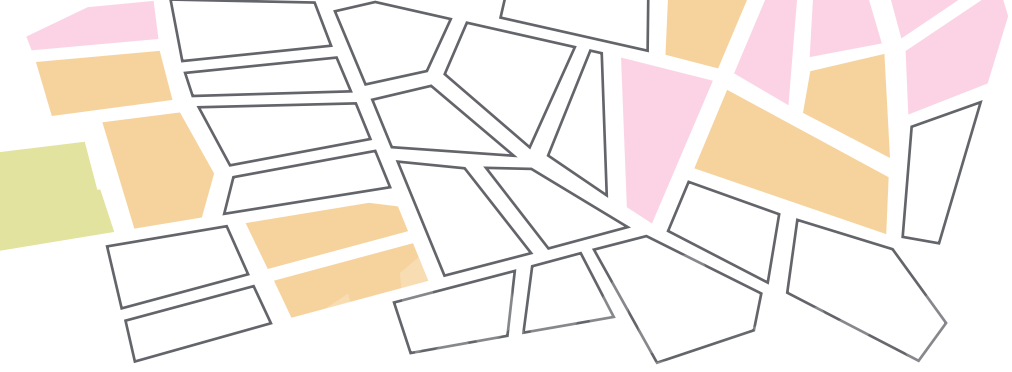
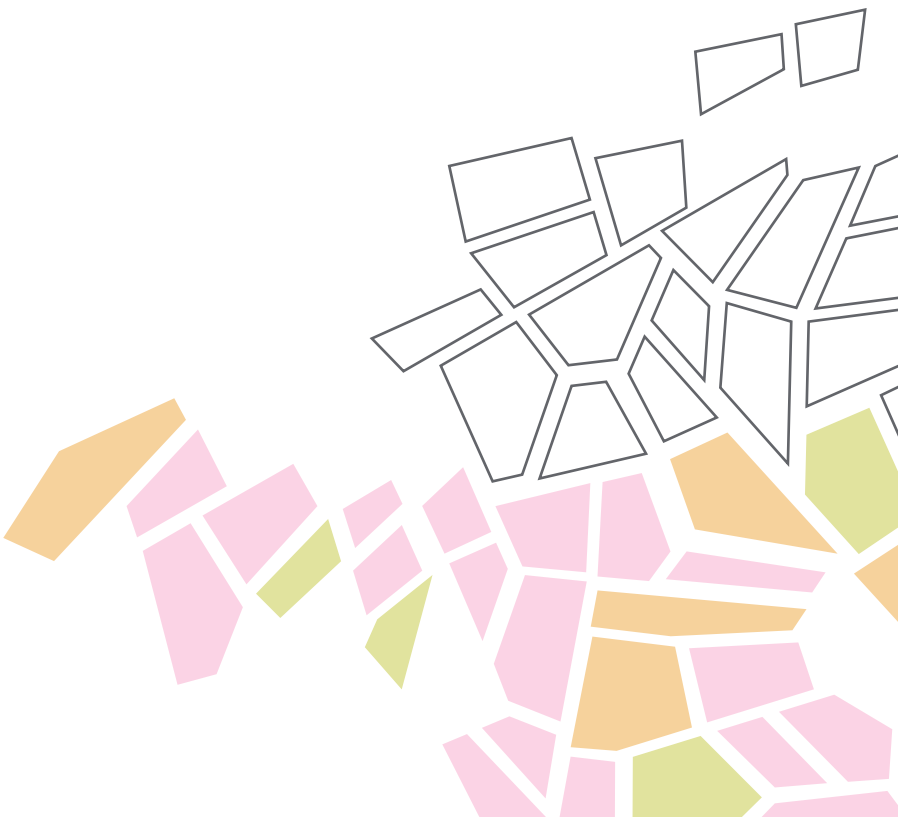
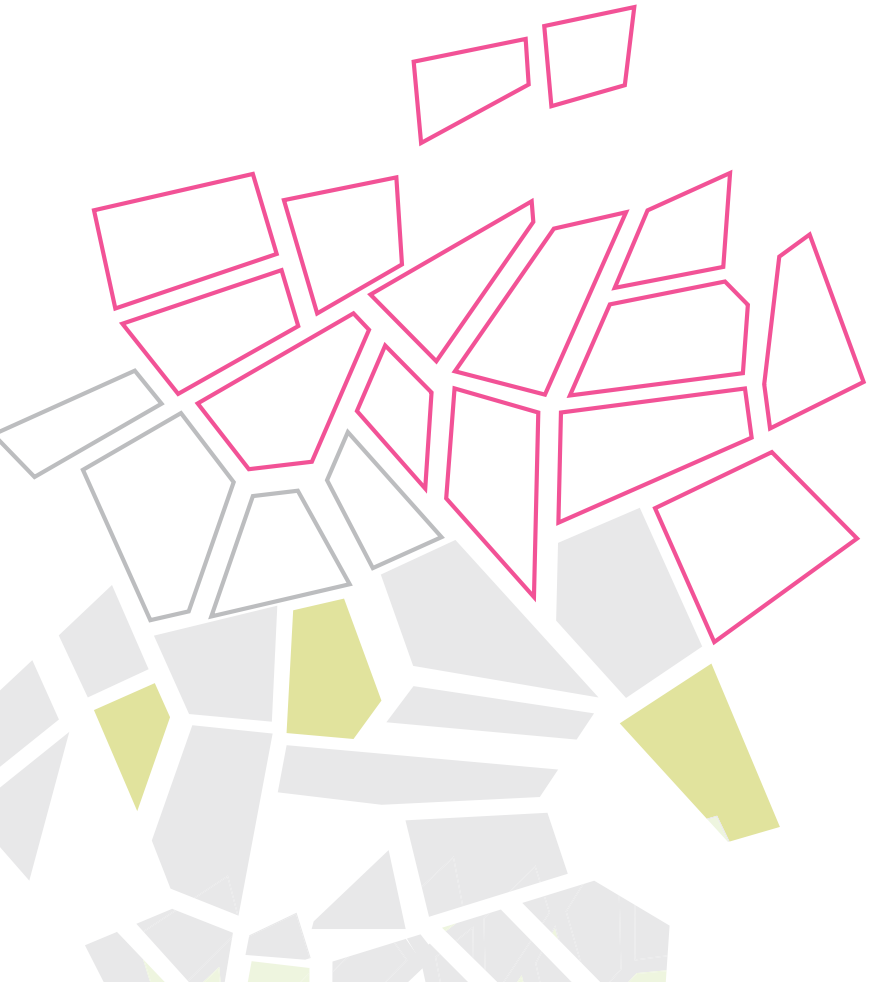
Creating

500,000

new jobs <in ICT/>







A. Byron Nicolaides

President of the Council of European Professional Informatics Societies (CEPIS),
Chairman and CEO of PEOPLECERT Group of Companies.

New technologies can be appealing to foreign investors; they may well be the route to Greece's financial recovery, and the way out of youth unemployment.

With estimates showing that the lack of ICT professionals in Europe will grow to 800,000 people by 2020, there is a unique opportunity for Greece: fill the large gap in the European ICT market, generate 500,000 new jobs in Greece over the next decade, and take advantage of the ability of ICT professionals to work internationally, regardless of their place of residence.

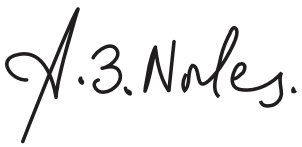
The 650,000 unemployed Greeks, which majority is under 35 years old, with an addition of 60,000 new higher education graduates each year, may constitute the pool of individuals that will develop the relevant skills in order to meet the demands of the new digital setting.

At the same time, Greece's geographical location makes it ideal for the creation of software centres that could employ thousands of well-paid ICT professionals, mainly developers. Multinational companies have already established technological support centres in Greece, taking advantage of the country's high level human resources.

It is time to create an alliance between market forces and the academic society, encouraging young people to develop coding skills and helping Greece to become the Silicon Valley of Europe. We can do it if we want to!

The goal is feasible, and as the President of CEPIS, I am committed to making every possible effort to achieve it.

A. Byron Nicolaides



AN INNOVATIVE PROPOSAL

Employability, unemployment and digital skills:
Recommendations to create new ICT jobs in Greece

A FEW WORDS ABOUT THE STUDY

The study was an initiative of A. Byron Nicolaides, President of the Council of European Professional Informatics Societies (CEPIS). It was conducted in cooperation with HePIS, the Athens University of Economics and Business and the ALBA Graduate Business School at The American College of Greece.

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1. SECTION A. Summary

The Need > The Vision > The Objective > The Outcome

1.1 The Need: Vacancies and unemployment, the employability problem

It is common knowledge that Greece has been experiencing one of the biggest financial crises in its recent history with unemployment rates - particularly youth unemployment - reaching historic highs. At the same time, there is a significant paradox in the labour market: **there is a high number of vacancies in the IT sector** yet employers state that they face difficulties in finding people to fill these positions. The issue of insufficient skills supply is even bigger at European level (where unemployment rates are much lower): thousands of positions remain unfilled annually, while **the gap between supply and demand for digital skills** (or e-skills, as they are often called) is expected to result in over 800,000 vacancies in 2020 (an increase of around 500,000 compared to today) (see Tables 1 and 13).

This strong and increasing demand for e-skills may be attributed to the **very high penetration of technology into our everyday lives**. The billions of Internet and smartphone users shape a new reality and define an international market, which is accessible through electronic channels. The above creates many new opportunities, both for existing and new knowledge-intensive and technological innovation enterprises, resulting in a situation where people with the right skills (who can help organisations avail of these opportunities) are sought-after at an international level.

New professions have emerged, combining knowledge of the new digital channels and IT with traditional skills. For example, in the field of digital marketing there are search/SEO specialists, online community managers, conversion analysts, directors of social media, Facebook marketing specialists, senior analytics consultants, etc.). There is an increased demand for software application designers and developers (software developer, web developer, mobile application developer, software engineer, data analyst, etc.). Another characteristic of these new professions is the requirement for soft skills and a good understanding of the wider business environment.

Professions related to the development of IT applications and new technologies feature in last year's list of the most sought-after professions in the labour market. For instance, from August to September 2015 in Greece the listings for IT jobs in recruitment websites were among the greatest in number (see Table 16).

This partly explains the relatively higher salaries offered to developers compared to other jobs, according to research carried out in 33 IT companies in July 2015 (see Table 22).

1.2 The Vision: Investment in digital skills for employment and competitiveness

This study highlights the existing and growing gap between supply and demand for jobs related to programming, IT and digital skills in general. Apart from explaining the main underlying causes, recommendations are made to convert the current situation into **an important development and employment opportunity for young people**.

The vision set by this study is for Greece to invest in the development of human capital with advanced technology skills. Using this development as a lever, **Greece can generate the ideal conditions to attract internationally-orientated investments in technological development and innovation**. Companies providing mobile applications and e-services that maintain technological development in Greece while doing business internationally have been extremely successful. This could become a recommended strategic growth model for Greece.

The need to learn digital skills and strengthen the technological background of the workforce becomes even more important in countries such as Greece, which is ranked 26th out of the 28 countries of the European Union, when it comes to the percentage of the workforce employed in ICT positions, with the Nordic countries and the UK at the top of the list.

1.3 The Objective: Introduction of young people to programming

The development of people **with advanced skills in cutting edge technologies, global approach and entrepreneurial spirit** is at the core of this study's recommendations. The main objective is to create 500,000 jobs in IT while the achievement of this objective will decisively contribute to bridging the gap between supply and demand.

In order to achieve this objective, the focus should be on:

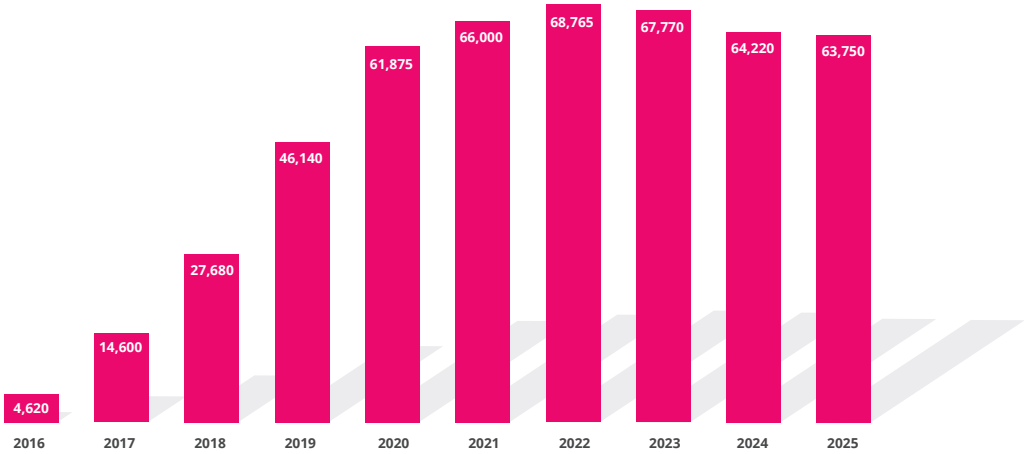
- Expansion and development of educational infrastructure at all levels, aiming to **introduce young people to programming and new technologie**s.
- Encouragement of all forms of **educational training and lifelong education,** including **online courses**.
- Creation of incentives, promotion of good practices and standards aiming to mobilize young people and **attract them to develop programming and digital skills**.
- Better mapping of the existing supply and demand for technological and other skills and **support of actions that can bring companies and candidates together**.
- **Business support to upgrade their technological infrastructure,** attract people with the appropriate skills **and invest in training and development of existing personnel**.
- Creation of the appropriate conditions in the wider business environment in order to attract foreign investment in technological services of high added value and the support **of innovative entrepreneurship**.

For each of the above, there are specific proposals made, with particular emphasis on teaching programming to young people, both as a foundation to an understanding of the digital environment and as an important asset to find a job, even one working remotely.

1.4 The Outcome: Half a million new ICT jobs and increased competitiveness

Following the reasoning that a certain percentage of vacancies in Europe could be covered by - mainly young - Greek people as a result of a national strategy to develop the appropriate digital skills to young people and address the country's high unemployment rates, a target is set to fill 500,000 new vacancies over the next ten years in the field of ICT, as reflected in the following diagram.

Table 1.Forecast for creating 500,000 new ICT jobs over the next decade in Greece



Source: "Creating 500,000 new jobs in ICT" study

These positions can be filled:

- either through establishing branches in Greece, similar to the technological support centres established by large multinational enterprises (e.g. Accenture) or,
- through the provision of IT services and applications development by Greek companies to foreign ones, based on the outsourcing model or,
- through remote contracting, especially in the field of applications development, where this new employment model is gaining traction.

