GREEK NATIONAL REPORT

Fostering the Adoption of ICT-enabled AMTs by European SMEs

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

This project has been funded with support from the European Commission.

Lead organization
ATLANTIS ENGINEERING

Revision History

Version	Date	Author	Description	Action	Pages
A	23/01/2019	ATLANTIS ENGINEERING AE	Creation	C	19

(*) Action: C = Creation, I = Insert, U = Update, R = Replace, D = Delete

Referenced Documents

ID	Reference		Title
1	2018-1-FR01-KA202-04780		FAME Proposal

Applicable Documents

ID	Reference	Title
-	-	-

Table of contents

List of Figures

Executive Summary

The Greeek economy is highly dependent on SMEs. Comparing the density of the SMEs with the population, Greece is on the first places of Europe having a very high density of SMEs. Since the financial crisis tore down the Greek economy, SMEs are struggling to find profitable solutions to survive, often sacrificing resources and workforce that in normal situation would have been allocated differently. This report summarises the situation in Greek SMEs, concerning the adaption of ICT-enabled AMTs. More specifically, three main categories of AMTs are selected to be studied, namely VR/Simulations, AMTs in management, and other ICT-tools. VR and simulations are gaining popularity among European SMEs, especially in design and reconfiguration of products and technologies. In Greece the use of VR and AR is not that extended and this technologies are mainly used either for advertising purposes or, which is most common, by cultural and educational institutions such as museums and archaelogical sites. ICT in management is, as in most European countries, also widespread in Greece. There are many Greek SMEs that use some kind of ICT to develop a strong management profile and maintain their position in the market, either through advertising using tageted advertising methods or providing services online. Finally, what is encouraging is that over the past few years Greek SMEs show progress and positive trends in the adaption of smart ICT tools. Technologies like 3D printing and robotics are gaining popularity among Greek SMEs, which seem to understand the importance of having intelligent systems to support other traditional methods they have been using, thus becoming more efficient while taking one step towards the digitalisation era. Summing up, a further insight about the use of ICT-enabled AMTs is provided, specifically for four industrial sectors in Greece, namely Electronics, Mining and Metal Industry, Wood Industry and Food and Agriculture.

Introduction

Scope of the Project

This report documents the use of ICT-enabled AMTs in Greece. It sets the baseline of how Greek SMEs adapt and use such technologies to upgrade their production processes and enhance their production capabilities by minimizing the required effort and workforce.

Target Group

Greece is among the higher ranked European countries accounting high density of SMEs compared to the countries population. Although Greek economy is struggling to get back on its feet, 96.9% of Greek enterprises are labelled as 'small' with only 3.1% have an overall workforce of 10-249 employees, while the mean European average sits on 7%. Despite being small to medium sized these enterprises act positively on improving the national GDP (approximately 19.3%, as acounted in 2014, from which 9.3% corresponds to very small, 5.2% to small and 4.8% to medium enterprises). What differs in Greece when compared to other European countries is that the negative trends on SMEs performance, reported over the last years mainly due to the financial crisis has been already overthrown. Having said that, FAME project could further support the effort made by Greek authorities to get back on track and follow the European trends.

Project objectives

The main objective of the national report is to document well accepted practices in Greece, as well as, investigate areas where Greek SMEs lack compared to their European counterparts (finance, knowledge, experience, etc.). While the specific objective of this document is to provide an insight about the reality of SMEs in Greece, it will also act as a starting point, providing input to other initiatives within the scope of FAME project. The primary goal is to develop a training program which will then act as a tool in hands of SMEs' managers to enhance the skills and productivity of their business, while being part of a wider network of SMEs across Europe allowing mutual knowledge sharing and ideas exchange.

VR/Simulations

VR/Simulations in design and reconfiguration of products and technologies

The application of virtual reality and simulations in areas such as training and marketing purposes are starting to take over traditional methods used in the past decades. According to ABI Research Virtual Reality (VR) and Augmented Reality (AR) will grow exponentially in the years to come, with an annual growth of 106% in the next five years. The same study estimates that by 2020, 43 million VR devices will be sold worldwide, with many of them for business use. With giant technology companies setting the path, SMEs must analyze in depth if VR/AR technology could serve part of their business.

The Situation in Greece

The field of Electronic and Electronical equipment production in Greece is not as preferred compared to others such as, agriculture, food, and tourism related enterprises. Thus, there is limited amount of information on the use of VR and AR technologies in this specific sector. Mainly Greek SMEs that can use VR/AR technology are offering services such as advertising, designing and promoting the work of others as external contractors, and are mostly media oriented.

Few consulting companies have started using this technology to support the services they provide, though the use of VR/AR is still not that extended.

Virtual Reality and Augmented Reality is mostly preferred by Greek SMEs that promote culture and ancient heritage. The use of technologies that can help recreate parts of ancient archaeological sites is slowly being introduced in museums and companies that operate in the field of cultural education. Other than that, the use of VR and AR technologies in Greece is limited to advertising, designing and promoting purposes rather than exploited in ways to enhance an SMEs productivity rate.

