 4 manufacturing engineering courses which cover topics such as industrial communication systems, cloud-based services, augmented and virtual reality, programming, or internet of things.

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Greece: The trainers must have a Bachelor's degree issued from a national or foreign university in a relevant educational area, which then has to be specialised on ICT skills of Industry 4.0. Trainers need to be familiar with the newest trends and activities of 4.0 as well as informed about what is required and needed by their students in order to find a job related to the Industry 4.0. This presupposes also lifelong learning by the trainers themselves as to provide only up-to-date information and training.

Scotland: The Scottish digital participation strategy '*A National Framework for Local Action*' was published in April 2014. This document sets out how a national movement for change will encourage people and businesses to get online and enjoy all the opportunities of the digital age.

Most companies in Scotland employ their Apprentices and Staff through the Modern Apprenticeship programme which provides training at SVQ L3 and L4 within the Engineering and Manufacturing Sector. Most manual Engineering Employees are trained to SVQ L3 and Trainers at SVQ L4 – TECHNICAL Apprenticeship. (EQF levels 4 and 5 Respectively). Many companies are engaged within the Modern Apprenticeship Scheme and use College or Training providers for the delivery of Training Assessment and have company mentors in place to support in-house training. It is recognised that Trainers should be trained to SCQF Level 7 (SVQ L3/4) or above (EQF L5). A higher percentage of smaller companies do not have specific trainers and rely upon external trainers or an experienced journeyman or employee to train others within the company. Additional external training is seen as costly, the Scottish Government tries to support additional training through Skills Development Scotland and Scottish Enterprise.

The Scottish Government have recently introduced a new source of funding "The Flexible Workforce Development Fund", however this is only targeted at companies with a large financial turnover. There is a demand for trainers/employees to have a higher digital skill level (EQF L6) if supporting other employees or acting as a trainer.

Bulgaria: At this moment there are no specifically designed VET trainings in Industrial Technological skills aimed at *trainers***,** except for short-term courses which are usually provided in-company for the specific needs of a company. These trainings, however, could be defined more as personnel trainings where the personnel within a company need to receive training in a particular skill concerning processes of their company. In this sense there are no VET trainings and all such trainings for Industry 4.0 are welcome.

Moreover, according to the Industry Concept for Digital Transformation of the Bulgarian Industry the shortages for implementation of the digital transformation of the Bulgarian enterprises are: low level of digital competence and trade; insufficient application of modern managerial techniques (lack of knowledge and experience in application of TQM, Lean 6 Sigma, GMP, KPI, etc.). The latter act as skill barriers for the advancement in the implementation of Industry 4.0 in Bulgaria. For acquisition of these skills by the trainees, the trainers will also need to possess the given skills so that they can transfer them.

Country Policy Regarding Levels of Digitalisation

How would you currently classify the level of Digitalisation and Integration into production within your country. EG: Current Usage % and potential Increased Usage % within Production Portfolio, Customer Service, Sales and overall Value Chain.

Spain: Following the results of the study *SPAIN 4.0 THE CHALLENGE OF THE DIGITAL TRANSFORMATION OF THE ECONOMY*, carried out by Roland, regarding the level of digitisation, Spain is below the European average and outside the world top 40. The same study reveals that, unlike other sectors such as banking or telecommunications, companies in the industrial sector are at the tail end of the digital transformation. Only 10% of industrial companies have a formalised digital strategy and less than half of their representatives considered

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that they had sufficient and adequate means for digital transformation, indicating a lower degree of digital maturity than other sectors.

Indicators measuring digital maturity and ICT usage such as the World Economic Forum "*Business Usage Index*", in 2016 Spain ranks 35th worldwide. At European level, Spain ranks 14th out of the 28 EU Member States in the *European Commission* ***Digital Economy and Society Index*** *(DESI) 2017*. Overall, Spain has improved its score on all the dimensions measured with the only exception of Human Capital.

Regarding the level of digitisation in the value chain of industrial enterprises, the industrial companies analysed in Roland's study showed greater maturity in communication equipment and collaborative tools, less in the use of user data and functionality for the customer and even less maturity in connection, sensorisation of plants.

Italy: Ranks 25th in *Digital Economy and Society Index 2017*. The use of digital technologies by enterprises and the delivery of online public services is close to the average. Compared to the 2016 data, Italy made progress on Connectivity, through improvements in NGA access. However, its low performance in digital skills risks acting as a brake on the further development of its digital economy and society. Italy has made some progress in the dimension of Integration of *Digital* Technology by businesses, although it remains below average. Italian firms are among the leaders in using electronic invoices, (compulsory for contracts with the public administration).