While this target of creating 500,000 new ICT jobs may seem ambitious, it could also be deemed to be conservative, considering there are approximately 650,000 unemployed young people (< 35 years old) in Greece. In addition, apart from young people already studying ICT, there is a large percentage of students in various scientific or economic schools that could potentially - through training in core digital knowledge and skills – become suitable for employment in this market (68,345 new candidates entered higher education in 2015-16).

We should mention that for every job in the core ICT sector, there are additional corresponding jobs in other sectors (eg administration and support). The increasing export of ICT services will activate a "virtuous circle" of domestic scientific and business activity in all sectors of the economy, which will in turn seek to utilize a part of the country's tech-skilled human resources. Moreover, these numbers do not take into account the positive impact of the potential foreign investments, innovative entrepreneurship and increased competitiveness of Greek businesses that could result in enhancing employment and job creation further.

What is even more encouraging is that the actions required to develop knowledge and digital skills for filling existing vacancies do not rely mainly on economic resources. In fact, they rely on interventions in the educational sector and the labour market, the increasing awareness of young people, the creation of a suitable setting, and finally, the inclusion of this new perspective into the national strategy of Greece.

Such a strategy could contribute significantly in boosting employment and, consequently, reduce unemployment, especially among young people. At the same time, it contributes to increased international competitiveness of Greek businesses, which will not only address the international market through electronic means, but will also meet the requirements of their customers through new technologies.

Such a strategy creates the conditions for driving activity and new investments in knowledge-intensive and technological sectors, making Greece competitive at an international level and creating a positive feedback cycle through additional employment and added value.

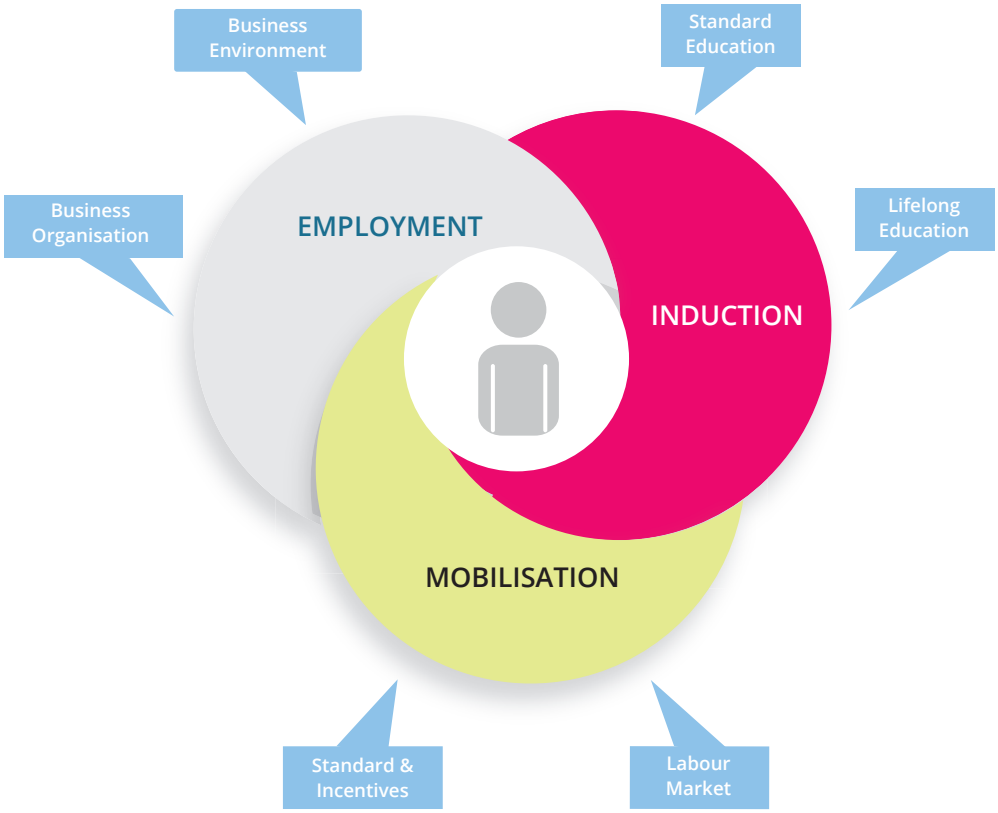
1.5 Recommendations

This circle starts with **Mobilisation**. Many young people either do not know about the value of and demand for digital skills or believe that these skills are inaccessible to them. As part of mobilisation, we recommend actions that address both the young people themselves through appropriate **role models and incentives** for action, as well as the labour market generally, in order to facilitate matching demand and supply.

Once young people are seeking professional careers in digital skills and programming, the next step is **Induction**. This includes **formal education** (from primary school to University), and **all the various forms of lifelong education**, from vocational training and certification to online courses (MOOCs).

Given the right mobilisation and education/training, the right conditions to fill a significant number of vacancies in digital skills will be created. This step is **Employment**. In addition, apart from the existing vacancies, the development of a robust workforce with sound digital and programming skills will enable the covering of vacancies in technology and innovation, both from current companies and from new direct foreign investments. In order to make this mechanism work, actions are suggested that will reinforce the modernisation of **Greek businesses** and will improve the extended business environment.

Diagram 1.The “virtuous circle” for the development of employment in digital skills and programming



Source: “Creating 500,000 new jobs in ICT” study

The circle is “virtuous”: with the successful operation of the labour market, the filling of vacancies and the creation of new jobs mobilisation is initiated, and, consequently, demand for education and training.

2. SECTION B. The employability problem and the gap between skill supply and demand

2.1 Introduction

With official unemployment in Greece reaching 25% in May 2015[1] and youth unemployment (15-24 years old) reaching 49.7%, the demand for jobs is largely unmet. Yet, according to a study conducted by Manpower Talent Shortage Survey in 2014[2], over 40% of companies in Greece face difficulties in filling vacancies. In addition, according to a study performed by McKinsey[3], 45% of companies in Greece believe that the lack of necessary skills among their young employees is a serious problem for their organisation.

This is particularly the case in ICT specialisations. The Empirica report, carried out on behalf of the European Commission, found that 1,300 job vacancies remain unfilled in Greece in the field of ICT for 2015 alone (Table 2). This is a barrier to innovation, competitiveness and extroversion of Greek companies, but primarily a missed opportunity to alleviate unemployment and achieve economic growth in the direction of high value-added services.

This phenomenon occurs in all the EU member states, regardless of the different penetration rates of digital technology and development of digital economy. As an indication, the job vacancies that were estimated to remain unfilled in 2015 reached 121,000 in Germany, 128,000 in the United Kingdom, 61,000 in Italy and 14,000 in Denmark (Table 3).

However, the number of vacancies in Greece is disproportionately small compared to the other pean countries, a fact that highlights the large growth potential of the ICT industry in Greece, as well as the opportunities arising to address unemployment (see Table 4).

The issue of unemployment and employability in ICT, and digital skills in general[4] , is analysed below, as it could ignite an economic growth model in Greece. The latter is financially feasible (it does not require investment and capital equipment), it is knowledge-intensive (Greece

[1] Workforce survey, May 2015, Hellenic Statistic Authority, August 2015

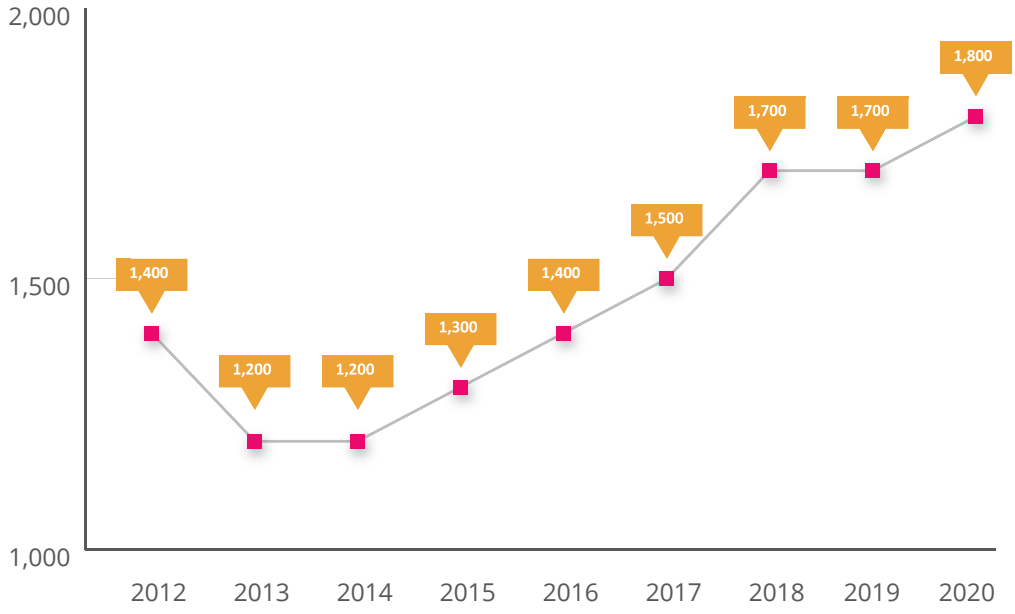
[2] OECD Skills and Work

[3] Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 9

[4] In this study we distinguish between ICT and general digital skills, which are necessary in each sector and profession. As regards ICT job vacancies, we distinguish those corresponding to the same category of ICT products and services to those corresponding to all other economy sectors (eg the same IT departments of commercial companies).

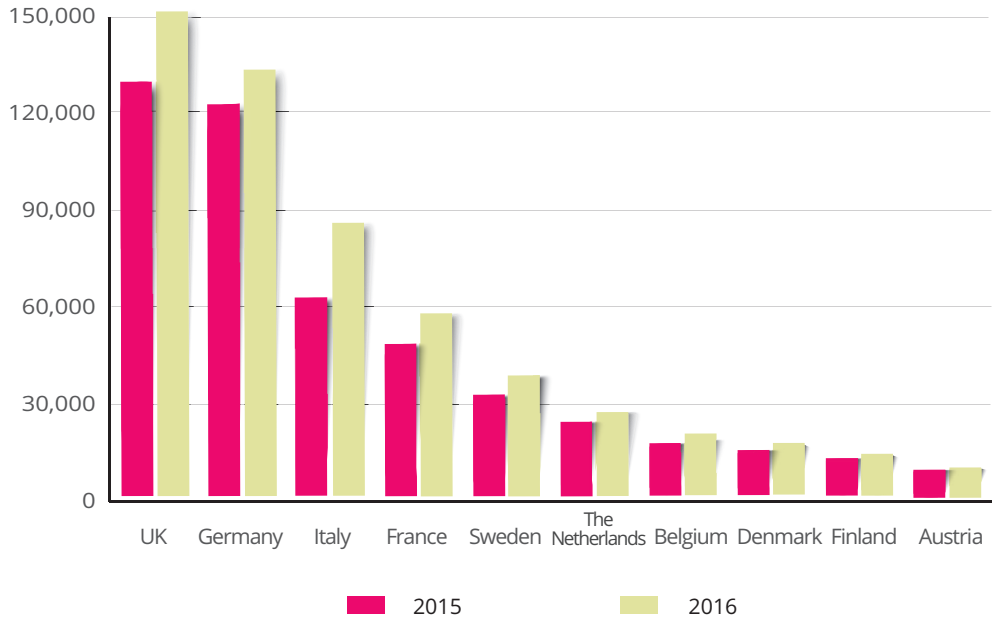
can train its competent human capital) and has a high value-added element (emphasising marketable software development services).

Table 2.Estimate of ICT vacancies in Greece (2012-2020)



Source: E-skills in Europe, Greece Country Report, Empirica, January 2014, page 7

Table 3.Top 10 EU countries with the largest number of vacancies in ICT



Source: E-skills in Europe, Country Reports, Empirica, January 2014

2.2 Digital Economy in Greece

Greece is falling behind in digital technology, according to the Digital Economy & Society Index (DESI)[5] drawn up by the EU, which grades the performance of EU member states in the ICT sector. Specifically, only 1,63% of the workforce is engaged in the development and management of technologies, ranking Greece 27th among the 28 European member states (e-skills country report, 2012). The first positions are occupied by Finaland, Luxembourg, and Sweden (Table 4).

These percentages have a major impact on business. Competitiveness in the international market is based on strategic development of ICT more than ever. Mobile technology services, Big Data, social media and the Internet of Things are only a few of the latest technologies that will make a difference for tomorrow's winners. These technologies require a robust ICT infrastructure, as well as digital presence, e-commerce facilities and electronic transactions with potential customers.

Greece comes 23rd among the 28 European member states in the percentage of businesses that have an active e-shop or perform online sales (only 9,1%), while the percentage of businesses conducting cross-border sales via the internet is 4.3%, occupying the 22nd position[6]. Greece's use of technology is also low. Only 59% of people aged 16-74 use the Internet regularly, compared to a European average of 75%.

The situation regarding connectivity – the type and cover offered by the telecommunications infrastructure of the country – is also an issue. Greece is ranked 27th in the so-called new generation networks, and 26th in the adoption of mobile broadband technology. The low rates of adoption, use and development of new technologies are an obstacle to the creation of the Digital Single Market, a key priority in the European Commission's Digital Strategy for the coming years[7].

The Digital Single Market is expected to contribute in the creation of thousands of job vacancies, adding to the European economy to the tune of 415 billion euro per year. If Greece manages to generate and maintain well-trained professionals in these sectors, it will have the opportunity to lead the development.

[5] Digital Economy and Society Index, Country Profile Greece, 2015

[6] Digital Economy and Society Index, Country Profile Greece, 2015

[7] Digital Agenda for Europe, A Europe 2020 initiative. Digital Single Market

Table 4.Employees in ICT jobs as a percentage of the overal workforce per EU country (2013)

Country	2013
Finland	6.2%
Luxembourg	5.9%
Sweden	5.4%
The United Kingdom	5.1%
Denmark	5.0%
The Netherlands	4.9%
Estonia	3.9%
Belgium	3.8%
Ireland	3.8%
Malta	3.6%
Austria	3.5%
Czech Republic	3.4%
France	3.3%
Hungary	3.1%
Germany	3.0%
Italy	2.9%
Spain	2.9%
Slovenia	2.8%
Latvia	2.8%
Bulgaria	2.7%
Slovakia	2.6%
Poland	2.5%
Croatia	2.3%
Portugal	2.2%
Cyprus	2.1%
Lithuania	1.9%
Greece	1.7%
Romania	1.5%
EU Average	**3.4%**

Source: E-skills and e-leadership skills 2020. Trends and Forecasts for the European ICT professional and digital leadership labour market, May 2015, page 8

2.3 The employability problem from the work demand aspect

> "53% of employers only invest systematically in training their employees"

The previous section highlights a vicious circle: the limited penetration of digital technology in society and economy is fuelled by the limited availability of the appropriate personnel in the labour market, and vice versa.

One of the structural problems in the labour market in general is that employers seek candidates with the necessary skills and sufficient relevant professional experience. But how can a young University graduate break the vicious circle of non-employability if they are unable to find the suitable work that will give them the necessary work experience?