Despite the vague use of VR and AR technologies in Greece, *FAREXTRA* is a Greek SME that provides customers with a special R3D Suite, a platform that allows users to easily and accurately manage their company's procedures, by using full multimedia content, including virtual and augmented reality to support assembling as well as personnel training. Part of the platform product is R3D flow, a tool allowing users to design, edit and export, among others, fully editable 3D models. *FAREXTRA* is one of the leading companies in Greece providing such services.

Management

Greek SMEs are show great performance in managing an enterprises profile online. That is, through the use of social media and webpage maintence. Also there is an increasing trend of the enterprises using social media to advertise and describe their products, in a way to promote their activity to potential customers.

Taking account data analysis and cloud computing though, leads to a safe conclusion that Greek SMEs need to take actions towards managing data other than customer related information. Following, statistics on the Greek SMEs performance are presented in terms of using e-commerce, big data analysis and cloud computing in general.

Supply chain management with suppliers/customers, network-centric production

Greek SMEs as said before are mainly focusing on advertising and selling trhough social media. On the field of production and supply chain manaagement statistics are not encouraging. Out of 830 enterprises only 83 (10.0%) is using some kind of ICT to communicate with customers concerning orders. Although in ELSTAT's survey, there is no discrimination of the enterprise field of activity, the percentage remains low compared with other European ternds.

Greece's main business activity is tourism and hosting. With many Greek SMEs being active on that sector one could expect that online booking and ordering would thrive among the technologies used by Greek enterprises. However, only 178 (21.4%) are using an online service for booking, ordering and reserving. This is a field at which further actions shall be taken to support the turnover of Greek SMEs from traditional methods to the usage of ICT-enable AMTs.

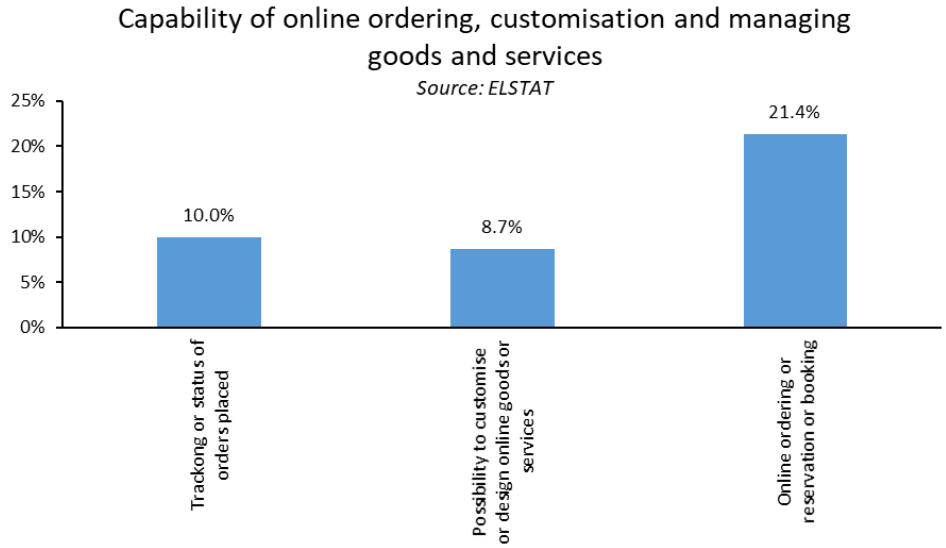


Figure 1. Capability of online ordering, customisation and managing goods and services

Where there is also plenty of room for improvement is the website content of the Greek SMEs. As shown in Figure 2, Greek SMEs typical post online content for advertising purposes. What is interesting is that, as they mainly post information about price catalogues, product descriptions and service statements, very few (8.6%) have developed any kind of AI software that allows for a target content projection. That makes advertising through the enterprise's website and/or social media very vague, resulting in difficulties in reaching the customer end in a more targeted manner.

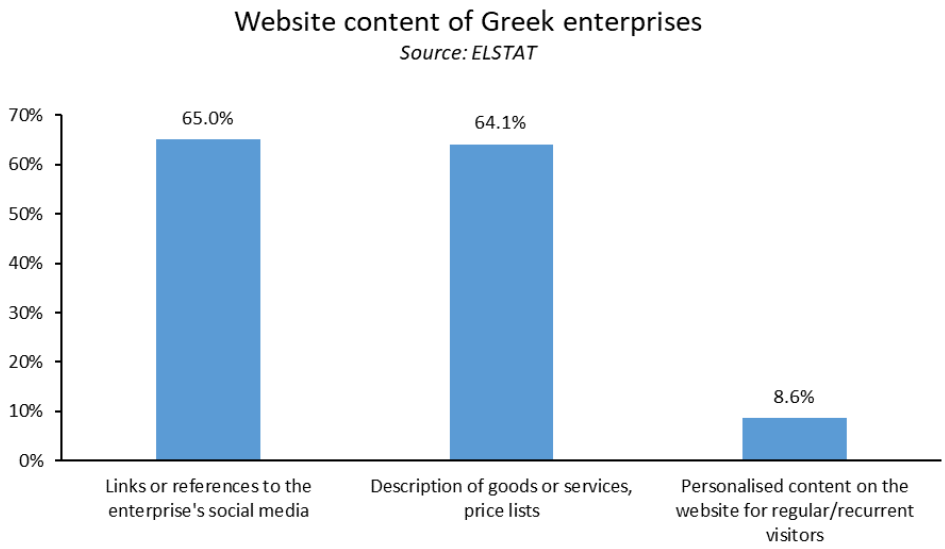


Figure 2. Website content of Greek enterprises

What is interesting is that despite the small amount of enterprises using target advertising through the internet, those that do, they use a wide of techniques to achieve the best outcome of the targeted advertisement plan. That comes supplements the fact that Greek SMEs do have the knowledge and expertise to use ICT-enabled AMTs but lack of resources and funds. The SMEs that are able to allocate resources in the field of ICT show greater overall performance than those who struggle with spending resources on that sector.