The use of RFIDs and the adoption of software to integrate different functional areas of the enterprise (i.e. ERP) are widespread among Italian enterprises. The use of cloud solutions has proven popular. Engagement with social media has been gaining traction quite rapidly among Italian firms. However, this doesn't seem to correspond to an integrated sales strategy given that e-Commerce remains relatively unexploited and Italy is losing ground with respect to other countries. The indicators analysed by the Digital Agenda Scoreboard regarding the adoption of services digital show how Italian companies (10 and more employees) are aligned with respect to European media on the use of applications for integrated management systems (ERP), while the gap is more marked for the use of management applications of the relationship with the customers (CRM). The gap is instead relatively minor regarding the presence of company websites and e-invoicing. One of the worst data regards e-commerce, which would not, however, have negative repercussions on exports. Only 7% of the Italian companies sell online (But there are significant differences among economic sectors: e.g. almost 100% of Bank and Insurance companies sell online). For over 40% of companies, the main obstacle is the use of the Internet, which they don't consider useful in their business area. Social networks are greatly growing and evolving. About 37% of companies use at least social media and the 14.4% use at least two, to promote the image of the company and its products (19%), but also to interact with the customers and stakeholders, or to develop new products and services (13% and 9% respectively). Regarding the relations with the Public Administration about 86% of companies use the Internet

Malta: It is difficult to quantify via %s the level of digitalisation and integration into production as there are no specific country specific official figures or statistics. On the other hand, based on PwC's document on Strategy and Measuring of Industry Digitization, Malta as part of the southern European region employs 45% of digitisation in basic manufacturing, 50% in automotive, 47% in trade and retail. This correlates well with the rapporteurs' knowledge of the industrial scenario in Malta.

Greece: Lately is undoubtedly making some serious progress in integrating digital technology but not to the desired level.

Overall, Greek companies use social media compliant to the European average (20%), while more and more SMEs incorporate sales channels. Nevertheless, more specialized technologies are not very frequent. Companies in the manufacturing sector score at 12% regarding ICT users and eCommerce, which shows that an Industry 4.0 strategy

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could really optimise Greece's digital potential and digitalisation planning, as the utilisation of the possibilities of digital technologies is a fundamental component of productivity growth.

Scotland: Overall it looks like there is still a lot of work to be done, the perception of using Digital Technology or Robotics is still far from the mind of many smaller employers. Larger employers such as Rolls Royce, BAE Systems, Aggreko, Diageo and Doosan's and other larger Manufacturing companies employ a high level of digitalisation across their manufacturing plants. Smaller engineering and manufacturers make little use of digital technology, mainly due to costs of investment.

Many companies see a high importance of digital technology into the operation of business development, with companies using mobile internet and technologies and management software most likely to rate these technologies as central to the way the business/company operates and performs.

A high proportion of businesses that use social media indicate that it would make little difference to the company if the technology was not used compared to those rating it as a central part of how the business operates. More generally the overall importance of digital technology to the current operations of the business is identified as essential to 25% of Scottish companies, a larger number, 50% of Scottish companies stated that digital technology was either important or very important, while 25% stated that digitalisation it was not important or not at all important. Use through digitalisation would increase production, currently digital technology provides around 25% usage, training for use of new technology would be estimate an increase to around 50%.

Bulgaria: According to *DESI2017* Bulgaria is ranked at 27th place, namely because of the low performance in digital skills, digitisation of businesses and of public services, which "act as a barrier to the further development of Bulgaria's digital economy and society". Its index score has increased by 0.02 points to 0.37, compared to 2016. As a result, Bulgaria is placed among the group of low performing countries.

According to the *Global Competitiveness Report 2017-2018* of the World Economic Forum Bulgaria is ranked 39th (out of 137 countries) in the Technological readiness pillar with a score of 5.1 (1 to 7 scale, where 7 is the best possible), marking advancement of the country in this respect in recent year, where:

- The country takes 68th place (out of 137) countries in ranking related to Availability of latest technologies with a score of 4.7.
- The country takes 66th place (out of 137) in Firm-level technology absorption with score of 4.5. This means that because of the increase in this indicator, Bulgaria fits in the first half among all the countries in terms of Firm-level technology absorption for the first time;

The figures reflect all sectors of the economy. The Insufficient capacity to innovate is among the 16 most problematic factors.

Concerning the extent of staff training, the country is one of the last (118th place), meaning that it falls far behind in this respect (with a score of 3.3) both at a world level and compared to the performance in the previous years. Insufficient capacity in many industrial sectors is the main barrier for SMEs for introduction of ICT-based innovations.

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What levels of Digitalisation is expected over the next 5 years, and how will this benefit local companies. EG: Higher production, Reduced Costs, Better Customer Relations, etc. And do companies plan to introduce new Digital Services, Production Systems over the next 5 years? If so what new services do they envisage. EG: New In-house Technology, Integration of Digital Technology, New Digitalisation Policies to meet changes, etc. And how quick do they react to digital advancement.