The prolonged recession in the Greek economy may indicate that employers do not invest time and money in training and adapting newly-hired personnel. Only a few multinational companies do. The remainder have neither resources, nor the size or mindset to do so.

One of the results of this structural distortion is the fact that approximately 15% of all employees in Greece are overqualified for the position they hold, while another 15% is underqualified[8].

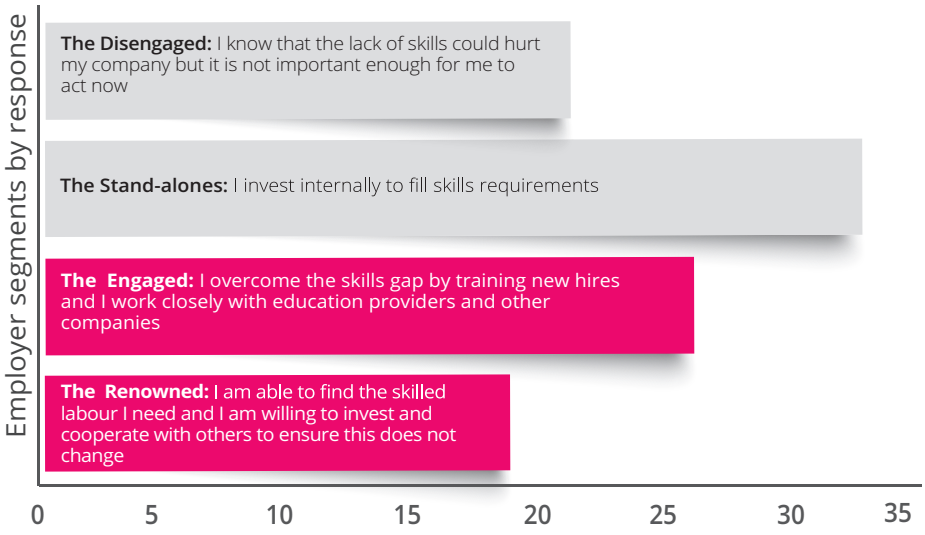
Furthermore, there is a lack of the necessary flexibility in the labour market. For all the above-mentioned reasons, many employers leave positions unfilled if the candidate's qualifications do not match the position's requirements closely.

According to a McKinsey survey, only 53% of employers (Table 4) invest in training their employees systematically. These findings are confirmed by the "Labour Market Trends

[8] Source: Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 9

Index" performed by the ALBA Graduate Business School at The American College of Greece for the second half of 2014, where 32,6% of the employers who participated in the survey intended to reduce investment in staff training[9].

Table 5.Q: How willing are you to invest in talent?



Source: Education to Employment: Getting Europe's Youth into Work, McKinsey Centre for Government, page 28

2.4 The employability problem and the small size of businesses

The percentage of employers who do not invest in training their personnel is even higher in small businesses, with 77% not opting to invest in their staff's professional development (Table 5, categories 'Disengaged' and 'Stand-Alones'). Considering that small businesses (1-18 employees) constitute the backbone of the Greek economy (73% of total employment) this problem is substantial (Table 6).

Small businesses, due to their size, typically have more urgent recruitment needs. A company of 10 people that hires a person increases its workforce by 10%. This means it has high expectations for the performance of this employee, and cannot afford to wait for this

[9] Source: Index for Labor Market's Trends, Department of applied research and innovation, ALBA Graduate Business School at The American College of Greece, page 27

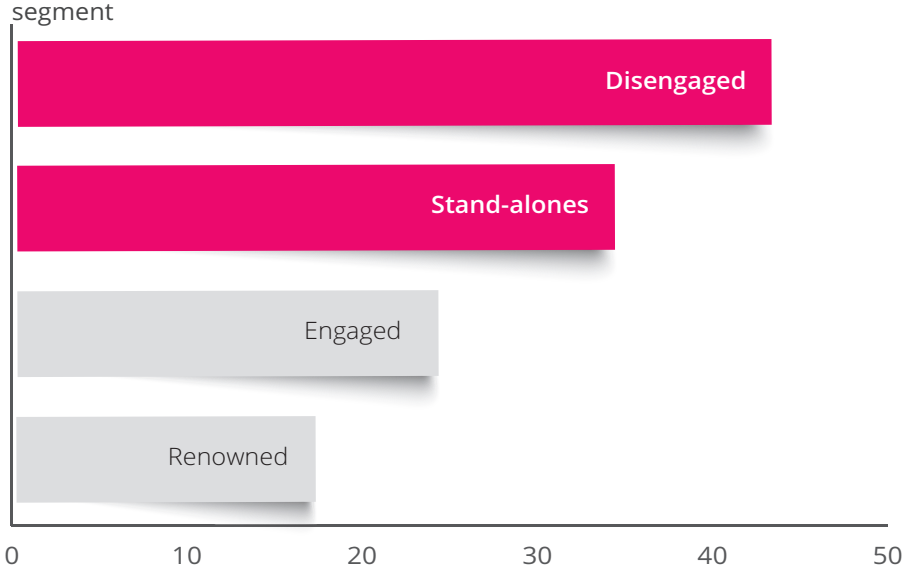
new employee to be trained and become productive. The employee must be qualified and experienced enough to address the company's immediate needs and issues. On the other hand, qualified and experienced candidates are not usually attracted to small businesses due to the low professional development prospects. If the appropriate employee is not found or does not accept the position, then the position will probably remain vacant. This situation creates a vicious circle.

At the same time, small businesses don't have a structured human resources department or formal procedures to seek, hire and develop human capital. Conversely, a large company plans its human resource requirements based on a long-term plan. It seeks entry-level talent that will develop internally and inculcate with the principles and culture of the company, in order to make the most of them after a few months. Additionally, as larger organisations employ entire groups of employees in each speciality and at different stages of seniority or experience, they can fill positions at a constant rate, without leaving vacancies. Thus, the fragmentation of the Greek economy into a high number of small units (when compared to other European countries) constitutes a structural trap that prevents young people from accessing a productive working environment.

Moreover, there are inherent weaknesses in small businesses that prevent them from adopting formal structures and processes. Management styles are commonly personal and informal while the need for structured operations and the use of technology is disregarded by small businesses. This creates a second vicious circle of ignorance and avoidance of technology, which results in falling competitiveness and failure to grow, which exacerbates further all of the above problems. ICT is perhaps the most important lever for accelerating productivity and, through it, for business growth, which in return creates job vacancies and It is worth highlighting that larger enterprises typically have greater impact on economic growth due to their larger productivity capacity (due to economies of scale and other related factors)[10].

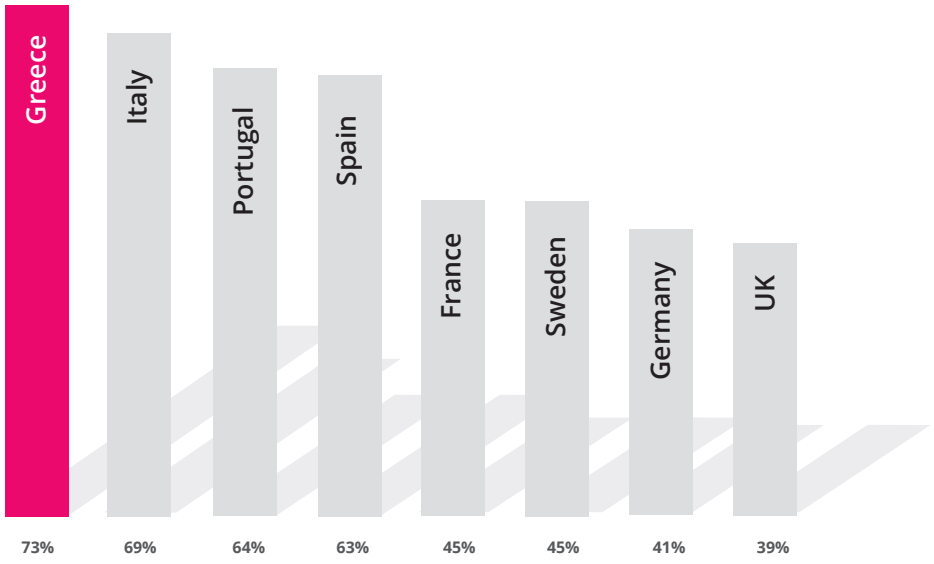
[10] McKinsey&Co,"Greece 10 years ahead", September 2011

Table 6.Percentage (%) of businesses of 1-19 employees in each employer segment



Source: McKinsey Survey, August-September 2012, 2013
Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 28

Table 7.Percentage (%) of countries' private sector workforce employed in small businesses



Source: Eurostat 2007, McKinsey Survey, August-September 2013

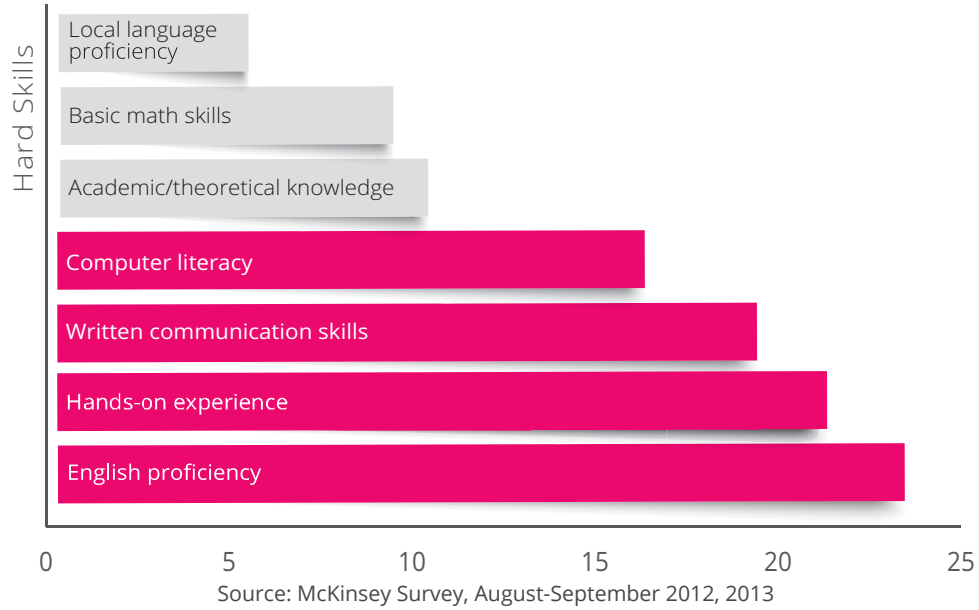
2.5 The employability problem from the labour market perspective

Despite the great demand for ICT skills and the industry's good prospects, the number of ICT graduates in Europe is constantly decreasing. The main causes of this trend include the stereotypes regarding the profession, the significant divergence between graduate skills and employer requirements for both social ("soft") and technical ("hard") skills, as well as Greek and European economic factors.

2.5.1 Skills gap and divergence with employers' needs

There are significant discrepancies between how the employers rate the importance of skills against the actual competence of young employees in each skill. With regard to hard skills, the greatest gap in expectations is found in English proficiency, hands-on experience, written communication skills, and computer literacy (Table 8).

Table 8.Employers' view of skill importance vs actual competence of young employees in each skill



Source: McKinsey Survey, August-September 2012, 2013

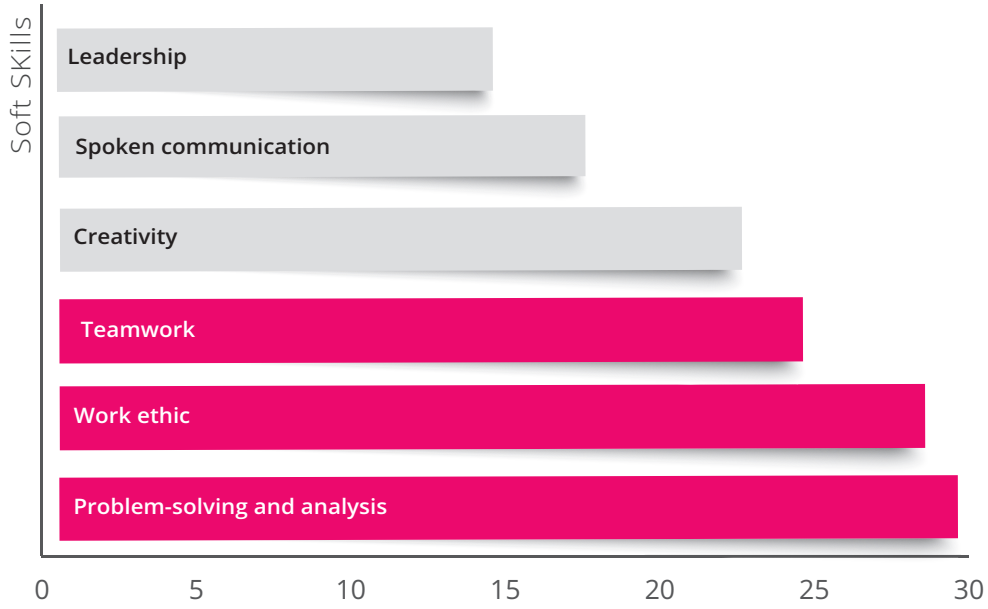
Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 45

It is a common misunderstanding that specialised professions (eg programmers) only require hard skills. As every professional works in teams and deals with dilemmas, conflicts, and compromises, the development of horizontal or soft skills is of equal importance. The

importance of soft skills is the area on which the perspective of employees and employers shows the biggest divergence.

Young people value skills, such as leadership, emotional intelligence, moral integrity, initiative and willingness to learn[11], less highly than their employers. With regard to soft skills, the greatest gap in expectations is found in problem-solving and analysis, work ethic, and teamwork (Table 9).