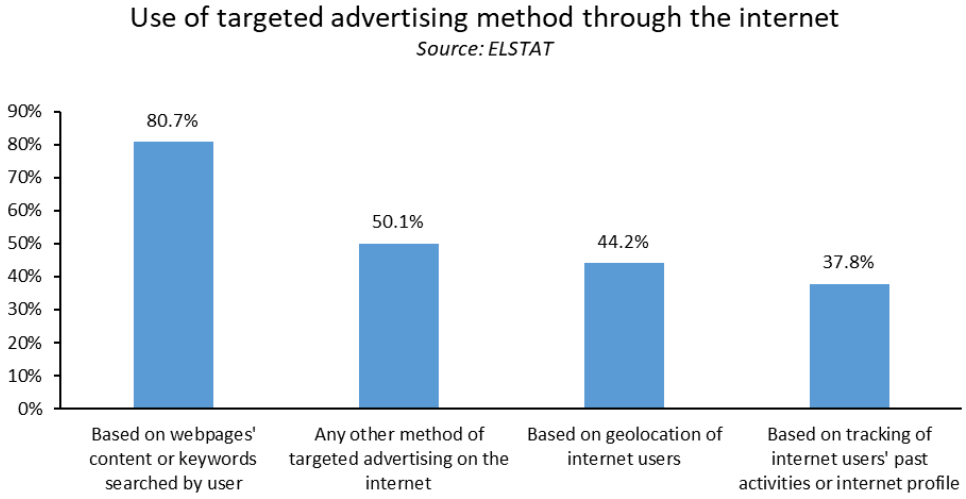


Figure 3. Use of targeted advertising methods through the internet

ICT-tools

Cyber-physica systems and networking, sensing and intelligent components

Usage of intelligent components and cyber-physica systems is not that widespread among Greek SMEs. As previously noted Greek SMEs may have the skills and competency to follow the European trends but they fall greatly behind in terms of stock technology and equipment that enables a smooth transition to the digital era. According to Figure 4, 830 enterprises make use of intelligent systems, whether this is robotics or intelligent surveillance systems. Out of the total number of 830, 570 are using industrial robots and 342 used service robots. What should be noted here is that there are enterprises that used both kinds of robotics and that no enterprises that used robotics for secretarial or administrative support were observed during ELSTAT's survey.

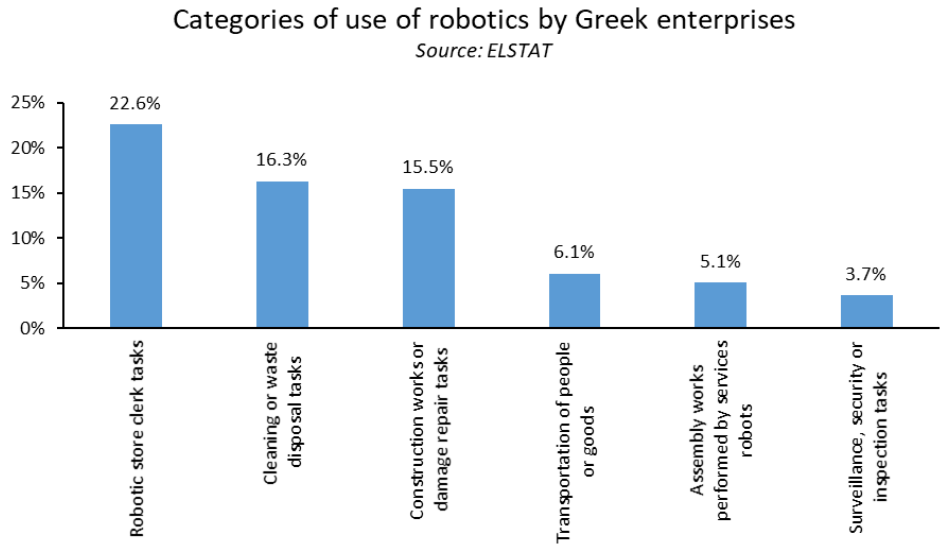


Figure 4. Categories of use of robotics by Greek enterprises

What the survey defines as an industrial robot is the automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation application. A service robot, according to the same survey, is a machine that has a degree of autonomy and is able to operate in complex and dynamic environment that may require interaction with people, objects or other devices, excluding its use in industrial automation applications.