Spain: Due to the scarce experience in digitalisation of Spanish industry, it is expected that in the coming years the industrial sector presents higher rates and better results. Many of its processes, products and services will be will be digitised, interconnected and integrated. The major advances will be sensorisation and digitisation of plant processes, process automation and total interconnectivity of the production process and access to the customer. And will lead to the flexibilisation of production, which will make it possible to produce according to real demand, in addition to the possibilities of highlighting the information collected and managed in the plant, which in turn will lead to the creation of new value-added jobs.
More specifically, the adoption of Industry 4.0 in manufacturing companies can lead to more efficient processes and lower costs (less downtime, fewer operations, lower consumption of raw materials and energy...). Thanks to process improvements, manufacturing companies could obtain products of higher quality or precision, with superior performance. This can lead to a significant increase in flexibility and agility, both total value chain and its different links: Flexibility and speed to adapt cost-effectively to changing customer requirements, reduced time-to-market; production of short or even unitary series, opening the door to the concept of mass customisation.

Italy: Different international studies show that *almost half of the jobs currently carried out by natural persons in the world could be automated when the technologies will have spread on a global scale.*
With reference to Italy, this means that almost 12 million workers could be affected by the process of progressive automation (at least up to approx. 50%) of their tasks. The digital shift will contribute to the creation and transformation of jobs based on new skills and, at the same time, could trigger their elimination.

The areas that have and will have the greater impact are those of Mobile Internet, Big Data, New Power Sources, the Internet of Things, of the Sharing Economy / Crowdsourcing, relatively to digitization; Robotics, Artificial Intelligence and Additive Manufacturing / 3D Printing.

The effect of substituting human labour with automated processes looms much more limited in Europe compared to the United States, but the most important evidence is that the main threat derives from structural changes in tasks and work organisation models. The most virtuous economies are indeed “destroying" obsolete jobs and creating new ones, with the consequent effect of raising the quality of their job market. In a time, horizon up to 2025, CEDEFOP and Citi Research for Europe estimate a significant increase of professions/jobs with a high qualification and a significant decrease of those with low qualifications.

The new skills a high qualification will include a complex mix of process, soft and social skills. Soft skills like the ability to solve complex problems, to manage change, to collaborate, to adapt flexibly and to communicate will have an increasingly important role. The search for these new skills will be more difficult for the countries lacking high profile digital proficiency, where the labour market for these characters is still in an initial phase.

Malta: Local manufacturing companies are aware of Industry 4.0, and whilst not all are knowledgeable about the details or requirements of implementing this technology, they all recognise that this technology must be implemented in order for them to remain competitive. Companies see these technologies as a possibility to increase productivity, but also as an opportunity to enter new markets and develop new products.

On a national level the Maltese government is providing incentives (such as tax rebates) to companies who update their systems to more modern technologies to improve competitiveness with other countries. A large investment

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is being made in the training of the workforce from a very young age, by improving literacy skills, mathematical skills and vocational skills.

Greece: Is dedicating a significant amount of ESI Funds (2014-2020) to broadband infrastructure and networks of higher speed, which constitutes a major asset for local companies and businesses.

As a result, this will a provide a basis for a more extensive digitalisation for industrial companies and enterprises.

Scotland: With regards to future use of digital technology overall there is a desire among most of businesses that already use digital technologies to further develop their usage 77%. Over 70 per cent of businesses with a website or using social media respectively are hoping to develop or use more of the digital technology as it becomes more available. 60% are hoping to develop their usage of cloud computing, and 58% of companies want to expand their use of mobile internet and technologies, with 46% of businesses using management software hoping to develop or increase their use of this type of technology. Many companies in Scotland recognise the need for a more digital approach, although initial cost could be a problem.

Companies see the use of Digital Technology increasing production and over the longer term reduce production costs, hence increasing customer relations through the delivery of a more efficient product. 50% of companies see an increase in digital manufacturing. Training to include; Software Development, increase in ICT and Digital Skills, use of Cloud Technology, Management Software, Hybrid Training, Info-structure Training, Virtual Training, Big Data, 3D, Cyber Security, Digital Awareness, etc. Scottish companies feel they don't react quickly to change and this is detrimental towards increased production and reduced costs.

Bulgaria: According to the Concept for Digital Transformation of the Bulgarian Industry it is expected until 2030 Bulgaria to be recognised as a regional centre for digital economy through implementation of products, technologies, business models and processes from Industry 4.0. The aim is reaching the DESI index's EU average score.