Table 9.Employers' view of skill importance vs actual competenceof young employees in each skill



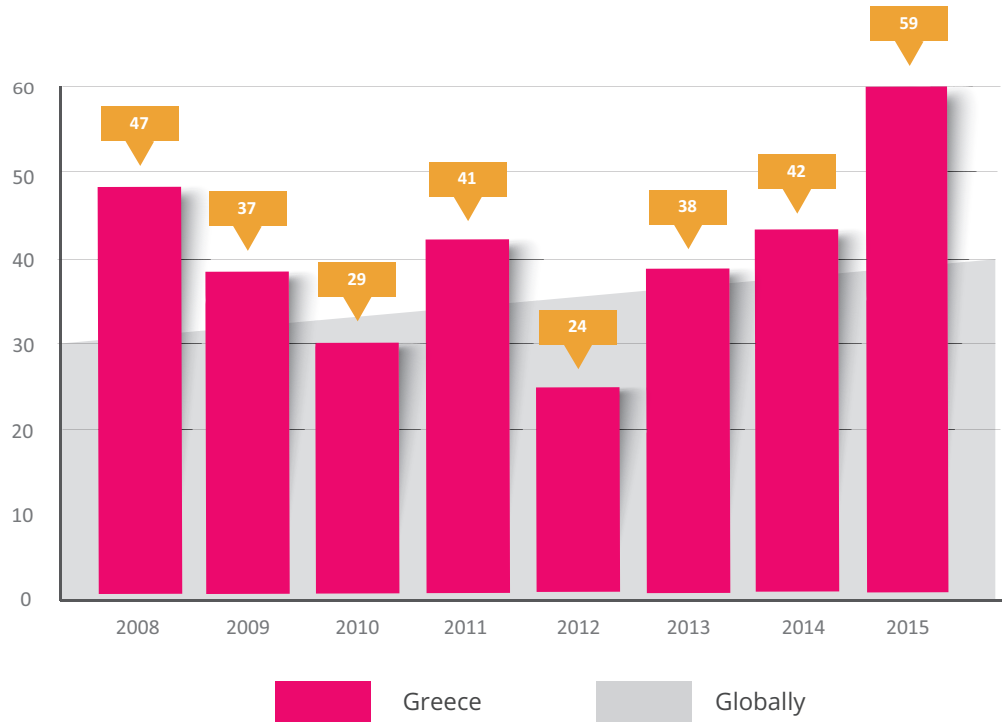
Source: McKinsey Survey, August-September 2012, 2013

Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 45

The divergence between employers and candidates, as reflected in studies at Greek and European level, has resulted in a huge lack of talent, which is detrimental to the development of Greek enterprises, while reaching historic highs in 2015 (Table 10). The problem is exacerbated by youth unemployment and the obstacles young people face in their effort to integrate into a productive workforce (preferably in mature and structured work environments) in order to develop these skills.

[11] Youth employability in Greece, Department of Applied Research, ALBA Graduate Business School at The American College of Greece, page 15

Table 10. Talent Shortage in Greece and Globally (2008-2015)



Source: Talent Shortage Survey, ManpowerGroup

2.5.2 Social Reasons

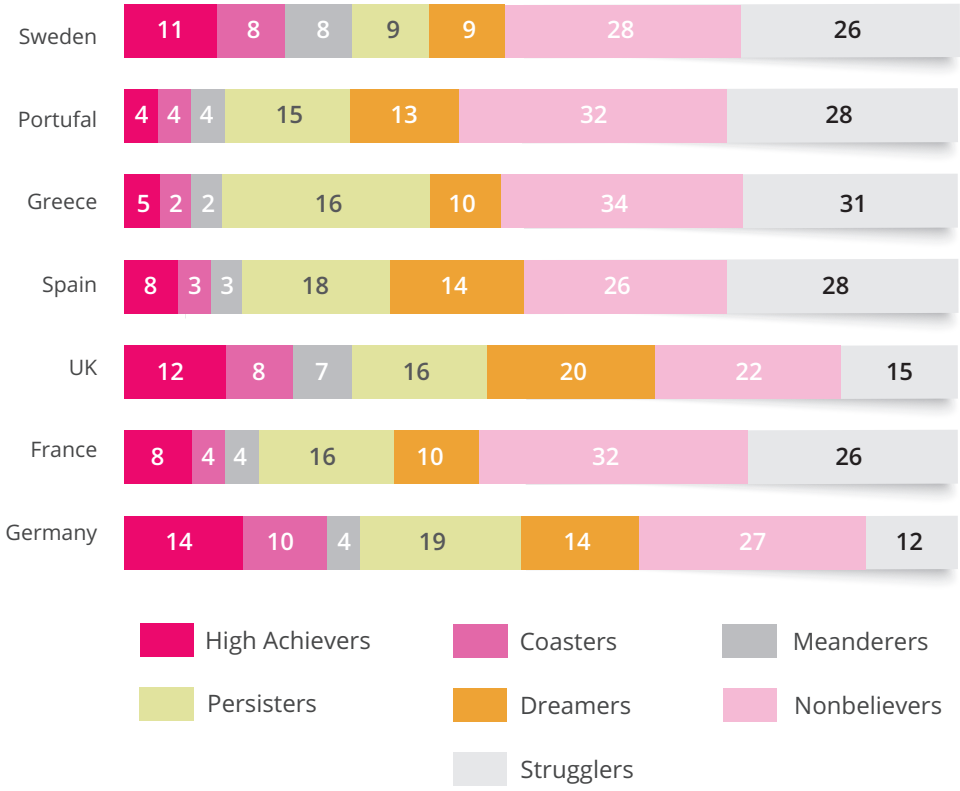
Young people do not invest time and money in continuous learning, self-learning and self-improvement for a series of social and economic reasons. According to McKinsey's survey entitled "Education to Employment: Getting Europe's Youth into Work", Greece is among the countries with the highest percentage of young people who do not enter tertiary education, while 41% of them do not enter higher education.

The main cause is that young people do not study because they cannot afford not to work. If they do not receive any financial support to cover their basic needs while they study, they are unable to study for higher levels of qualifications. A large percentage (65%) of young people[12] believes that education will not equip them with the appropriate skills for professional development and choose to work or undertake short courses rather than gain an academic background. Although this is an obstacle to young people's competitiveness in the labour market, it could become an opportunity. Providing better structures and opportunities for short-term training and certification schemes in areas of current and future skills shortages, with modern content and learning methods, will appeal to younger learners.

[12] Source: McKinsey Survey, August-September 2012, 2013
Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 23

McKinsey's survey identifies seven categories of young people, depending on whether they seek training opportunities that will prepare them for the labour market and whether they make use of them. The bottom two categories (Nonbelievers and Strugglers) comprise people who do not continue on to higher education. Despite the widespread perception of a love of learning and high educational values in Greek society, Greece has the highest percentage of young people leaving education at an early stage. At the same time, Greece has the smallest percentage in the two most "successful" categories: High Achievers and Coasters (Table 11).

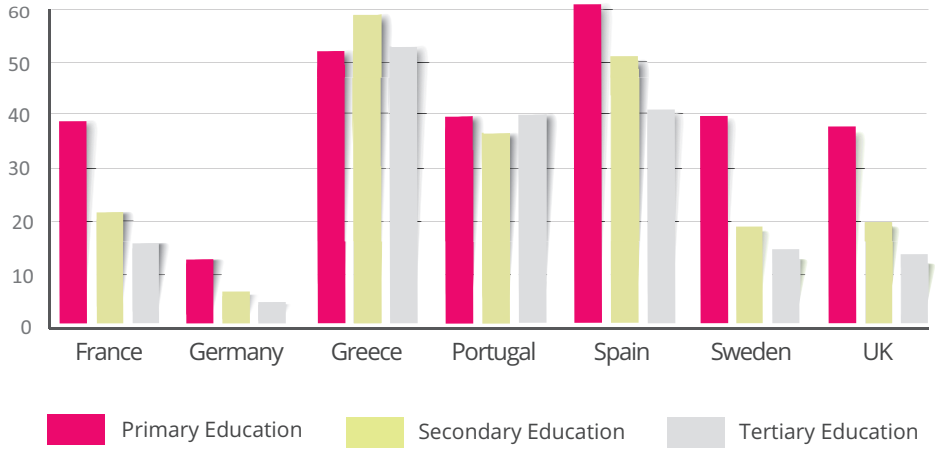
Table 11.Distribution of tertiary education candidates per country, % of respondents



Source: McKinsey survey, August-September 2012, 2013,
Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 23

The fact that 52% of graduates are not in temporary or permanent employment, with the corresponding percentage of secondary education graduates reaching 58% and primary education graduates reaching 51% (Table 12) has meant that university education is viewed negatively. In most countries around the world, it is believed and empirically proved that higher education is associated with better employment prospects (and earnings). In Greece in the years of crisis (and in Portugal as well), this rule does not seem to apply.

Table 12.Percentage of youth unemployment per stage of education



Source: Education to Employment: Getting Europe's Youth into Work, McKinsey Center for Government, page 39

2.5.3 Negative stereotypes

Across Europe, the average age of ICT professionals is 42 years old[13] with young people not choosing ICT as a career. Despite the great demand for skills and high remuneration, the number of ICT graduates in Europe is constantly decreasing and fewer than 20% of ICT professionals are under 30 years old. Consequently, the industry lacks new talent.

At the same time, there is low representation of women – only 15% of ICT workers throughout Europe are females, according to the survey conducted by CEPIS[14]. A key problem is the negative stereotype surrounding careers in digital technologies, especially the profession's perceived introversion, poor working conditions, as well as the perception that this is a profession for males.

These stereotypes prevent young people – and particularly women, from engaging with digital technologies and programming jobs, while their under-representation in the sector makes it even more difficult to bridge the gap between supply and demand.

[13] E-Competence in Europe. Analysing Gaps and Mismatches, European Report, CEPIS, page 8

[14] E-Competence in Europe. Analysing Gaps and Mismatches, European Report, CEPIS, page 19

2.5.4 The educational system

The educational system, despite all the efforts made, is not keeping up with the rapid development of technology; employer expectations are evolving faster than the preparedness of ICT graduates related to knowledge and skills of technology management. Therefore, the gap between education and the labour market remains wide and, the educational system does not deliver the skills required by the market.

Greek society and its higher education system are stuck between two models for university education, yet, without representing sufficiently any. On one hand the American model argues that the first degree ("bachelor") provides general education and the master's degree targets professional knowledge. On the other hand, in most European countries, the choice of a first degree is also a career choice for the rest of the young person's life. In Greece generally, the system of national ("Panhellenic") examinations classifies young people early on in vocational direction, while, at the same time, most university departments avoid clear connection of studies with the market, thus tending towards "pure" scientific education. These problems are often masked by some impressive results of a few exceptions.

Furthermore, the boom of online courses (MOOCs and others) in the past few years has enabled professionals, executives, and young graduates to improve their knowledge and meet the demands of the digital economy. At the moment, online courses are perhaps the best choice (for young people and the market) to bridge the gap between young people's lack of knowledge and companies' expectations. There are plenty of online courses with high-level content in a wide range of specialities. Most of these are free of charge, while the relevant certifications are quite cheap compared to most traditional forms of training.

Moreover, the continuous progress of the ICT sector brings about a pressing need for lifelong education and training for all ICT professionals, whether they work in Greece or abroad.

In conclusion, the gap between the educational ecosystem and the labour market in the field of digital skills requires the development of new methods to ensure better connection and alignment.

2.6 Employment prospects in the ICT and New Technologies sector

2.6.1 From digital skills to programming

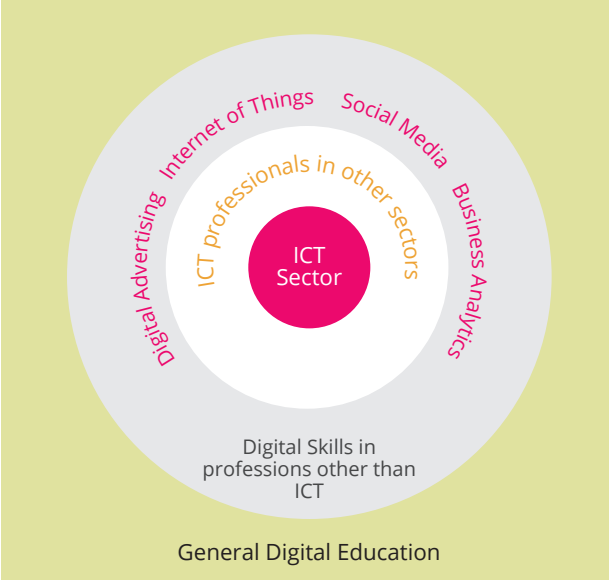
The importance of digital technologies has been documented in many parts of the present study, and it is arguably an issue that is repeatedly stressed by research and political bodies. As regards the needs of the labour market for digital skills, it is possible to distinguish the specialised skills required in each sector or profession within the economy through a "vertical" approach.

For example, ICT skills in the narrow sense are those skills that are necessary for the creation and support of information and telecommunications systems and services. These skills are necessary both in the information and telecommunications sectors and also in every sector of the economy, to the extent that most organisations employ some ICT staff mainly (but not exclusively) in ICT departments.

Specific sets of skills are required in various professional categories. For example, marketing, advertising and communications have been largely transformed by technology. Specialized employees are required. There is a similar trend associated with Big Data, business analytics, data science, machine learning and other applications. Furthermore, there are specific needs in sectors or operations, such as in supply chains, sales, customer service, financial transactions and others.

A complementary "horizontal" approach identifies the need of all employees, and people in general, to have sufficient basic digital literacy in order to be functional and be able to participate in the modern economy. This includes skills, such as the use of computers, email, web browsing, use of basic word processing applications, spreadsheets, presentations etc.
The following diagram summarizes this classification of digital skills, demonstrating that all the above categories of digital skills are a requirement for employability in the labour market, a source of economic value to the economy and a significant component of business competitiveness.

Diagram 2.Map of digital skills



Source: "Creating 500,000 new jobs in ICT" study

It is therefore crucial for businesses and for individuals to invest in cutting edge technology and relevant digital skills. Conversely, the lack of digital skills multiplies the number of ICT-related vacancies in a period of serious unemployment, and explains the lag in the productivity of businesses and the economy, in relation to global competition.

Of all the digital skills, horizontal and vertical ones, experts agree that the most fundamental one is programming. Most countries around the world start teaching core ICT concepts and some programming language skills to children from a young age. In general, the mass teaching of programming skills can be a stimulator for development, innovation, and employment. Key reasons for this are the following:

1. Just as languages are a fundamental component of individual personality and social organisation, programming languages are another means of rational expression. Programming languages develop the mind in a way similar to natural languages. In addition, they designate a new set of concepts and objects that make up the functioning of modern society and economy.

2. In that sense, programming is not just about learning code. It is the development of an algorithmic way of thinking and the strict application of rational rules.

3. Programming skills form the cornerstone of creativity in the digital world. We are all technology users and it is important to be skilled and productive in that. However, the future is primarily made by the creators of new technologies and secondly by the users. Economic

development and competitiveness depend on the ability of people and the economy in general to evolve from consuming to creating new technological systems. Although creation requires the blending of many individual skills, programming is the most important of all.

4. Even if a person is not and does not want to become a developer, it is important to be able to communicate with developers. As developers play a particularly important role in the digital era and because the rules of programming languages provide a concrete rational structure to the world around us, it is a communication prerequisite that anyone can participate in this way of thinking.

5. Programming skills have two tiers: productive skills (a person may practice as a developer) and meta-skills, ie fundamental skills for each individual's equal and productive participation in the digital society. This way, the dissemination of programming skills positively affects the economy both directly and indirectly.

6. The learning and practice of programming does not require capital equipment other than a computer and the necessary software tools. In addition, most of the time, developers work remotely using electronic means. Therefore, developers can work from any place and location, as long as these are suitable for this kind of creative work.