A very good example of a Greek SME fully utilizing automations in their production line is *KEBE. KEBE* is an SME active in the sector of ceramics production. It uses high-tech, innovative equipment turning the production line to fully automated utilizing applications of robotics. Apart from the use of robotics *KEBE* is using intelligent systems to assess the quality of their products at all stages of their production

line. Their employees are also well trained to operate automatic machinery such as light weight cranes and carriage vehicles.

Software robots (such as computer programms) are not included in the above statistics and are covered separately in the 'Management' sector of this national report.

Mass customization (3-dimensional printing, direct digital manufacturing)

According to the Annual Survey on the Use of Information and Communication Technologies and e-commerce in enterprises performed by the Hellenic Statistical Authority, the use of 3d printing technologies in Greek SMEs shows great results compared to other AMTs. It is a fact that more than half the Greek SMEs (51.1%) that participated in the survey stated that they use 3D printing technology to produce prototypes or models for internal use. Out of the companies participated a decent amount of 34.7% stated that are also selling the part they produce with 3D printing techniques.

When it comes to overall use of 3D printing in the production line of the enterprises 44.7% stated that they use 3D printing technologies to produce parts for their production line including models and prototypes with 22.6% using such techniques purely for the later stages of their production processes (excluding prototyping stages).

A useful finding of this survey is that out of a total of 546 enterprises that used 3D printers, 208 enterprises used printers owned by the enterprise or printer that were leased by the enterprise rather than outsourcing.

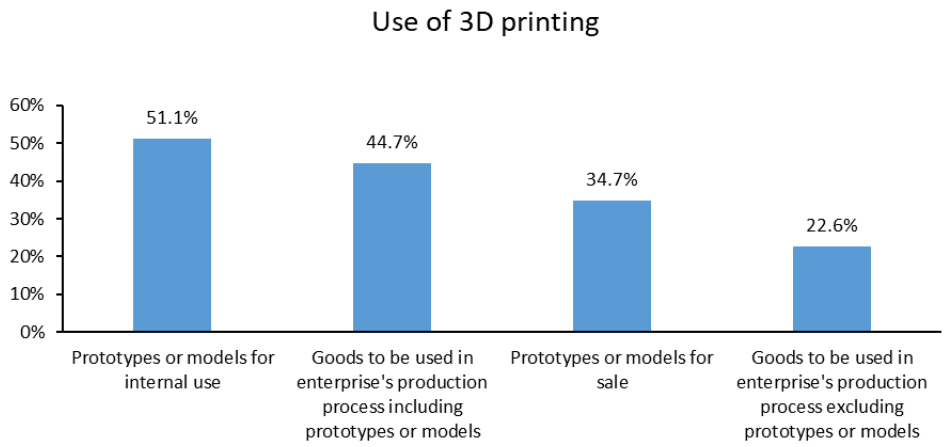


Figure 5. Use of 3D printing by Greek enterprises

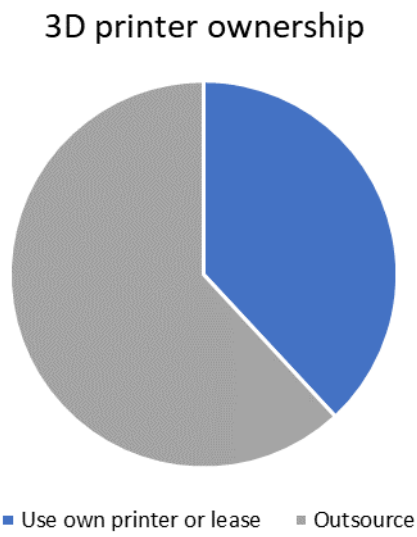
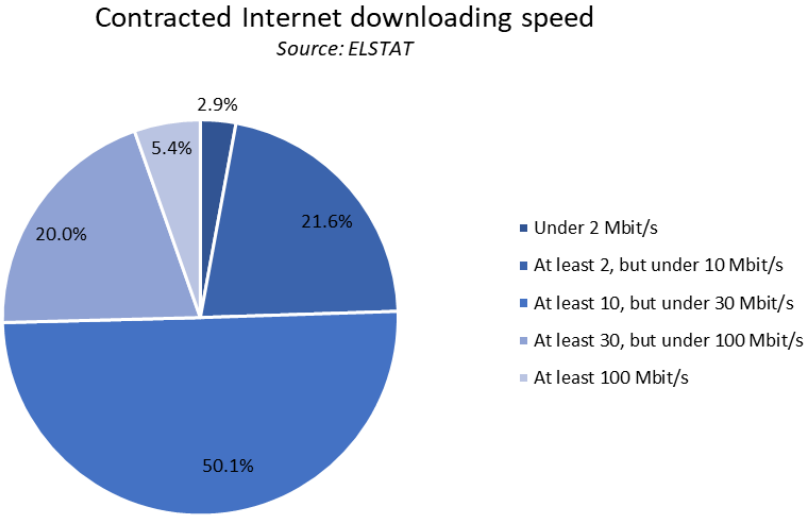