Generally, Bulgarian companies fall behind the EU average performance in terms of digital advancement, mainly due to human capital skills and financial resource shortages. Very few companies have already introduced, or are currently in the process of introduction or plan to introduce digital technologies.

There is no common opinion about the industries, which will be the pioneers in the Fourth Industrial Revolution. According to experts, the automotive industry will have a leading role in digitisation. This will contribute to reduced costs, related to stock management through on-time transfer of information about the necessity for production. According to the Bulgarian Industrial Association (BIA) the sectors that will be mainly affected by the digitalization are: machine building; electrical industry; transport; energy industry.

According to a questionnaire survey, performed by the German-Bulgarian Chamber of Industry and Commerce, conducted in 2016 among 59 Bulgarian, German and foreign member companies, more than 80% from the interviewed rate the role of the digitalisation in their company as "crucial" or "very important". Concerning the status of digitalisation more than half of the respondents report that its level is higher than the average. Nearly 90% of the companies will have made steps towards digitalisation of the processes in the next three years, and 64% responded that they have department or specialist, responsible for this. More than 70% of the interviewed plan to invest up to 3% of their turnover in the next five years.

As the sample is composed of many foreign companies, it is supposed that they form the majority of the numbers given above. Namely the foreign-owned companies in Bulgaria are the pioneers in bringing the digital innovations in industry. According to BULGARIAN ASSOCIATION OF ELECTRICAL ENGINEERING AND ELECTRONICS (BASSEL) the foreign ownership in the Bulgarian industry must be used as a channel for introduction of the new technologies.

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The actions described include both introduction and implementation of Digital Technologies and New Digitalisation Policies to meet changes.

Example for digitalisation: An innovative solution operates at "Festo Production" Ltd for management and maintenance of the production facilities, called Expert Maintenance. It decreases the time needed for responding in case of accidents and replaces the hard-copy documentation, necessary for the planning and tracking of repairs.

What is the existing national policy towards 4.0 Industrial changes and how are local policy makers reacting to the changes required by the E_Revolution. Is there new policy adopted or being developed?

Spain: In 2015, the Spanish government launched the Connected Industry 4.0 initiative in order to promote the digital transformation of Spanish industry through the joint and coordinated action of the public and private sectors. This initiative is aligned with and complementary to two national initiatives: The Digital Agenda and the Agenda for the Strengthening of the Industrial Sector in Spain, approved by the Council of Ministers on 11 July 2014.

Additionally, several regions have developed their own Strategy for industry 4.0 such as Basque Country, Navarra, Cantabria or Aragon. In the case of the Basque country, due to the specific importance of industry in the region, its strategy for boosting industry 4.0 is included in its intelligent specialisation strategy RIS3.
The strategy includes an action plan and a series of measures to support public-private initiatives, personalised advice to companies, analysis of the evolution of the digital maturity of our companies.

A public consultation process is currently underway on the new Digital Strategy for a smart Spain, which will undoubtedly affect the 4.0 industry strategy.

Italy: Recent Italian governments have introduced a number of ambitious policy reforms: (2014 “Jobs Act”) Education system (2015 “Good School Act”) and Innovation system (2015 “National Plan for Digital Schools and Industry 4.0 National Plan 2017-2020”). These reforms aim to break through the current low-productivity, low-skill equilibrium and create productive and rewarding jobs across the country.

We launched an Industry 4.0 strategy in September 2016 (Piano nazionale Industria 4.0), with the aim of modernising Italy’s manufacturing sector, mainly through the adoption of digital technologies and digital business models. The strategy foresees: corporate tax deductions for investments started by end of 2017 for new equipment, ICT goods and high tech instrumental goods, the tax credit for R&D expenditures has been strengthened. Additional measures include tax deductions for equity investments in innovative start-ups and innovative financial solutions to support innovation and industry 4.0 investments. Another pillar: the creation of digital innovation hubs and competence centres. The former, organised by employers’ associations, will raise firms’ awareness - especially at SME level - about the possibilities offered by the digital economy and help locate funding opportunities for innovative investments. The Chambers of Commerce network oversees the sensitisation and first information of the SMEs about Industry 4.0 and digitisation. Critical issues on the Italian Industry 4.0 plan remain: only some of the planned digital innovation hubs are operative and the competence centres won’t be active before the second half of 2018 with the risk that an important share of tax deductions could be misallocated. The capacity to raise awareness among SMEs of the opportunities offered by digital technologies, will rely on the successful coordination between the government, higher education, the Chambers and the Business Intermediary Organizations.

Established on 1st March 2012 the *Italian Digital Agenda* (ADI) transferred the strategies and the principles outlined by the Digital Agenda for Europe to the Italian context. The ADI aims to promote and lead in the country

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the wide spread of new technologies, the modernisation of the PA, the creation of a digital single market of contents and services, thus enabling citizens and companies to access and exploit the potential of ICTs.