7. Among all digital skills, programming is the most fundamental, horizontal and transferable one. Other digital skills may be overtaken by successive waves of technological evolution or they may be limited to specific uses. Irrespective of the variety of programming languages, developers' specialisations in different system architectures and the rapid evolution of technology, general programming constitutes a solid knowledge base and allows participation in ICT developments.

8. For all the above reasons, learning programming skills may be the most powerful lever to break the vicious circle of non-employability – the main cause for the numerous vacancies at a time of high unemployment. The positive impact of mass training (in programming) for employment and the economy consists of:
• The ability to fill vacancies;
• A creative option for self-employment and innovative entrepreneurship;
• The abundance of developers in the market which acts as a magnet for direct foreign investments in software development centres.

9. Although, just like foreign languages, it is generally good for people to learn programming at a young age, everyone can learn programming at any time. While, as with any form of skill, the acquisition of a high level of competency in programming requires perpetual practice, everyone can learn programming principles within a few weeks. Regardless of their age, level of previous study, or specialisation, everyone - with no exceptions - can acquire basic programming skills.

10. Learning programming, more than any other digital skills, can have a multiplier effect on employment and the economy, through filling vacancies, creating new jobs, attracting investment, fostering innovative entrepreneurship, and creating demand for complementary digital and other skills.

11. Finally, good programming knowledge is necessary for one to understand the structure, architecture, and operation of information systems and, consequently, to understand the feasibility, time and cost requirements for the development of such systems. This kind of understanding constitutes a core prerequisite for one to be able to suggest innovative systems and fill management positions in the ICT sector, a sector that has the most vacancies by far.

2.6.2 Digital skills are among the most sought after

The European Commission estimates that there may have been 337,000 vacancies in the ICT sector across Europe in 2015. The estimate for 2020 is for 825,000 vacancies.

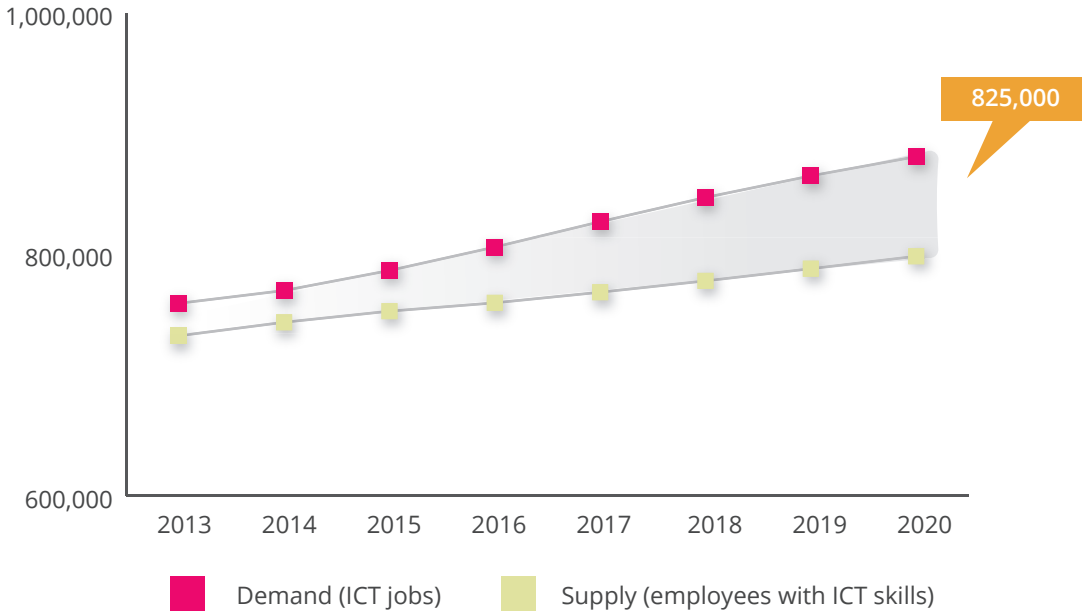
The growing demand for digital skills can be easily explained by the accelerating development of new digital channels, and the extensive use of technology in many aspects of the daily life of consumers and businesses. Today's consumer spends six hours a day interacting with digital technology in the US, double the time spent in 2008[15], while the number of smartphone applications increased massively over the last three years[16].

This trend, which is expected to spread, creates an even bigger demand for expertise in the technology sector, as well as for digital professions. A set of new specialities combining knowledge in the ICT and other sectors, such as digital marketing, has evolved in the past few years. Professions such as search/SEO specialist, online community manager, conversion analyst, director of social media, Facebook marketing specialist, senior analytics consultant are only a few of the new specialities seeing growing demand in the e-commerce and digital marketing sectors.

To meet the demands of these positions an employee must be familiar with the digital environment, have a good technological background and ICT understanding, as well as analytical thinking and entrepreneurial approach. Furthermore, it is vital to have a solid technology background in technology combined with a management perspective, especially when the latter is developed through experience in sectors where technology can play a significant role in operations and in achieving a business competitive advantage.

[15] eMarketer 9/14 (2008-2010), eMarketer 4/15 (2011-2015)
[16] Blog.appfigures.com, "App Stores Growth Accelerates In 2014, 2015"

Table 13.The gap between demand and supply in ICT jobs in the EU (2013-2020)



Source: "Creating 500,000 new jobs in ICT" study

ICT skills requirements are not limited to software developers, but are also a prerequisite for a number of positions in the business ecosystem. As a result, the demand for ICT skills is significantly underestimated - as only core ICT jobs are included in estimates (Table 20) - a fact that exacerbates the gap issue between supply and demand for ICT skills.

The above may explain why ICT is the only sector of the Greek economy that managed to increase the number of job vacancies during the economic crisis in Greece by 6%: from 51,000 job vacancies in 2008 to 54,000 job vacancies in 2013[17]. We can assume that this increase would be even higher if there was systematic registration of employees in ICT and other sectors or if the growing need for digital skills in a wide range of other positions was reflected accurately.

Data collected by kariera.gr show that demand for ICT executives continues to grow (Table 13), while according to Manpower Group's survey, two (2) out of ten (10) "Hardest Jobs to Fill" in Greece relate to ICT (Table 14). It is worth mentioning that in August 2015, when Greece was going through one of the hardest periods of the last decades (shortly after the imposition of capital controls) the second most sought after job vacancies where in ICT, after sales or seasonal occupations, according to several job search websites (Table 15).

[17] Creating job vacancies for young people, Endeavor Greece, page 13

The ICT profession among the most in demand[18] showing a 17.7% increase. Experts in applications development, software development, systems and business needs analysts, project managers, development and networks development technicians, information systems and product design technicians are at the heart of the sector constituting the core of the gap in vacancies.

Table 14.Demand for ICT executives according to kariera.gr (2011-2014)

Year	No. of ads
2011	**2,906**
2012	**3,309**
2013	**4,496**
01/01/2014 - 01/07/2014	**3,796**

Source: kariera.gr

Table 15.The 10 Hardest Jobs to Fill in Greece (2015)

2015 The 10 Hardest Jobs to Fill in Greece (ranked by level of difficulty, decreasing)
1. Sales Representatives
2. Management / Executives
3. Skilled Traders
4. Engineers
5. Office Support Staff
6. IT Staff
7. Technicians
8. Accounting & Finance staff
9. Workers
10. Sales Managers

Source: "Creating 500,000 new jobs in ICT" study

[18] CEDEFOP (http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations)

All ICT vacancies require programming skills, resulting in the high demand of the latter in the global business ecosystem. In a broader context, all digital skills require a general understanding of the algorithmic way of thinking. In that sense, programming skills – basic or advanced - are necessary for all professionals in all sectors, without exceptions.

2.6.3 Wages and earnings - Research in Information Technology Companies

The increased demand for technical skills further explains why the ICT sector is one of the few sectors in Greece where the market operates in favour of employees who, taking advantage of the lack of supply, achieve higher wages as well as better and more flexible working conditions.

The nature of developers' work makes it possible to work from home and thus the employee gains significant time on a daily basis since they are not obliged to commute to work. In addition, if employees live in the countryside, they do not need to relocate to the major cities of Greece, since they can provide the same services remotely.

An employee in the software development sector with 2-4 years of experience can obtain wages that are twice the minimum wage. A wages survey conducted by Randstad shows that the average annual salary of an analyst developer in Greece is 50,000 euro and the salary of a developer in Greece is 33,000 euro per annum. The European average monthly salary of a newcomer in the field of ICT products and services is 2,432 euro, while an experienced professional might receive 3,462 euro[19]. On freelancer networking websites the earnings of ICT professionals range between 30-120 euro an hour.

This data is confirmed by a survey conducted in July 2015, on 33 Greece-based companies specializing in the ICT sector. The survey was based on a telephone interview (using a pre-defined questionnaire). Out of the 329 companies of the sample, 247 were contacted, 42 responded (17% response rate), 33 of which provided valid answers. The following table indicates the distribution of companies that participated in the survey with regard to the company's sector and the number of employees.

[19] Get Online Week 2015 (http://getonlineweek.eu/ict-jobs/)

Table 16.ICT vacancies according to job search web-sites (August 2015)

kariera.gr August 2015	No. of ads
Sales	418
Information Technology/Telecommunications	**229**
Marketing/Market Research (includes digital marketing positions)	210
Customer Care	164
Support Staff	135
All other positions (average)	27

skywalker.gr August 2015	No. of ads
Catering - Chefs – Producers – Hotel employees – Tourism	481
Software Developers – Analysts – Web Applications Development – IT Technicians and PC Engineers	**269**
Call Centre – Customer Service – Telesales	251
B2B Sales Executives – Sales engineers	210
Retail Sales Executives – Commercial employees	148
Doctors – Nurses – Rescuers – Health – Pharmaceutic	138
Education – Sciences – Translations	136
Management and Corporate Executives	124
All other positions (average)	45

gr.indeed.com ICT positions. August 2015	No. of ads
Developer	463
Web Developer	260
Software Developer	222
Software Engineer	215
Engineer	150
Business Analyst	72
IT Consultant	61
Data Analyst	53

Source: “Creating 500,000 new jobs in ICT” study

Table 17.Number of Companies per sector that participated in the survey

Sector	No. of companies
Applications Development for Web-Mobile	8
Software Development - Applications Development - Call Center	8
Advertising/Marketing/Sales	2
IT Innovative Solutions-Automation	2
Technology And Business Operations Support Services	1
Software And Games	1
Development of Information Systems For Electronic Publications	1
IT Professional Services	1
Renting And Sub-Letting Properties	1
Market Research	1
Digital TV Applications	1
Financial Design / Software Production	1
Business Consulting	1
Electronic Voting Systems	1
Telecommunications	1
Telecommunications And Digital Marketing	1
Total	33

Table 18.Percentage of developers out of the total number of employees

Company size	% of developers out of total number of employees
up to 5 employees	73%
6-15 employees	49%
16-25 employees	62%
26-50 employees	50%
over 50 employees	44%
Average	**55%**

Source: “Creating 500,000 new jobs in ICT” study

Diagram 3.Segmentation of companies surveyed, by number of employees

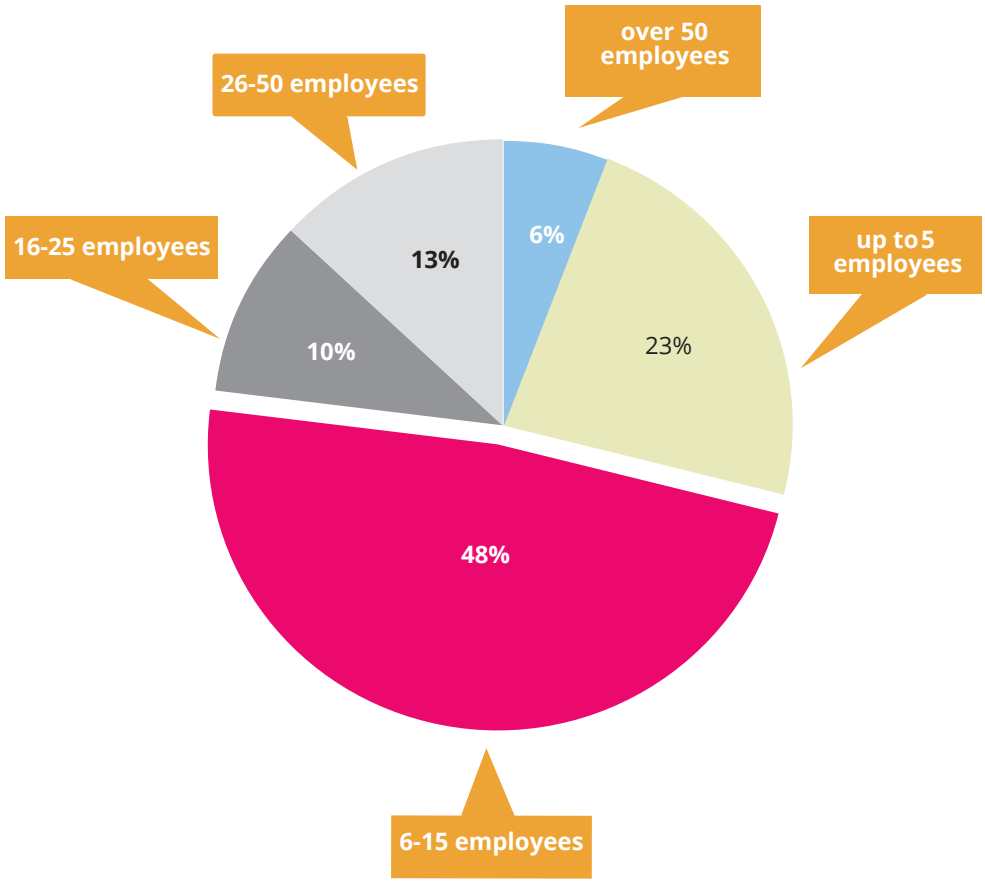
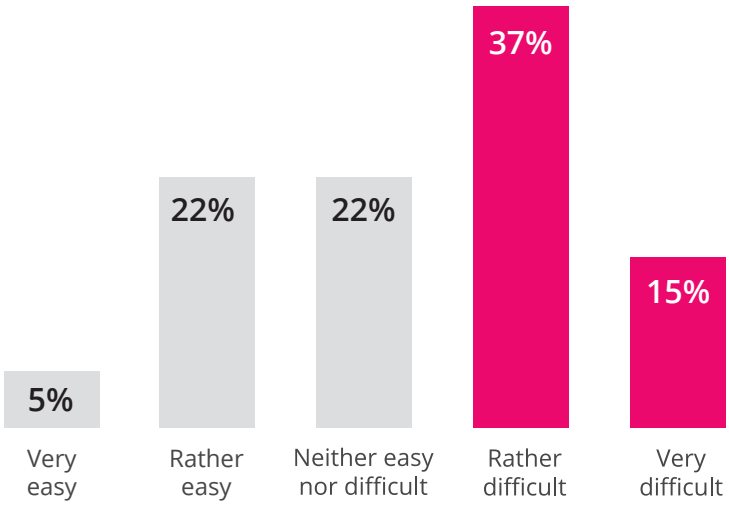


Table 19.Q: How easy/ difficult is to attract candidates in the software development sector?