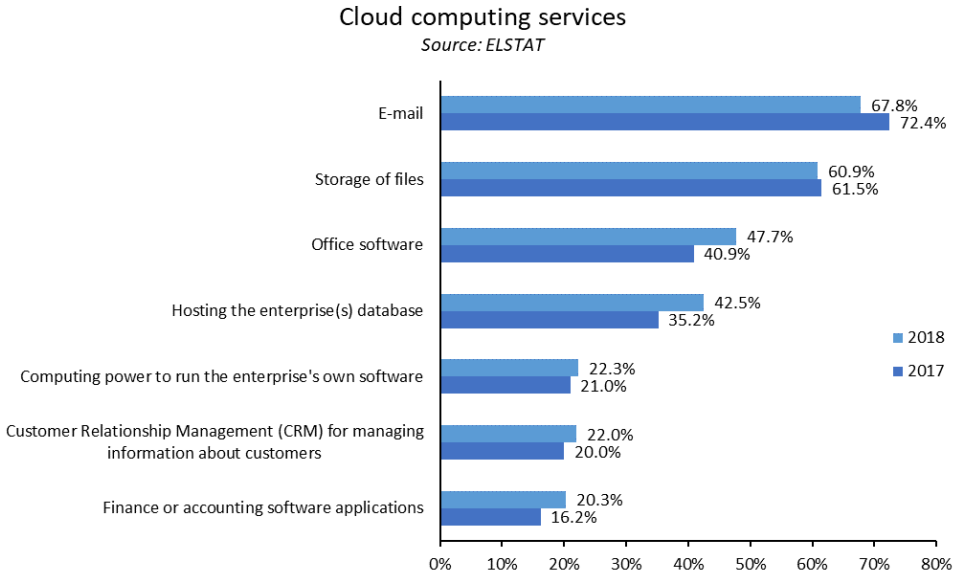
Figure 6. 3D printer ownership of Greek enterprises

Cloud manufacturing

Greek SMEs in terms of cloud computer services are scoring close to average in the basic categories that an enterprise should be able to handle using online cloud. That is e-mail and domain handling, file storage and office software capabilites. The performance slighty falls for the ability of the enterprises to host their own database. Further decrease is observed on computing power and finance for software applications. Related to the low performance of targeted advertisment usage by Greek SMEs, the Customer Relationship Management performance is also low. What is encouring though is that compared to 2017 there is slight increase to all cloud computer services, other than e-mail usage. That is not necessary a bad indicator, as it shows that Greek SMEs are swifting to other types of communication, more personal and more efficient (e.g. virtual calls, personalsed messages, e.t.c).

A good example of a Greek SMEs that utilizes cloud computing and is a good practicioner on the field is *EMPHASIS TELEMATICS.* They provide solutions for the data driven operational intelligence and the performance alansysis of business processes based on sensor data. Their team of engineering experts are applying machine to machine (M2M), industrial Internet of Things (IIoT), and mobile technologies to optimise efficiency, safety, quality, and cost of business processes. The *EMPHASIS TELEMATICS* approach is based on accurate real-time sensor data that visualizes business processes. The information is aggregated and transformed into corporate knowledge and intelligence to support decision making. The firm designs, develops, and deploys IIoT solutions for maritime transportation, manufacturing, mining, and logistics applications, addressing challenging requirements on operational, tactical, and strategic corporate levels. *EMPHASIS TELEMATICS* is an M2M partner of Deutsche Telekom AG.





ICT-enabled AMTs in clusters

This final sections provides an insight of the situation in Greece, and more specifically in two of the leading sectors in Greek economy, mining and metal industries and agriculture. As presented in Figure 7 most Greek SMEs on the four selected clusters are categorized as 'small' with employees number ranging from 0 to 9 people.

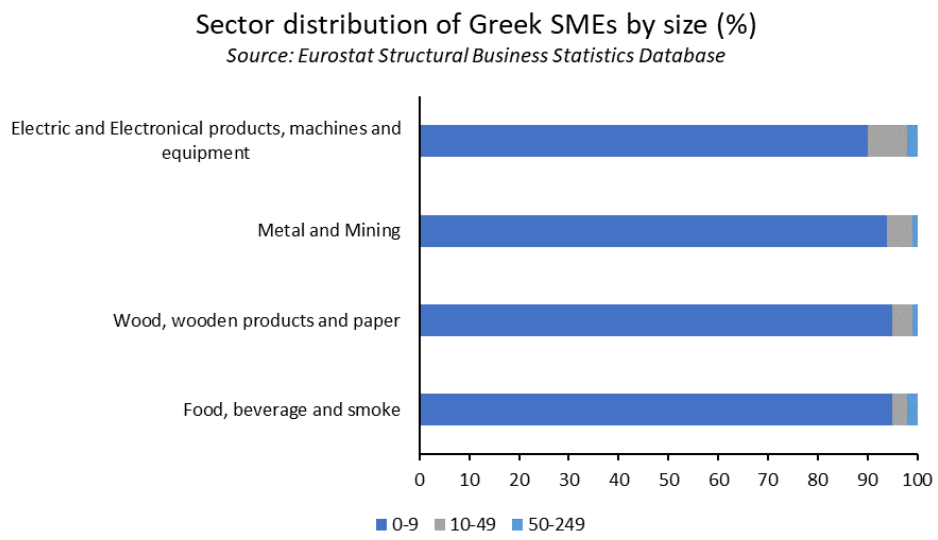


Figure 7. Sector distribution of Greek SMEs by size (%, as per 2014 update)

Electric and Electronical products, machines and equipment

The electronics manufacturing sector is not among the first clusters of Greek economy. Although, a fair number of SMEs are being active in this sector over the past few years, either by offering service-based consulting using self-produced equipment or simply act as manufacturers delivering electronic products and parts on demand. The adoption of ICT-enabled AMTs is high on Electronic manufacturing companies as technologies such as automation in the production line can help companies reduce time, costs and meanwhile increase product quality.