At local level, the *Veneto Digital Agenda 2020* is the programming document with which the Veneto Region defines its strategic commitment to promote the Company and the Digital Economy in its territory. The Veneto Agenda is structured with a focus at two dimensions. The first dimension is related to 3 transversal drivers: the presence of adequate and enabling technology infrastructures and the value they have for digital development; in the importance of human resources in innovation processes; the importance of capacity building and empowerment. The second dimension is oriented towards 10 vertical ecosystems or priority thematic areas such as: businesses, agri-food, infrastructure and mobility, tourism promotion, public administration, health care, social services, smart communities, human capital and digital skills, cultural heritage.

Malta: Whilst the Digital Malta – National Digital Strategy 2014-2020 covers the digital and ICT strategies to be implemented or supported by the Maltese government, there are no current national policies or strategies which directly target the industry 4.0 technology, or how this will be affecting the Maltese manufacturing industry. The local Chamber of Commerce and Enterprise have identified that digitisation is an important "do-or-die" capability for the Maltese manufacturing industry, there is no policy which is currently being developed which may support companies to implement these technologies.

Greece: In May 2017, the Greek Government created "a General Secretariat for Digital Policy with responsibility for the policy-making, design, overall coordination and monitoring of implementation of the ICT investments in the country. This triggered the creation of a new Ministry for Digital Policy, Telecommunications, and Media in November." So, in general Greece has realised the first steps towards the utilisation of the ICT investment under ESIF for the period 2014-2020.

Scotland: The Scottish Government has an ambition for Scotland to be a world leading digital nation by 2020. To achieve this, companies in Scotland, need to be confident and capable users of digital technologies, and businesses/companies need to make effective use of such technologies to grow their business and to realise their full economic potential. The Scottish Government has introduced several local initiatives to help increase and develop the local workforce at local and national levels.

The Scottish Government work closely with the Scottish Funding Council, Skills Development Scotland, Scottish Enterprise, Scottish Colleges and with Scottish Universities. These Government organisations establish the baseline of where businesses currently stand in their level of digitisation and to allow the digital progress to be measured and tracked over time. The Scottish Government, together with its partners commissioned IFF Research to carry out a Digital Economy Business Survey in the summer of 2014. The latest move by the Scottish Government is the announcement of a new Innovative Digital Centre in Glasgow at a cost of £65M to support new Business Manufacture Development through Innovation National Manufacturing Institute for Scotland (NMIS), the Scottish Government will invest £48 million in NMIS, with £8 million from the University of Strathclyde. Renfrewshire Council will provide a further £39.1 million through the Glasgow City Region Deal. Scottish Government has policy on; Digital Connectivity, Digital Economy and Digital Participation.

Bulgaria: There is no complete national policy towards 4.0. Industrial changes yet. Currently there is only Concept for Digital Transformation of the Bulgarian Industry, which acts as a basis for the elaboration of the Strategy for the Participation of Bulgaria in the Fourth Industrial Revolution.

Another Policy instrument addressing Industry 4.0 is the Digital Bulgaria 2020 Strategy. Because of the high-centralised governance in the state, all the local policies fit in the framework defined at national level. Local authorities are more likely to be a subject of national digitalisation policies, rather than active policy actors in the field.

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Potential ICT and Digital Skills Shortage

What is seen locally and nationally as the major skills barrier to addressing the advancement and providing the necessary 4.0 Digital skills for the future?

Spain: Due to the growth of the industrial sector of the last years in Spain there has been a generation of new recruitment needs, especially of Commercial Engineers profile – for the diversification of sectors or regions- and of technical profiles such as PLC (Programmable Logic Controller) programmers and Project Chiefs who would be able to manage the increment of the orders' volume.

This upward trend on the demand of specialised engineers in industrial automation has a negative aspect, which is the demand of curricular abilities and competences to the workforce, which, nowadays, is the biggest barrier to the development of the Industry 4.0 in Spain. The most asked aptitudes are: a minimum of 7 years of experience, a great domain of languages –such as English, French or German-, customer orientation, great capacity for communication, autonomy and the capacity for decision making.

Italy: In medium-large companies, start-ups and professionals in international contexts, it emerges that the soft skills of young Italians *are often not in line* with the international labour market.

In some sectors there is a *strong cultural and entrepreneurial problem:* limited capacity to work in team, no contamination or co-creation among different actors (e.g. traditional companies and CCIs), difficulties in accessing the "digital world". Italy is currently trapped in a low-skill equilibrium: a situation in which the low supply of skills is accompanied by low demand from firms.