Source: "Creating 500,000 new jobs in ICT" study

Table 20.Which channels do you use to find/attract candidates?

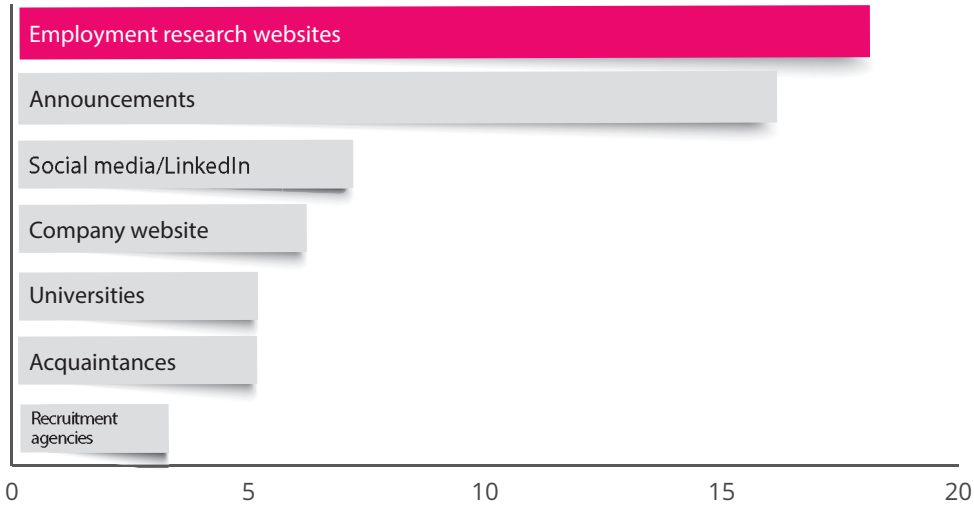
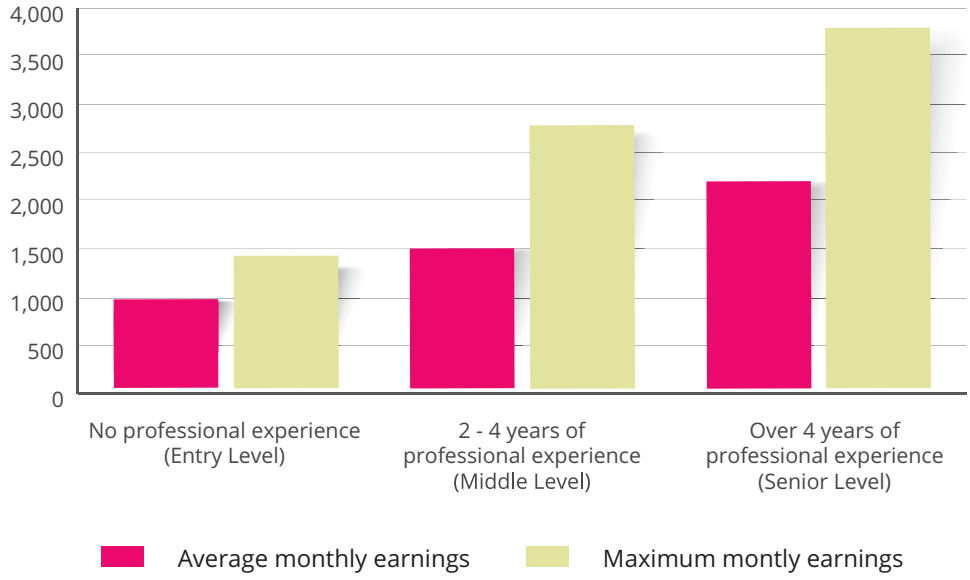


Table 21.Average and maximum monthly earnings for Greece-based developers (gross amount in euro, 2015)



Source: "Creating 500,000 new jobs in ICT" study

Table 22.Developers vs Other Positions
Average salary per level of experience (gross amount in euro, 2015)

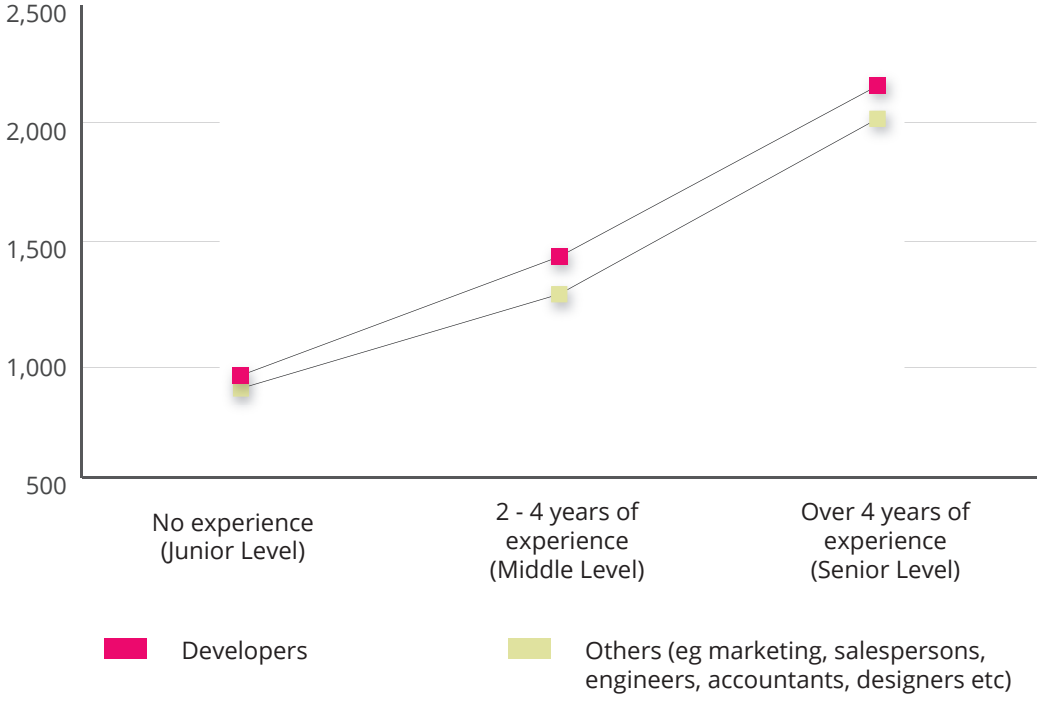
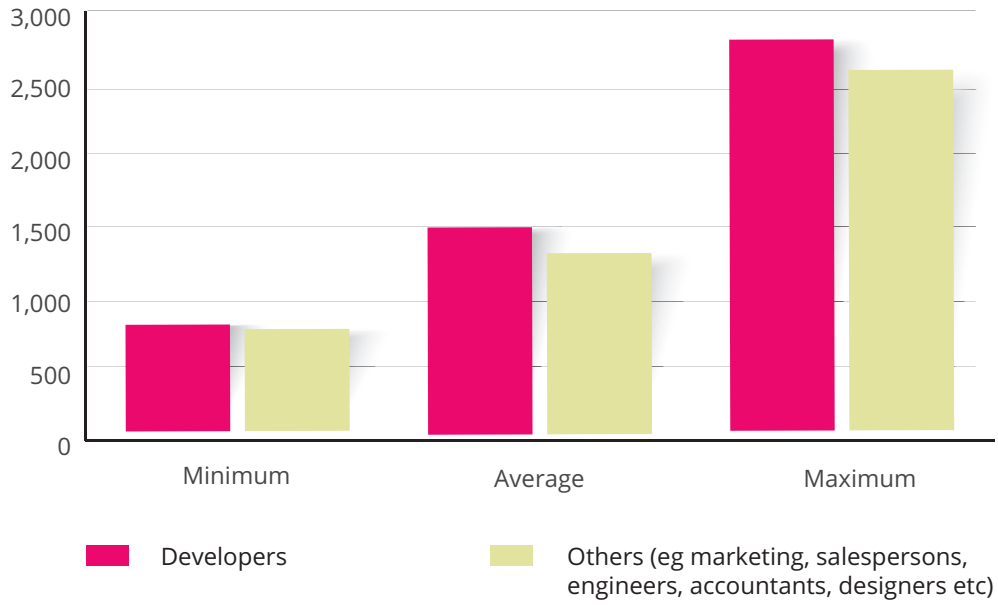


Table 23.Developers vs Other positions
Average salary per level of experience (gross amount in euro, 2015)



Source: "Creating 500,000 new jobs in ICT" study

These companies estimate that, despite the current economic conditions, the number of developers will increase by 8% over the next two years. At the same time, they face difficulties with attracting candidates in the programming sector (Table 19), taking an average of 6.5 weeks to fill a developer's position. It is worth noting that at the time of the survey (July 2015, only a few days after the imposition of capital controls), the 33 companies stated that they have 40 vacant job positions for developers. The channels used to find and attract candidates are mainly online (job search websites, social networks and LinkedIn, company websites etc), as well as direct communication with universities or networking (Table 20).

Based on the data gathered by these companies, the average salary of a developer without experience is 900 euro per month (gross), while the maximum salary goes up to 1,375 euro (Table 21). Monthly earnings for a developer with 2-4 years of experience (middle level) is 1,400 euro on average and may reach 2,750 euro. For a developer with over four (4) years of experience (senior level), earnings range between 2,100 euro (average) and 3,750 euro.
For all levels of experience, the corresponding salary for other positions (eg marketing, sales, accountants, engineers, graphic designers) is lower (Table 22) and the biggest variance can be as much as 250 euro per month or 3,000 euro per year, for employees with 2-4 years of experience (Table 23).

2.6.4 Career Opportunities

This section aims to describe the professional options for a candidate with digital skills according to three dimensions: type of employment, type of company and job specialisation. Each candidate or professional, at every moment of their career, has to choose and decide where to position themselves in this three-dimensional space: decide the type of employment (eg full time), the type of company (eg corporation) and position (specialisation).

The first dimension is the type of employment and there are three basic options. Dependent (or salaried) employment is the primary choice most candidates. Typically, the candidate combines the job search with a company search. This is the most widespread type of employment in the economy.

Another option, especially in the digital technologies sector, is freelancing, which offers candidates multiple opportunities. Compared to other professions (eg doctors, engineers) that also work independently as freelancers, the advantage in digital technologies is that there is no need for physical presence in the customer's place of activity. For this reason, there is a very dynamic and well-paid international market for freelancers who offer their services via the internet to customers around the world. The opportunity for someone to live in a beautiful place in Greece and have customers across the world is now an attractive reality.

The third option, one attracting an increasing number of young people, is to become an ICT entrepreneur. Obviously, all freelancers are by definition entrepreneurs in the broad sense, as they take risks and affect the market in which they operate. Yet, unlike freelancers, entrepreneurs aim to develop multifaceted organisations that will seek to attract economies of scale and create many job positions through economic growth. While freelancers sell their personal skills, entrepreneurs promote the collective skills of their corporate organisation. A positive consequence of the crisis is that unemployment in types of dependent work turns many young people to entrepreneurship.

Digital technologies are critical to entrepreneurship. Not only because technological entrepreneurship presents many opportunities, but mainly because digital technology provides solutions and reduces costs and obstacles to entrepreneurship in all sectors. For example, a new entrepreneur in the agriculture or tourist industry is expected to use the internet or other digital tools to seek customers and partners, to promote their products and services, to manage their finances, production, communication with potential customers etc. Digital technology makes entrepreneurship possible and affordable in almost all sectors.

The second dimension concerns the type of company or its economic activity. A person who has invested in digital skills may seek employment either in the ICT sector or in any other economic sector. It is easy to underestimate or ignore the needs for digital skills within sectors of the economy whose main line of business is not ICT. There is no economic sector that does not have great need of and difficulty in finding employees with digital skills.

It is appropriate to distinguish between large, medium, small or very small businesses and startups. The requirements and the work environment are very different in each case. Larger companies are characterised by more professionalism, structured rules and procedures and well-defined job profiles. In smaller companies the setting is typically less structured and expectations less defined. While larger organisations are considered as “best practice schools”, smaller organisations enable the candidate to learn all the aspects of work and develop the ability to be flexible and improvise. In startups, the employee or freelancer directly or indirectly participates in the business risk and shares the founding vision for business growth and success.

The third dimension includes the digital skills that someone chooses to specialise. There is a wide variety of specializations and sub-specialisations. Specialisation is inevitable and necessary. The choice of specialisation is critical. At any time, some technological tools are in growing demand and others are in decreasing demand.
The lifecycle of each technological tool and related skills may be quite brief. It is necessary for individuals to seek opportunities for improvement and to constantly adapt in order to remain employable.

Table 24 presents a list of general specialisation categories in accordance with upwork.com, a major online search platform for professionals around the world. It is important to note that the development of technology overturns the traditional business models of progressively more sectors of the economy, transforming them from traditional sectors into technology-intensive sectors. The most typical example is the marketing, advertising and communication sector. It is now a heavily technology-focused sector with requirements for highly specialised knowledge in individual tools and huge demand for skilled candidates. The same applies to the sector of creative design.

Another strong trend today involves the decision making process in business which, in every operation, is based on the use of advanced tools and methods of data analysis (data science, business analytics). In this case, neither experience nor intuition is enough. It requires deep understanding of tools and analysis methodologies.

No sector or profession is unaffected by the technology potential; medical diagnoses, legal services, agricultural cultivation, and distribution networks, are several examples of economic sectors which are in the early stages of an historic transformation, thanks to the flourishing of artificial intelligence, robotics and the Internet of Things.

The conclusion must be that increasingly digital skills are necessary for employment in all aspects of the economy.

2.6.5 Careers in three dimensions

To make the three-dimensional model and the above analysis more tangible, here are some archetypal career examples.

1. Eleni is a freelancer and works from home. She specialises in Java and Python programming languages. Her clients find her through large international platforms targeted at freelancers. On these platforms, Eleni has a very good reputation, which enables her to charge a high price per hour. She usually works at the same time for four or five clients simultaneously from different countries, and 24 hours is not enough.

2. After a short career in multinational companies, Eftychia worked as a commercial director in a startup that wishes to change the health services industry through a digital wristband that stores all the medical history of the person who wears it.

3. Alexandros specialises in network security and has one of the most specialised certifications from one of the largest vendors in network equipment. He works as an executive in large corporations that specialise in such services.

4. Pavlos studied applied mathematics and obtained a master's degree in Computer Science and later in business administration. He works in a large consulting company that brings large databases of customers' data from all over the world to Greece for statistical analysis, conclusions and advice.

5. Angeliki works in a family business in the field of electrical appliances production, which she managed to turn into a purely export company through smart and economic methods of digital B2B (Business to Business) and B2C (Business to Consumer) marketing.