A good example of a Greek SME being active on the field of PCB manufacturing since 2009, is GETO. The company offers Contract Manufacturing Services concerning PCB assembly in a fully automated production site. All production line individual processes, from assembly processes to optical inspection and testing, are being conducted using automated equipment and fully trained personnel ensuring the quality standards are the ones expected. Fully automated production line includes robotics, automated cutters, printers and a wide range of automation in parts handling.

GETO serves as a good example of the situation of ICT adoption on the Electronics field in Greece. Most companies are using advanced techniques to manage delivery costs and reduce effort while constantly trying to be competitive compared to other companies in the sector.

Metal Processing and Mining

An analysis of the Greek mining and Metal Processing industries, with regards to their digital maturity shows that Greece lies on the lower end against nine other European countries, as accounted from 2014 through 2016. It is worth noting that since 2014 only small progress has been made in this sector, with the index increase by approximately 4 points as shown in Figure 8.

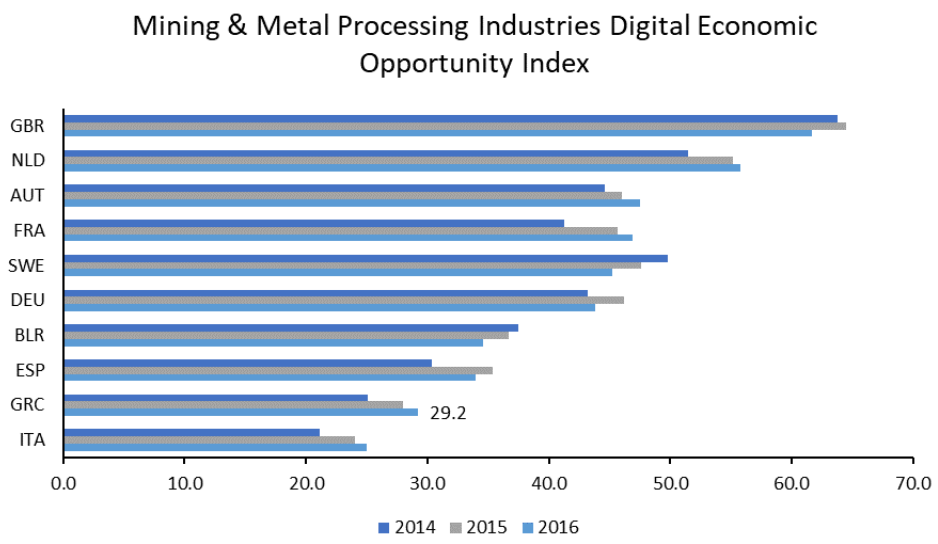


Figure 8. Mining & Metal Industries Digital Economic Opportunity Index

The same study was based on the breakdown of the parameters that make up the DEOI which namely are:

a. Digital Skills
b. Digital Technologies
c. Digital Accelerators

The breakdown of those three parameters for 2016 are shown in the following figure

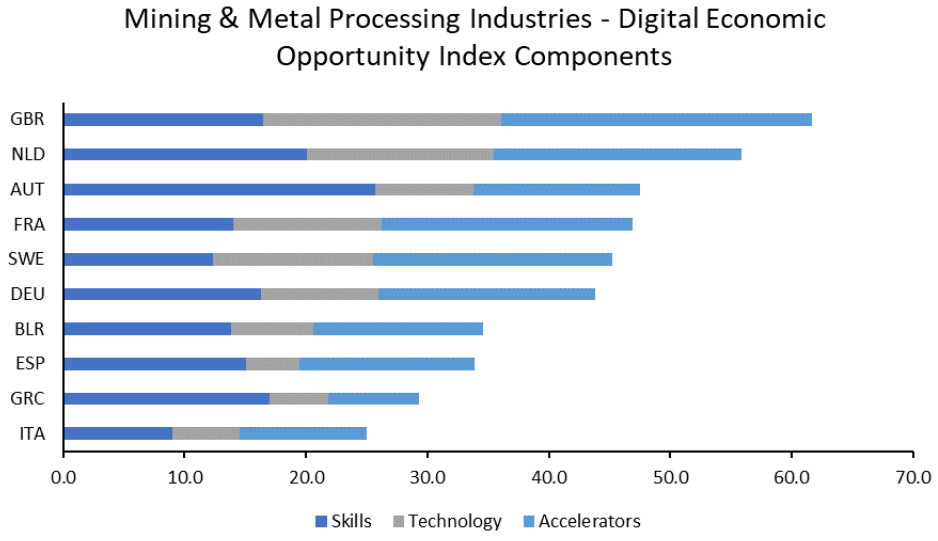


Figure 9. Mining & Metal Processing Industries - Digital Economic Opportunity Index Components

What the above graphs tell us about the situation in the Greek Metal industry is that with regards to digital skills, the Greek industries seem to have the experience and benchmark skills to be able to adapt to the digitalization era. Those skills range from ICT specialists to a workforce that exhibits at least some basic digital skills. Concerning training and development Greece performs closely enough with the European sample. Also, businesses have lately development digital practices to enhance the workforce's mobility, such as remote working and access to enterprise's IT system.