While many, relatively large, companies compete in the global markets successfully, many others have low skilled managers and workers. The low levels of digital skills of managers and workers are coupled with low investment in productivity-enhancing work practices and in technologies requiring workers to use high-skills. These in turn reduce incentives and capacity to effectively invest in skills and productivity-enhancing work practices and technologies. This dynamic is partly explained by the way work is designed and organised, and the way firms are managed. In Italy, family-owned businesses account for more than 85% of all firms and about 70% of employment. But managers of family-owned businesses often lack the skills needed to adopt and manage new, complex technologies. Furthermore, pay scales in Italy are often related more to seniority than to individual performance of the worker, thereby reducing incentives for workers to use their skills more fully and intensively at work.

Malta: The lack of a skilled workforce in advanced ICT technologies such as internet of things, artificial intelligence, big data analysis and industrial communication networks are seen as the major skills barrier which is seen by local companies. Typically manufacturing employees are not trained in ICT technologies beyond digital communication technologies and CAD systems.

From an unemployment point of view, by September 2017, 13.8% of the total unemployed people stated that the reason for their unemployment is due to lack of education or training. This figure went down by 0.3% from the previous year.

Greece: Throughout Europe in more and more jobs, and Greece is no exception, digital skills and competences are required. However, there is a clear mismatch between the demand and the supply of skills, which generates a significant barrier for Greece's economic development as the job posts exist but not the human capital to occupy them. To illustrate this, it would be useful to mention that 1/3 of the country's population has never used internet, a fact that impedes the possibilities of digital economy and society.

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Therefore, it seems that there is not enough provision of training and information in order for people to get more familiarised with ICT and the skills required not only for professional but also for day-to-day reasons.

Scotland: Across Scotland the main barriers to the business increasing its use of digital technologies over the next 12 months (%):

- Cost / lack of funds 21%
- Lack of time and / or resource to implement 17%
- Lack of understanding / skills in the organisation 15%
- No need / no strong business case 15%
- Appropriate technology is unavailable 9%
- Poor internet connection 6%
- Other 3%
- No barriers 25%

Base 4,002 Employers; Source Scottish Government White Paper.

Barriers to increasing use of digital technologies: One quarter (25 per cent) of businesses stated that there were no barriers preventing them from increasing their use of digital technologies in the next year. However, the most cited barriers to increasing businesses' use of digital technologies over the next 12 months were cost/lack of funds (21 per cent stated this) and lack of time and/or resource to implement (17 per cent). Further training requirements. Other reasons include: lack of skills/understanding; that the business was too small and cost/lack of funds.

Bulgaria: According to Bulgaria EDPR Country Profile the country's performance in terms of human capital in the context of digital transformation is well below EU average, even though it made some progress in 2017, compared to the previous year. Only a quarter (26%) of the citizens possess even basic digital skills.

In the same time, the number of STEM (science, technology and mathematics) graduates remained the same (1.4% of all graduates) posing some risks for Bulgaria's capacity to fulfil increased demand for ICT skilled specialists. Several IT companies provide extensive IT training to students. As being alternative form of education, this is not recognised by the Government.

According to the Industry Concept for Digital Transformation of the Bulgarian Industry the shortages for implementation of the digital transformation of the Bulgarian enterprises are*: low level of digital competence and trade; insufficient application of modern managerial techniques (lack of knowledge and experience in application of TQM, Lean 6 Sigma, GMP, KPI, etc.)***.** The latter act as skill barriers for the advancement in the implementation of Industry 4.0 in Bulgaria.

What is identified as the major ICT staff skills shortages faced by employers within local Traditional Industry Sector. Please list any specific training subjects identified as necessary to meet the 4.0 demand on industry. EG: Software, Hardware Training, Programming, etc?

Spain: The impact of digitisation and the Industry 4.0 not only requires engineers, but also professionals with a more technical and technological profile. Information technology professionals will be key elements in the industry 4.0 scenario. Many companies report having difficulty at locating the profiles needed to fill their vacancies. Companies are increasingly demanding profiles with digital skills that are familiar with the use of new technologies and their different applications.

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In addition, there is a growing demand for new management-oriented profiles such as team managers, product managers and channel managers. In terms of digital skills, many factories, particularly larger ones, are increasingly demanding the following profiles

- web developers: “back front end”
- mobile apps programmer/developer
- big data solutions developer
- cybersecurity specialist
- "Agile/scrum" software specialists
- Cloud computing
- UX Specialist (User Experience Design)
- Connectivity and IoT

Other necessary skills to meet the needs of the industry 4.0 are data analytics, information manager, and other profiles able to adapt applications to artificial intelligence to improve business performance and optimise business processes.

Italy: Within the Digital Agenda of Veneto, the ICT staff skills is a fundamental issue.