6. Harris studied creative and industrial design and subsequesntly attended digital marketing seminars. He established a startup with his friends which specialises in digital advertising. They win over larger customers and hire executives with the appropriate knowledge on a continuous basis.

Table 24. The 3 Dimensions in Career Opporunities related to digital skills

The Type of Employment

- o Employee
- o Freelancer
- o Entrepreneur

The Type of Company

- o Per sector
  - IT products and services
  - Other
- o Sort by size and maturity level
  - Large
  - Medium
  - Small
  - Startup

Job Specialization (according to www.upwork.com)

- o Developers (Web, Mobile, Software)
- o IT systems and networks
- o Data Science and Analytics
- o Engineering and Architecture
- o Design and Creative
- o Marketing, Communications and Sales
- o Administrative Services and Project Management
- o Business Consultant
- o Entrepreneur

All other occupations change with technology

2.7 Estimated impact and creation of new jobs

Investing in ICT human resources through the filling of vacancies and enhancing the technological profile of Greek companies will create benefits for the entire economy, while it will contribute to gaining a competitive advantage, reducing expenses, enhancing innovation and increasing the growth of exportable services.

By investing in Greek ICT personnel, many Greek companies in the ICT sector have joined the global elite, with a turnover of tens of millions euro, more than 2,000 employees (based mainly in Greece), while at least 80% of their activity comes from "export of know-how".

At the same time, the ICT outsourcing trend, ie ICT services provided by companies or freelancers mainly from foreign countries such as China and India, is being replaced by the backsourcing trend (pulling those functions back in-house), as companies act to improve the quality of their business, minimise the cost of ICT services, as well as be more flexible and adaptable to a constantly changing market. In addition, factors such as the different culture and mindset, communication barriers and the lack of innovation and efficiency are increasingly viewed as significant disadvantages of outsourcing services[20].

In this context, many countries of southern Europe are looking to penetrate the backsourcing market (which exceeds 150 billion dollars[21]) and assume the role of technology centres that provide analysis and technical support to leading groups of companies. They strive to achieve this by highlighting their geographical position, their expertise, knowledge, the high quality of provided services, and their qualified workforce.

Accenture, a company with annual global revenue of approximately 30 billion Euro, is among the strongest international players, who within the past few years have established technology centres in Greece. The Greek team creates customised solutions in the field of analytics, tapping into a resource of engineers and scientists specialised in statistics, econometrics, mathematics, programming etc. The achievements of the Greek team enjoy global recognition. With over 400 consultants, Athens is nowadays considered to be the global centre of Innovation for Customer and Marketing Analytics, supported by six more specialised teams located in India, China, Poland, Spain, Argentina and South Africa.

Greek people who are engaged in ICT, either at national or European level, have proven skills and knowledge for providing high quality research and innovative solutions, applicable on a global scale. Examples of good practices such as in Lithuania, Estonia, Israel and Egypt demonstrate that national growth could result from the development of the ICT sector and through human talent. For instance, Egypt has established cloud services for SMEs, and has created cloud farms to serve the broader African region. The strategic plan is to increase GDP revenue by 70 billion EGP in 2020 and by 560 billion EGP by 2030. The investment required is 120 billion EGP by 2020, and 88% of this amount is covered by multinational companies, banks, private partnerships and international investors[22].

[20] Survey conducted by Deloitte. "Global Outsourcing and Insourcing. 2014 and Beyond"

[21] http://www.livemint.com/Industry/bCLOgyaLGili6TuhmN0S7J/Indian-ICT-services-exports-seen-growing-1214-in-year-ahead.html

[22] Egypt's ICT Strategy 2014-17

Based on the above, this paper aims to project the number of jobs that could be created in Greece over the next years, as a result of an effective national strategy. This strategy would bridge the gap between supply and demand in the labour market through the development of the appropriate digital skills among young people, using the methods discussed in the previous sections.

This way, Greece could play a significant role in Europe, providing the human resources to fill the vacancies that already exist and are expected to significantly increase in future (Table 25).

Table 25.Estimate of ICT vacancies in Greece and Europe (2016-2020) [23]

No. of ICT vacancies	2016	2017	2018	2019	2020
Greece	1,300	1,400	1,500	1,600	1,700
Europe	462,000	584,000	692,000	769,000	825,000

Although other countries could also develop a similar strategy and play such a role, Greece is now the country with the largest youth unemployment in Europe, while other European countries (excluding Spain) report much lower levels of unemployment among their young people. This fact could convert the biggest weakness of Greece, its youth unemployment, into the greatest opportunity for the future.

The goal of this strategy would not be to increase the migration of young people towards other European countries, but to fill Greek vacancies with young Greek employees. This could apply:

• Either through establishing branches in Greece, similar to the technological support centres established by large multinational enterprises (e.g. Accenture), or

• Through the provision of ICT services and applications development by Greek companies to foreign ones, based on the outsourcing model, or

• Through working remotely as a freelancer, especially in the field of applications development, where this new employment model is gaining traction.

Assuming that a percentage of ICT vacancies in Europe could be filled by young Greeks, as a result of a national strategy that would enable young people to develop the required digital skills and address high unemployment, the quantification of this goal is explained below.
Vacancies in the ICT sector in Europe are estimated to reach 825,000 in 2020 (Table 26).

[23] E-skills and e-leadership skills 2020. Trends and Forecasts for the European ICT professional and digital leadership labor market, May 2015

Approximately half of these vacancies (48%) are expected to be technical positions (software development, web and mobile app development, databases etc.), while the other half are expected to be management positions in ICT (ICT projects management, systems analysis etc.)[24]

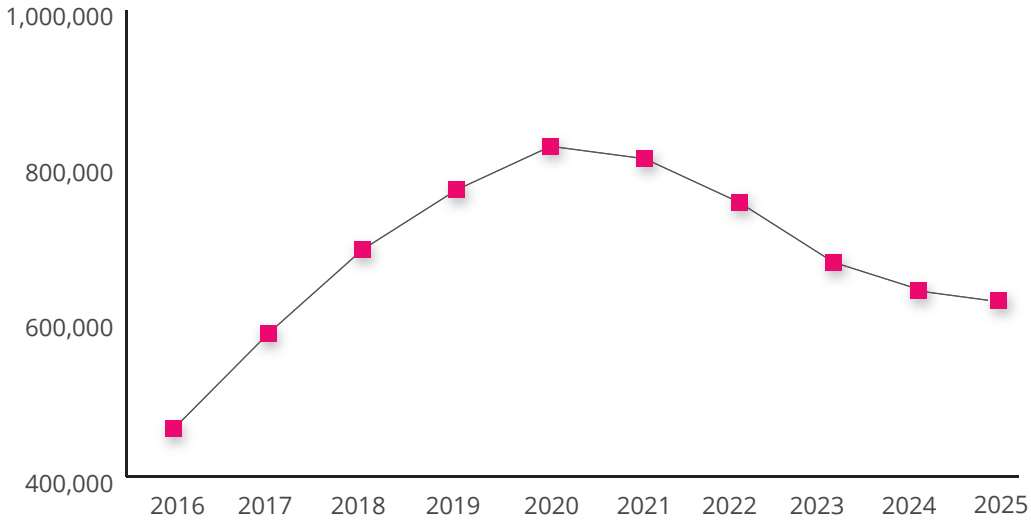
Assuming that 2020 will bring the largest gap between supply and demand, estimated vacancies for the five years up to 2025 are presented in the corresponding chart (Table 26). It is believed that a percentage of these vacancies will be filled by young Greek employees, although this percentage will not exceed 1% at first. Then it will increase at a linear rate, which will be lower in the second five years compared to the first five years (Table 27). There will be almost half a million new jobs for Greek employees who could potentially fill ICT vacancies in Europe, as shown in Tables 1 and 29.

While this objective seems to be ambitious, it may be deemed to be conservative if we consider that:

• Over 6,000 students enter ICT faculties each year, who could cover vacancies during the first years (Table 29).

• In Greece 40-50% of young people are not part of the labour market (650,000 unemployed people < 35 years old[25]). These people could - by developing the appropriate skills - fill these positions.

Table 26.Estimated number of vacancies in ICT (Europe, 2016-2025)

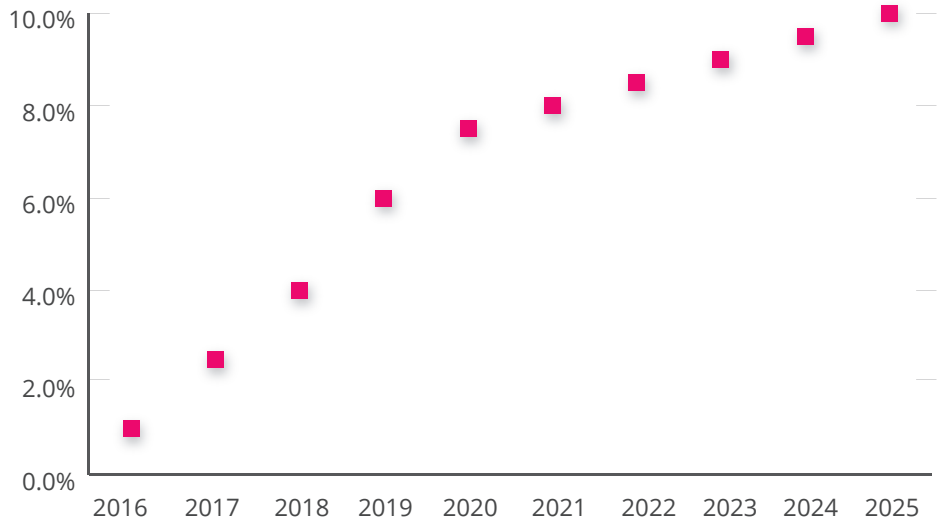


Source: E-skills and e-leadership skills 2020. Trends and Forecasts for the European ICT professional and digital leadership labor market, May 2015

[24] E-skills and e-leadership skills 2020. Trends and Forecasts for the European ICT professional and digital leadership labour market, May 2015

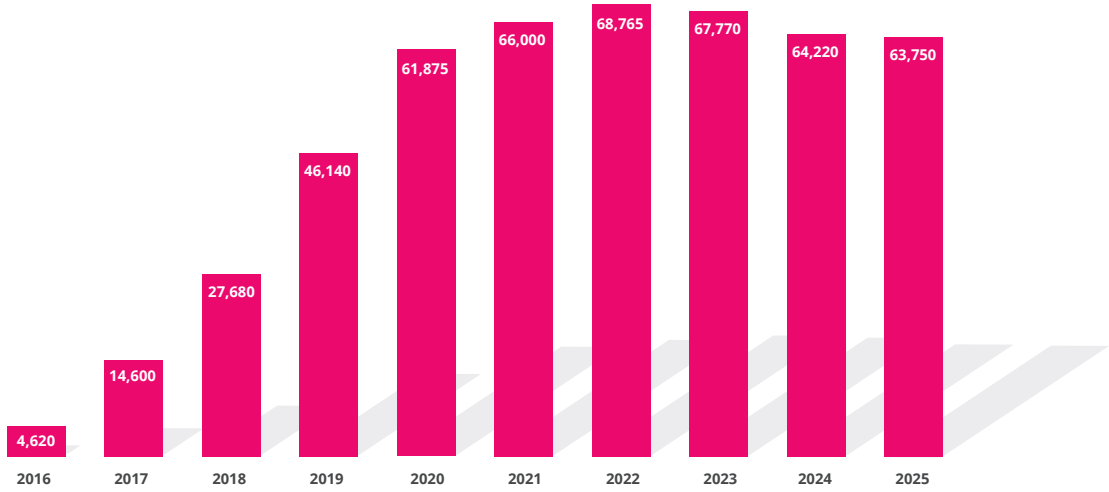
[25] ELSTAT, Endeavor

Table 27.Percentage of vacancies filled by Greek employees (estimate; 2016-2025)



Source: "Creating 500,000 new jobs in ICT" study

Table 1.Forecast for creating 500,000 new ICT jobs over the next decade in Greece



Source: "Creating 500,000 new jobs in ICT" study

Table 28.Total number of students admitted to Greek tertiary institutions (2015)

	IT Subject	Scientific Subjects*	Economics /Admin Subject	All other subjects	Total number of students admitted (2015)
Universities	4,155	9,400	5,895	24,750	**44,200**
Institutes of Technology	2,285	6,660	7,160	8,040	**24,145**
Total	**6,440**	**16,060**	**13,055**	32,790	**68,345**

* engineers, mathematicians, physicists, etc.

Source: ELSTAT

• Greece has a large percentage of young people studying in scientific or economic schools that could – by learning basic digital skills – penetrate the market (Table 29).

• For each job vacancy in the core of the ICT sector, there will be additional job vacancies in the same sector (such as administration, support jobs).

• The increasing export of ICT services will activate a "virtuous circle" of domestic scientific and business activity in all economic sectors that will seek to tap into the technological human capital potential of Greece.

The following data also supports the objectives set for new job vacancies:

• The average number of new job vacancies per year (48,500) corresponds to 70% of the number of students admitted to higher education in 2015-16 (68,345).

• During the past decade, the main certification bodies in Greece certified approximately 900,000 people in core ICT knowledge and skills, which corresponds to 90,000 people per year on average.

• The number of unemployed people in 2009, 489,543, increased to 1,200,981 in May 2015, an increase of 117,000 people per year. The estimate for 2020 is that there will be 1,150,000 unemployed people[26].

• In 2014, there was a reduction of unemployment of 72,000 people; however this is mostly because of their participation in subsidised programmes[27].

In addition, the estimate for new job vacancies does not take into account the possible contribution of the development of competitive entrepreneurship and the increase of competitiveness of Greek companies to the creation of job vacancies.

What is even more encouraging is that the actions required to develop knowledge and digital skills aiming to fill vacancies do not largely rely on economic resources but on reforms of the education sector, improved information for young people, the creation of an appropriate culture and finally the inclusion of this new perspective in national strategy.

Such a strategy may contribute significantly to an increase in employment, especially to the reduction of unemployment among young people. At the same time, it will foster competitiveness in Greek companies, to address the international market through electronic channels and to meet the contemporary demands of their customers through the use of new technologies.

The most important thing is that it should create the conditions to develop activity and to attract new investment in knowledge-intensive sectors and technological innovation, making Greece competitive at the international level and creating a positive feedback loop through further development of employment and value creation.