On the contrary there is much more room for improvement in the digital technologies area. As Figure 10 indicates the Greek Mining and Metal Processing companies have significant lack of ICT hardware and software stocks, compared to other European companies. In addition, the Greek companies demonstrate a low adoption rate of emerging technologies, such as IoT, cloud, analytics etc. Despite being below average on the digital technologies sector some companies display willingness to digitalize parts of their production process while others have already started acted towards this goal.

in addition, Greek industries seem to fall behind the European sample on the digital accelerators level, highly affected by the state of the national communication infrastructure. Furthermore, the strict regulation imposed by the Hellenic Data Protection Authority with regards to data openness and interoperability, as well as the lack of digital, lean, user-centric public services provided to business are additional decelerators.

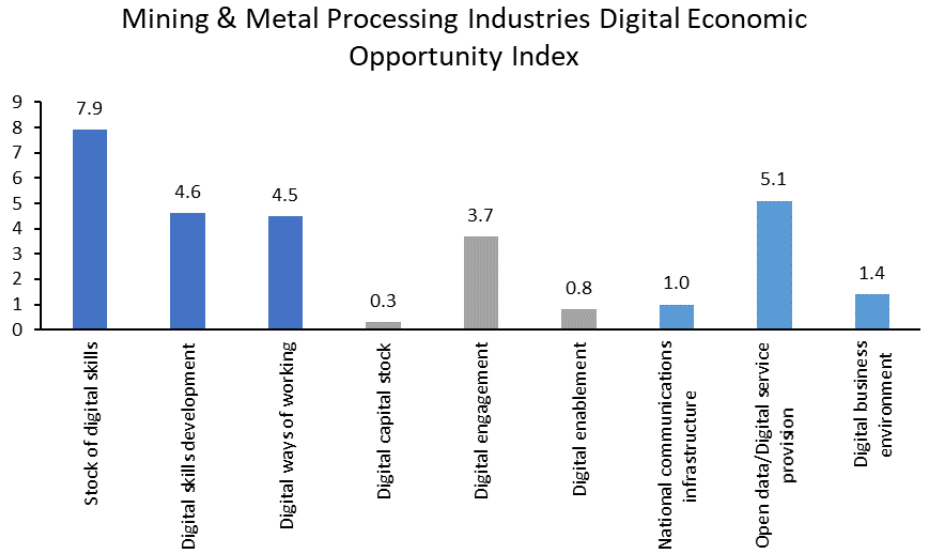


Figure 10. Mining & Metal Processing Industries Digital Economic Opportunity Index

The Agricultural Sector in Greece

The Greek economy is based on a large percentage on the agricultural sector. Many SMEs as well as individuals are showing great interest in this sector, over the last years. Traditional methods of farming

have been replaced by more intelligent systems, which draws the attention of mostly young people on rural Greek areas, who seek opportunities to establish a profitable enterprise close to their homeland

ICT training and ICT usage

According to a research study on the aspects of incorporation of ICT in Greek agricultural enterprises, ICT training can give new impetus to agricultural activity, which can act as a transformative agent for rural development. Out of a sample of 29 farmers working as individuals or are employees in an SME being active in the field of agriculture only 4 have received a formal ICT training either through vocational training or as part of university studies. Informal and non-formal training are the forms of training most accounted for in the survey, which represents either a self-education course or a training through friendly or family background of farmers. The entire analysis is shown in Figure 11. What is interesting is that according to a research showed that Greek farmers are willing to pay for rural education, an element that appears to be true also for ICT training.

ICT innovation and initiatives

According to Greek authorities more than five thousand farmers and farming enterprises are now adopt pilot programs of smart farming. To help spread the idea of smart farming the Greek Ministry of Digital Policy is working closely with the Ministry of Rural Development. Also, Greek universities support the effort by promoting innovation and ICT skills development in the agriculture sector through applied courses and research programs.

More specifically NEUROPUBLIC is a Greek ICT company that is active on supporting more than 70 innovation programs of smart farming across Greece. This company uses its group expertise on computing and farming obtained also by working closely with the European Space Agency (ESA) and other international organisations to apply technologies such as remote sensing in the Greek agriculture sector.

Most Greek SMEs that innovate on the agricultural sector are demonstrating expertise in developing smart monitoring systems, smart plant protection systems through data monitoring (weather conditions, pest control etc.) and smart watering systems by monitoring plants' needs. To do so, satellite images and data are being used supported by on land data collection, while in many cases, drones and autonomous vehicles and aircrafts are deployed to collect data. A leading Greek SME in land monitoring is Terra Spatium which also takes part in national and international research programs for the creation of innovative products.

Finally, Greek SMEs are also providing e-services such as online and live monitoring of croplands through laptops, tablets and even mobile applications, through which Greek farmers can get live and target information through maps and other geolocation services.