The widespread adoption of digital technology in the business eco-system, especially in small and medium-sized businesses, necessarily entails the diffusion of digital skills in business contexts. In particular, some priority actions are identified:

- SMACT technologies (acronym for Social networks, Mobile platforms & apps, Advanced analytics and big data, and Cloud Technologies)

ICT for tourism and cultural heritage. Tourism and artistic heritage are a precious resource for the Veneto Region, but with a potential that is still unexpressed due to a lack of systemic approach that has not yet been able to grasp the opportunities that digital culture already offers to optimise the management of flows, to improve the quality of services, to enhance sites of great interest but excluded from traditional circuits, to integrate museum circuits and improve visitor enjoyment, etc. We need targeted actions to empower the operators in the tourism sector to know and use the potential of ICT (big data collection and analysis, promotion techniques, VR and augmented reality).

Skills/training needed to meet new production demands with regards to the 4.0 Digital gaps facing local and national industry. EG: Data Management, Cyber Management, Remote Telepresence, Design Management, Nano Technology, etc?

Malta: The National Skills Survey states that 32.1% and 30.9% of job applicants lack technical skills and problem-solving skills respectively. Respondents in the National survey stated that 8.0% of their employees are not fully proficient. Technicians and associate professionals make up 25.6% of the total number of employees who are not proficient.

Lack of problem solving skills amount to 43.0% of not fully proficient staff. 57.8% of employer’s resort to an increase in training to address this lack of proficiency.

Greece: In Tourism, ICT staff shortages include a sound knowledge of software that have to do with online booking regarding hotels and accommodation and ticketing regarding travel. Also, in the Accommodation and Food sector, software for online orders, addressing both to individuals and to providers of food services. More and more people and businesses seek to automatise these activities in order to save both money and time.

The same applies for Wholesale and retail trade; it is a major barrier in the development of the sector that employees are not familiar with this kind of software and training.

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Equally important, any job in the Professional services (e.g. accountant, engineer, IT consultant etc.) needs certain types of software to not only facilitate their job but also remain competitive. A first step would be the ECDL certification which is recognised throughout Europe and has become a required document for most jobs. A more specialised example would include seminars on training courses on AutoCAD, a designing and drafting software application.

Scotland: *Digital skills of workforce:* 37 per cent of all businesses stated that their staff were fully equipped in terms of skills to meet the business' digital technology needs. Over two-fifths (41 per cent) stated that they were well equipped but with some skills gaps, and 16 per cent stated that they had considerable skills gaps.

Type and impact of skills gaps: Across Scottish companies the most commonly cited skills that staff were lacking were: software skills (58 per cent), web development skills (55 per cent) and digital marketing skills (51 per cent). Six per cent stated that the skills gaps have a major impact on the performance of the organisation, while 38 per cent stated that it has a minor impact. When asked what areas have been affected by their employees' digital skills gaps, the most cited answer was that it prevented the business from fully exploiting the latest methods and technologies (21 per cent). 18 per cent stated that it had prevented adoption of the latest methods and technologies, and 15 per cent respectively stated that it impacted on the business' ability to sell products/services over the internet and ability to adopt or develop digital advertising.

STEM competences are more required across existing workforces of engineering and manufacturing to meet increased ICT demands of digital expansion.

Bulgaria: VET on Programming is available both by the VET school on Computer Systems and Technologies, by tertiary education institutions, as well as provided by VET centres on courses for occupations, defined by the National Agency for Vocational Education and Training. However, the trainings are general and do not fit the specific needs of INDUSTRY 4.0.

What skills/training are needed to meet new production demands with regards to the 4.0 Digital gaps facing local and national industry. EG: Data Management, Cyber Management, Remote Telepresence, Design Management, Nano Technology, etc.

Spain: As intelligent production systems move forward, the number of semi-skilled staff will fall, and new highly skilled jobs will be created, mainly linked to new technologies or the design of products and services. Industry is demanding more and more computer engineers with knowledge in the digital technologies that are at the base of the new industrial model.

There are several areas that stand out in terms of training needs related to industry 4.0. Firstly, it highlights the need for training of experts in the new enabling technologies of industry 4.0 (IoT, robotics, additive manufacturing, augmented reality). Secondly, it highlights the need to train professionals from different areas of the industry (logistics, manufacturing, marketing, after-sales service or customer service) in basic digital skills that enable an industry-wide approach to be adopted throughout the value chain.