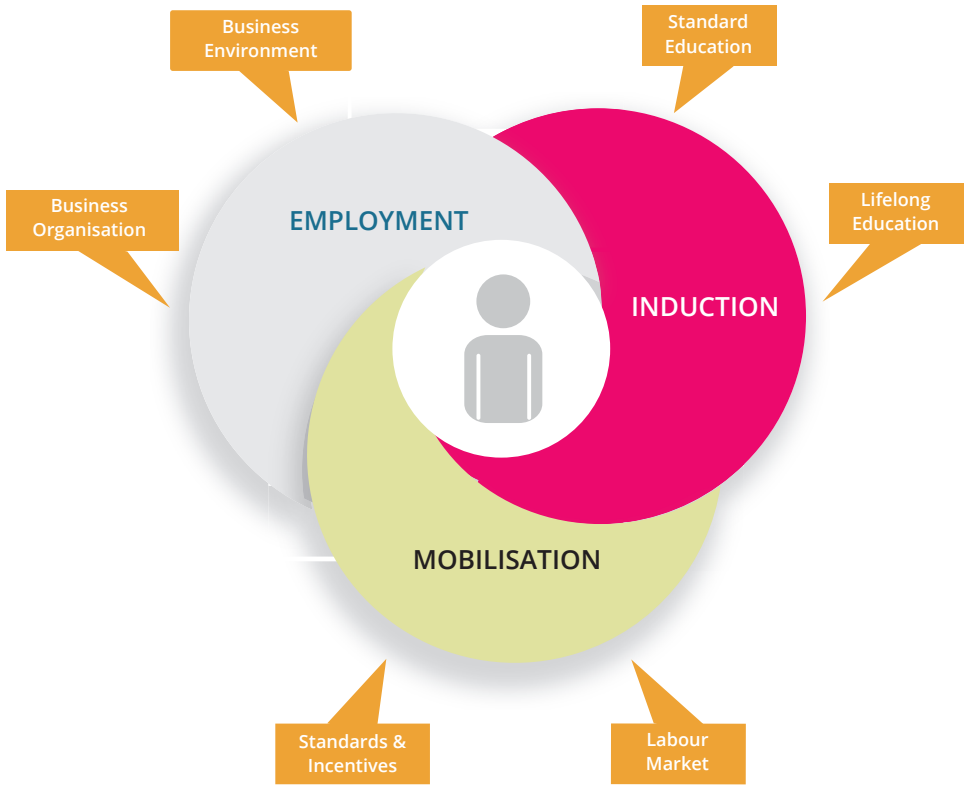
[26] ELSTAT, GESEE Work Institute

2.8 Recommendations

Having identified the issues at hand, it is time to present the corresponding solutions. These solutions are applicable to the public sector, educational institutions, private companies, vocational bodies, as well as individuals considering career and personal development choices.

The following section makes concrete proposals that demonstrate how digital skills can improve employability, and even create jobs. In order to show the direct application of these arguments, we need to draw a "virtuous circle" with three core pillars of action.

Diagram 1.The "virtuous circle" for the development of employment in digital skills and programming



Source: "Creating 500,000 new jobs in ICT" study

This circle starts with **Mobilisation**. Many young people are either not aware of the value and demand for digital skills, or they believe that these skills are inaccessible to them. As part of mobilisation, we suggest actions that address both the young people themselves through appropriate role models and incentives for action, as well as the labour market factors in order to facilitate matching demand and supply.

Once young people have started to chase professional careers in digital skills and programming, the next step is **Initiation**. This includes formal education (from primary school to University), and all the various forms of lifelong education, from vocational training and certification to online courses (MOOCs).

[27] GESEE Work Institute

Specific suggestions per pillar have been developed. It is important to highlight that these suggestions cover reform interventions and private initiatives. No investments or major expenses are required, while private initiatives can be self-financed.

2.8.1 Mobilisation

Many, as a result of ignorance of the opportunities available to them, do not believe that they could follow a career in digital skills, especially programming. Moreover, very few candidates understand the traits of the demand side of the labour market. It is urgent to create the conditions that will allow companies and candidates to participate in a continuous and close dialogue. Ultimately, cultivating a setting that will attract people that would have never considered a career in ICT, especially in professions requiring digital skills and/or in programming, is essential.

Mobilisation: Labour Market

Suggested actions:

- Adjustment of curricula in higher education to align with the labour market's needs, and development of "hybrid" programmes that combine knowledge in a specific subject with ICT and programming skills. A good example is the Management Science and Technology Department of Athens University of Economics and Business, which achieves very high levels of graduate employment.
- Coordination of consulting programmes (mentoring/coaching) that will contribute in bridging the gap between skills supply and demand.
- Formulate internship/apprenticeship schemes that are not only relevant to students of Universities/Institutes of Technology, but to everybody.
- Organise competitions and other events that will bring candidates and companies together in order to enable social networking, highlight the gaps in the expected skills and guide the candidates through the employment process.
- Provide information related to the ICT profession through executives of the labour market and through consulting services (mentoring sessions).

Mobilisation: Models and Incentives

The creation of incentives is a cornerstone for attracting young people to the ICT profession. There is a widespread misconception that a developer's work is difficult and boring. The truth is that developers drive transformation in the global economy, have significant prospects for professional development and are flexible as regards the place and sometimes the hours they work. In addition, new and flexible employment models - that allow ICT freelancers to work remotely or implement projects and innovative applications without owning or working in a company – should also be supported. Through a set of actions, young people can become more knowledgeable and, therefore, interested in ICT professions:

Suggested actions:

- Provide incentives so that someone can work as a developer, even straight out of Secondary school, with flexible professional certification based on professional experience.
- Create collaborative places (such as The Hub Athens) where developers will have a flexible base to work on software development projects around the world, without having to register a company.
- Create campaigns to inform students about prospects in the ICT sector at national and European level, as well as about digital self-employment opportunities.
- Promote role models with emphasis on young people and women, who could play a significant role in the programming sector.
- Run competitions for technological innovation and digital entrepreneurship (hackathons), with a corresponding provision of tangible incentives for young people to participate in those competitions and create innovative applications.
- Organise "shadowing events", through which young people will be able to work closely with ICT professionals for one business day and, in this way, address way misconceptions about the profession.
- Support other actions that aim to give students and young people hands on experience in entrepreneurship and technology, and allow their application in real world environments (eg business schools, development of virtual companies etc.)

2.8.2 Induction

Many executives worldwide state that in a few years programming will be the core of workforce skills, and anyone who doesn't know at least one programming language will be deemed to be "illiterate". By learning programming, young people are able to implement their ideas, release their creativity and be innovative. At the same time, programming develops skills, such as critical thinking, creativity, and the ability to solve problems.

Induction: Formal Education

In Greece, although programming is taught in schools, the teaching methods currently used require review in order to disseminate knowledge effectively within limited teaching hours.

In secondary education, students are required to learn programming languages such as Logo, which do not relate to contemporary developments and trends. At the same time, learning methods that are not student-friendly make programming unattractive to students. By contrast, programmes with active participation such as the seminars of Getcoding.gr or "The Code Time" initiative, through which students use friendly web applications and games to obtain core programming skills, are very enticing for students, countering stereotypes that programming is difficult and boring.

During the final years of secondary school ICT is optional in A and B class, while in C class it is an elective subject that children only have to take if it is required by the professional route they have chosen. As regards vocational secondary schools, a set of subjects is found in A to C class such as "Design and administration of websites", "Computer Programming Principles", "Programming Elements in a Graphic Environment", "Operational systems and information systems safety" etc.

Induction: Lifelong Education

Within a few years the courses and educational resources available on the Internet (free or payable) for learning programming have multiplied. This trend is a conclusive proof that programming fits everyone, regardless of age, level of studies, speciality or experience. It is therefore possible - and thus important - to find support structures (online and offline) for training, professional education and lifelong learning in this dynamic field of knowledge.

A typical example is the FIT4JOBS initiative, which was initially launched in Ireland. Its objective is to fill the gap between education and the labour market. It is also piloted in Greece by HePIS. Through this initiative, educational programmes are conducted where employers actively participate in their design and development.

Through FIT4JOBS, more than 16,000 candidates have been trained so far, and more than 75% (12,000) are now in the labour market. The initiative is deemed to be best practice by the European Commission, while it is part of the Grand Coalition for Digital Employment. The programme is also being piloted in Lithuania, Spain, Portugal, Latvia and Greece, where candidate labour market placement exceeds 60%.

2.8.3 Employment

According to surveys, the percentage of employers who invest in training their personnel is inversely proportional to the size of companies. Taking into account that small companies (1-18 employees) are the backbone of the Greek economy accounting for 73% of overall employment, the problem is structural, and it is mainly focused on the lack of procedures for human capital development.

Unlike large companies, SMEs do not use formal procedures to find talented employees, nor to recruit and develop their skills, even though the demands on the performance of new employees are high. The reason for the latter is that companies do not have the time to adapt, train and develop them.

At the same time, while the use of ICT technologies is perhaps the most important way to increase productivity and grow each business, the structure of SMEs does not encourage full use of technology: the need for systemised operations, flexibility and efficiency is not obvious.

Employment: Business Organisation

Suggested actions:

- Education of science students, such as those studying Physics and Mathematics, that have a strong theoretical background but less career opportunities in ICT in which advanced skills are in high demand.
- Creation of accelerated educational programmes in programming that target ICT skills with increased demand in the labour market, and the concurrent introduction of certification structures for these skills.
- Creation of educational training programmes for the transition of graduates and professionals from very different disciplines (eg medicine) into technology and programming.
- Creation of a support infrastructure for the use of training material and courses available on the Internet, mainly addressing people with no relevant experience, albeit with the ability to attend a MOOC or similar lesson alone.

Suggested actions (continued)

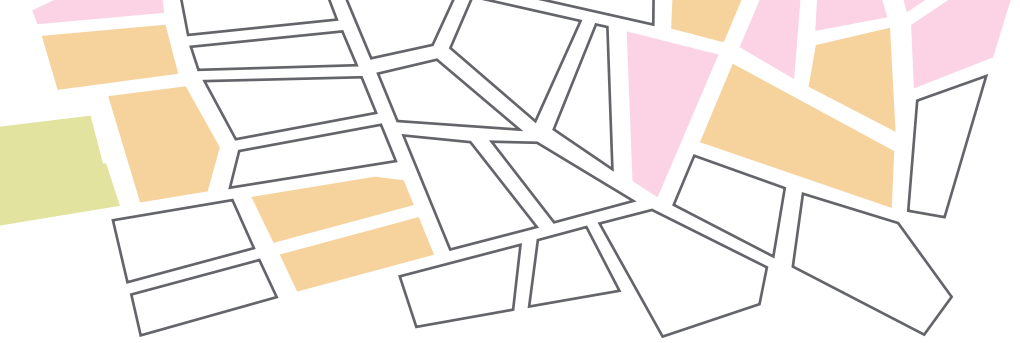
- Create subsidised programmes for the education and training of SMEs' employees in sectors and skills chosen by the employers.
- Drive the adoption of new technologies and company modernisation through subsidised programmes. The respective training of employees, use, and customisation of these technologies, will increase the productivity of Greek companies substantially.
- Put training programmes for small and medium sized entrepreneurs in place which will support the development of their companies and the use of new digital channels.
- Provide incentives for companies to recruit young people with the appropriate technical skills, aiming at modernising and improving the rate of technological readiness of companies.
- Establish business networking actions at a sectoral or intersectoral level, aiming to spread good practices and create new solutions to common problems.
- Create a networking infrastructure to match work demand and supply better (examples include websites for connection of companies with recent graduates, based on both hard, as well as soft skills).
- Strengthen internship and work experience opportunities for young people within business environments.
- Develop actions to bring young people close to the daily life of SMEs in various business sectors to increase the awareness of people with technical skills and an entrepreneurial approach of the problems SMEs face today. The purpose of this is to use technology and innovative thinking to deal with issues and develop sustainable business activities.

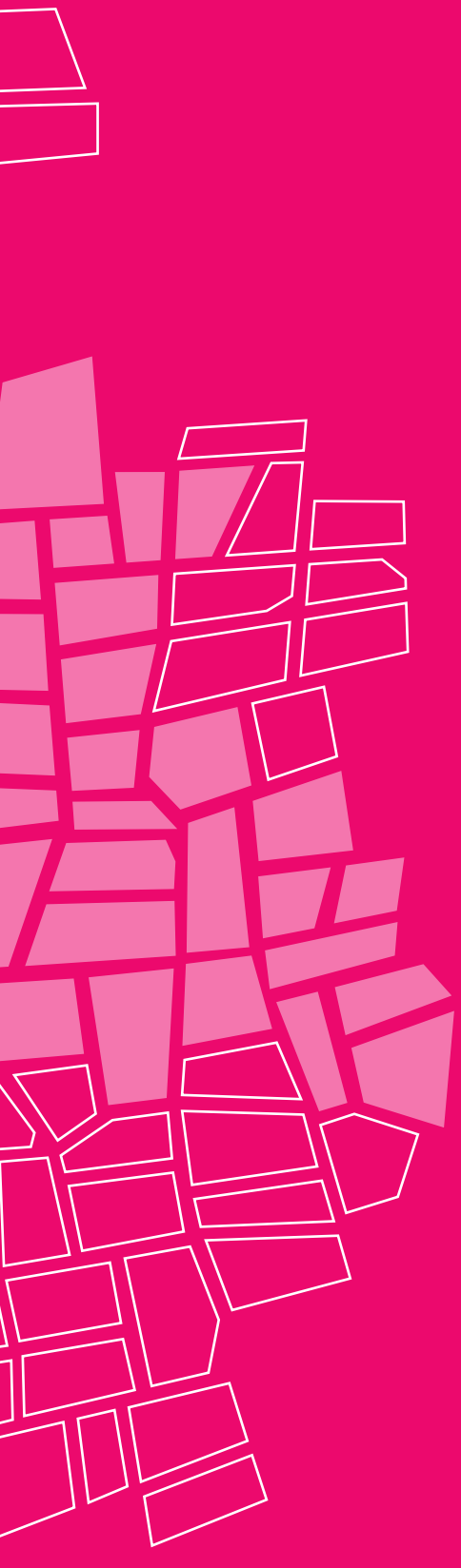
Employment: Business Environment

Business environment is one of the most important aspects in the context of policy making, and is significantly affected by the broader economic and institutional backdrop. On condition that a climate of political stability attracting investments in the country can be gradually developed, actions such as the following ones could significantly contribute to employment and innovative business development.

Suggested actions:

- Provide incentives for large multinational companies for the creation of international programming centres in Greece, with Greek developers.
- Develop technological parks to co-locate startups that are focused on technological or business innovation, and which operate in specific or complementary sectors, aiming at developing synergies and creating economies of scale for them to operate in the international market.
- Address the broader ecosystem to foster innovative entrepreneurship: starting from higher education with the provision of incentives to students, to setting up incubators and accelerators, accompanied by supportive actions for startups.
- Use development (NSRF) and research programmes to provide economic support to teams and startups that have proved their ability to take innovative technologies and business ideas to the market, as well as contribute to the business use of research.
- Support flexible forms of work and employment that encourage working remotely and the sharing of specialised technological knowledge.
- Provide incentives and support structures for the growth of SMEs, either through organic development or through acquisitions. Aim to improve the work environment through a structured approach to human resources and the development of advanced strategies to seek and develop talent.





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