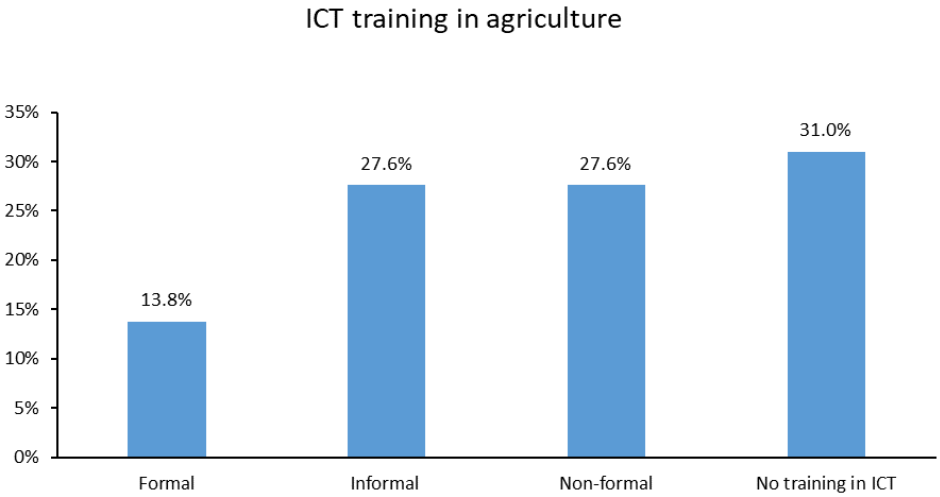


Figure 11. ICT training in the agricultural sector in Greece

Conclusions

It is a fact that Greek SMEs are struggling to survive the financial cirsis that striked the Greek economy over the past years. That effort is highly affecting inittiatives being adopted towards the use of ICT-enabled AMTs. In most cases, SMEs compromise with basic use of ICT mainly due to lack of funds. The use of ICTs in Greek SMEs is limited to the basic use of cloud services and mainly to promote and advertise their services or products rather than exploiting the full potential of such technologies. Few are the cases, encountered under specific circumstances, that SMEs are adopting some kind of advanced technology in their workforce. SMEs who benefit from the use of technology either under the scope of a research partnership with a university or by managing to allocate funds on the ICT sector are those who manage to innovate and are ranked first on customers preference. An interesting fact is that Greek SMEs seem to have the skills and expertise to adopt ICT-enabled AMTs but lack the financial support and the resources. Those who don't have the expertise are also willing to make effort to obtain such skills even through paid ICT courses. FAME's role should fill that gap of lack of knowledge by creating a detailed training program on ICT-enabled AMTs and the opportunities presented when adopting them, while ensuring constant support to the SMEs by creating a network of knowledge, ideas, and expertise sharing.

References

[1] *About: Farextra* . (n.d.). Retrieved from Farextra Website: http://farextra.com/about.html

[2] Accenture. (2017). *Digital Greece: The path to growth, Mining & Metal Processing Industries Digital State.* Accenture.

[3] Botsiou, M., & Dagdilelis, V. (2013). Aspects of incorporation of ICT in the Greek agricultural enterprises: The case of a perfecture. *Procedia Technology*, 387-396.

[4] *Company Informations: Emphasis Telematics*. (2014). Retrieved from Emphasis Telematics Website: http://www.emphasisnet.gr/company-information/

[5] *Company: KEBE Northern Greece Ceramics*. (n.d.). Retrieved from KEBE Northern Greece Ceramics Website: http://kebe-sa.gr/e/company-profile/

[6] European Commission. (2017). *2017 SBA Fact Sheet Greece.* European Commission.

[7] ΕΥ, Σύνδεσμος Επιχειρήσεων και Βιομηχανιών (ΣΕΒ). (2017). *Οι μεσαίες και μικρές επιχειρήσεις στην Ελλάδα.*

[8] Giotopoulos, I., Kontolaimou, A., Korra, E., & Tsakanikas, A. (2017). What drives ICT adoption by SMEs? Evidence from a large-scale survey in Greece. *Journal of Business Research*, 60-69.

[9] Hellenic Confederation of Professionals, Craftsmen & Merchants (GSEVEE), National Confederation of Hellenic Commerce (ESEE), Union of Hellenic Chambers of Commerce (KEEE), Task Force for Greece of the European Commission (TFGR). (2014). *The Development of SMEs in Greece.*

[10] Hellenic Statistical Authority. (2018). *Survey on the use of information and communication technologies and e-commerce in enterprises 2018.* Piraeus: Hellenic Statistical Authority.

[11] Mourtzis, D., VLachou, E., Milas, N., & Xanthopoulos, N. (2016). A cloud-based approach for maintenance of machine tools and equipment based on shop-floor monitoring. *Procedia CIRP*, 655-660.

[12] Pontikakis, D., Lin, Y., & Demirbas, D. (2006). History matters in Greece: The adoption of Internet-enabled computers by small and medium sized enterprises. *Information Economics and Policy 18*, 332-358.

[13] Spanos, Y. E., & Voudouris, I. (2009). Antecedents and trajectories of AMT adoption: The case of Greek manufacturing SMEs. *Research Policy*, 144-155.