In summary, two sets of competencies needed to meet the challenges of the connected industry have been identified:

Development and Integration of Cyberphysical Systems:

- Sensors and data acquisition
- Embedded systems
- Communication Technologies
- Fog/Cloud computing
- Big data / Machine learning

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- Design Patterns
- Software modelling
- Simulation
- Intelligent Manufacturing:
- Digital Company Transformation
- Industrial company management models
- Platforms for digital transformation
- Innovation management
- Big data and business intelligence
- Cyber-security management

Italy: The Industry 4.0 paradigm implies new productive formats, the affirmation of new governance and organisation models in a company. The technological fields in which there will be a need to introduce new skills are, at this stage, especially those of IT and Big Data. The companies that are achieving this change need to have resources that combine the knowledge of industrial protocols skills in IT, Cloud, and Big Data, design skills of associated applications to new media, augmented reality and skills robotics, security.

Beside these, companies will need strategic skills, with the ability to support and implement a different business model, a plan that exploits the technologies to achieve new business goals, facilitating the work of staff, increasing productivity, making logistics more lean and sustainable and helping the company to be more agile and reactive to the market.

Therefore, Industry 4.0 approach will require managerial skills with a strong propensity towards innovation. Companies will need skills/training about Robotics & Automation Manager, IT Engineering, IT Experts, Big Data Scientists, Technology Innovation Managers, Cognitive experts about Computing and Artificial Intelligence.

These, in addition to specific individual skills, will have to be able to analyse the processes, draw paths to simplify and improve them with the support of technologies, give evidence through adequate documentation of the projects that enable evolutions and know how to present them to top management. Not just technological skills, therefore, but also interpersonal skills, to interpret needs and act proactively

Malta: To meet the new production Industry 4.0 demands training in the following skills are required:

- internet of things,
- artificial intelligence,
- big data management and analysis,
- industrial communication networks,
- cloud based services,
- augmented and virtual reality.

Greece: In Tourism and Commerce, some skills needed would be sales management, digital marketing, user support and service delivery, as well as in the Accommodation and Food sector.

Needless to say, that some skills could also be horizontal or required for more than one posts, for example risk management or project management.

The e-CF 3.0 is a reference framework that provides an overview of the skills needed in main ICT business areas and it is an invaluable tool in addressing digital skill gaps and shortages.

Scotland: Measures taken to develop employees' digital skill: Just over one quarter (26 per cent) of businesses stated that they are doing something to develop their current employees' digital technology skills, for example by providing training. 18 per cent stated that they are planning to do this in the future. Over half (54 per cent) stated

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that they were not currently taking action to develop their employees' digital skills and had no plans to do so in the future. Nine per cent of businesses had successfully recruited an ICT specialist in the last 12 months. One per cent had tried but had not been able to do so.

Importance of digital technology in the future: The majority of businesses stated that digital technology was important to the future growth or competitiveness of their business; 28 per cent considered digital technology to be essential while 46 per cent stated that it was important or very important. Less than one quarter (24 per cent) did not think digital technology was important.

Required Training: Training to include; Software Development, increase in ICT and Digital Skills, use of Cloud Technology, Management Software, Hybrid Training, Info-structure Training, Virtual Training, Big Data, 3D, Cyber Security, Digital Awareness, etc.

Bulgaria: Considering that many Bulgarian industries are making their first steps towards digitalisation, the Data Management skills and skills for working with ERP are useful for the initial transition in digital industry. They will improve the management and production efficiency, will bring value to the flexibility and responsiveness to the changing demand. Both can be taken as basic prerequisite for facing the new industrial challenges and will make the industrial enterprises more flexible and competitive.

Relevant training is needed for the purpose of facing the challenges, brought by the Fourth Industrial revolution.

Conclusion

There is a wide divide of 4.0 Digital Skill levels across the project partner countries, employers and government bodies. It is apparent that a significant investment is necessary across the pool of employees and the labour market as a whole to combat the 4.0 Digital E_Revolution.

All partners recognise the need for new digital training skills and models to provide a wide reaching Digital Training programme, much that will not be possible through the limited resources of the RESTART Partnership. Most of companies contacted through the survey highlighted the importance of Digital Skills for their workforce and future employees. Investment in Digital skills Training is necessary for future growth and competitiveness within most business sectors.

As intelligent production systems advance the number of semi-skilled staff will reduce and there will be a demand for new highly skilled jobs and employees linked to new technologies, design and services. The 4.0 Industrial approach will require managerial support with a strong move towards innovation across the manufacturing sector.

Training includes: Software Development, Increase in ICT and Digital Skills, use of Cloud Technology, Management Software, Hybrid Training, Info-Structure Training, Virtual Training, Big Data, 3D, Cyber Security, Digital Awareness, Robotics, Additive Manufacturing, Logistics, After Sales, Basic Digital Skills, Embedded Systems, Simulation, Supply Chain Management, Platform and Digital Transformation, Communication Networking, Project Management, etc.

Training providers, both Public and Private need to change much of the current training provision and model to ensure that they are addressing the training needs identified by the 4.0 Digital Industrial Sectors.

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