AddTex

Advancing industrial digital and green innovations in the advanced textile industry through innovation in learning and training

WP2 Greek National Report

Co-funded by the European Union

Project acronym:	ADDTEX
Project full title:	Advancing industrial digital and green innovations in the advanced textile industry through innovation in learning and training
Grant agreement no.:	101056303 — ADDTEX — ERASMUS-EDU-2021-PI-ALL-INNO
Responsible partner for deliverable:	CITEVE & TUS
Contributing partners:	____
Author(s):	Cre.Thi.Dev.
Target Group(s):	Institution
Distribution level:	Partnership
Total number of pages:	27
Version:	Final
Language	English
Reviewed by:	Peer review
Status:	Final
Delivery date:	10.01.2023

Version control:

Number	Date	Description

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Contents

1. Introduction

As member of the consortium in the ADDTEX project, Cre.Thi.Dev. carried the list of activities within the timeframe regarding Work Package 2. Due to the resources and the expertise of Cre.Thi.Dev. in the textile sector in Greece as well as in the Erasmus+ projects, the activities and the research were conducted successfully. All activities took place in Greece, and in online forms.

During the first two months, September and October, the organization worked on gathering information from its partners for conducting the desk research. With a focus on textile and clothing sector, Cre.Thi.Dev. completed the results about the current situation in education and industry that the country is under. For the second part of the time left, the organisation contacted its affiliates and organized the meetups and the living labs, according to the guidelines given by the responsible. There were two meetups conducted, while the living labs were combined with the second meet-up. During the first discussion, Cre.Thi.Dev. gathered 3 HEIs and 1 VET provider during an online session. As for the second meet-up and the living labs, the session participated 8 stakeholders (7 companies and 1 research center) and 3 HEIs, where there were issues discussed regarding the connection between the Greek textile industry and the education.

The list of partners included in all online sessions are:

1. HEIs
    a. International Hellenic University (IHU)
    b. Technical University of Crete (TUC)
    c. University of West Attica (UNIWA)
2. VET providers
    a. PANSIK Fashion school
3. Textile and Fashion Industry stakeholders
    a. 3Quarters
    b. C.Siamidis
    c. MUSA collection
    d. Cutcutuur
    e. Emi Tsakalou (researcher)
    f. Cl. Dimitriadou (researcher)
    g. Sioutaris George (researcher and employee)
    h. Foundation for Research and Technology Hellas/ Institute of Chemical Engineering Sciences (FORTH/ ICE-HT)

Starting with the desk research, the results were conducted through online research, reach out to affiliates for information and from the organization's portfolio of activities on advanced textiles and green/ digital/ smart development. There is a wide variety of projects performed and discussions organised on a national and international level, but still the sector is scarce, and a large group of the market is still unaware of both advanced textiles and even sustainability-based thinking.

Moving on to the results of the discussions and maps designed during the meetups and living labs. More specifically, during the first session with the HEIs and VETs, the focus of discussion was on what was available for education and towards which directions are the institutes moving to reach green, digital and smart development and knowledge. On the other hand, the discussions with the companies were first to realise the existing technology in the Greek industry, and secondly the correlation of the industry and the HEIs. We also asked the stakeholders, about the dissemination of their activities and to what extent they take actions for communicating them.

2. Technologies / innovation /documents /tools

In this section, we provide the results of discussions during the second meetup and the living labs, that were conducted also online including educators and textile industry stakeholders. To maintain a specific pace and gather the required information without moving out of line, we first divided the of high importance activities which all stakeholders agreed upon. Then, according to the companies' processes and activities, we categorised the aforementioned, in green, digital and smart categories. For the final findings, there was extended discussion between education and industry about existing technologies, methods and tools used, lack of information and resources, future and ongoing processes. For each one of these, the participants stated strengths, threats, opportunities, and barriers that are faced in the Greek industry.

2.1.1 Green transition

Table 1. Green

Functional areas of the company	Technology/innovation/ changes	knowledge needed to perform the process	Topics to be addressed
Sustainable based thinking	Waste management right choice of raw materials changes in the supply chain stages New methods of energy management	Train the staff and prepare students accordingly Maintenance of new technologies Learn about new hardware and software that will assist with the innovative methods of sustainability Strategic management for waste management and energy saving	Methods of recycling/ repurposing Why choose something sustainable and how to recognise it What means energy maintenance What means waste management
Raw materials	Regulations and ISO	For raw materials it is important to know about origins, how they were produced, under what conditions and how much waste did they produce.	Transparency Follow regulations and ISO standards Bring awareness Train the local market
Packaging	Recycled materials	More or less the same as for any material that wants to follow the regulations. Know about the origins, when where and how.	Transparency Effectiveness and durability ISO standards and regulations

2.1.2 Digital transition

Table 2. Digital

Functional areas of the company	Technology/innovation/ changes	knowledge needed to perform the process	Topics to be addressed

Product design and production	3D design, 3D cutting, digitised processes in the supply chain	Software Hardware New channels	This is a constantly growing area Train the staff and be up to date for changes and innovative ideas
Product distribution	Online websites	Basic skills and methods for reaching out to new channels in the digital world	Keeping up to date and renewing the knowledge on new marketing vendors
Product advertising	Online websites	Marketing skills marketing influencer New software	Third party companies to meet expectations New collaborations with respective partners

2.1.3 Smart transition

Table 3. Smart

Functional areas of the company	**Technology/innovation/ changes**	**knowledge needed to perform the process**	**Topics to be addressed**
Product advertising	Innovation Strategic planning	3D software	Strategies Business models Software knowledge
Sales	Customisation Online channels 3D technologies	Marketing channels Software	Smart sales Customisation
Customisation	Data process Data collection On time services	Ability to analyse data Ability to support customisation through tools	Digital tools
Transparency	Raw materials Packaging Processes	New technologies Regulations and standards	Design for sustainability Be open and how to bring awareness

3. Existing Initiatives (Projects/strategies/documents/tools)

- Identification of projects and documents at national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 on the adoption of new working methodologies in the Advanced Textiles industry.

Industry	
Country	Greece
Partner name	CRETHIDEV
1. Identification of projects and documents at national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 on the adoption of new working methodologies in **industry.** □ Target application areas of the producers of textile materials in your country □ Specific needs at the level of the most emerging skills that result in occupations that will best respond in the short and medium term to the market needs. □ Areas of knowledge development for new cross-cutting knowledge and business models	
Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	http://yfatronic.physics.auth.gr/ Professor S. Logothetidis, PROJECT COORDINATOR Lab for Thin Films, Nanosystems & Nanometrology (LTFN) Physics Department, Aristotle University of Thessaloniki, Thessaloniki, 54124, Greece Phone : +30 2310 998174, Fax : +30 2310 998390 logot@auth.gr
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **YFATRONIC – Development of Integrated Flexible Textile & Electronic Products (National funding)** Project Duration: December 2010 - December 2013 The main idea of YFATRONIC was the technology development for the integration of flexible organic photovoltaic devices onto textile products (e.g. textiles for tents, clothing etc.) and the design of the appropriate electronic circuits which will support OPVs for the charging of external portable electronics devices. The know-how acquired from this project will be the base for the integration of other kind flexible electronic devices onto textile products, like sensors, displays, antennas, etc. For the achievement of the above goals YFATRONIC combined all the Greek excellence and know-how in this field.

	The goals of YFATRONIC were: 1. The development of organic photovoltaic devices (OPVs) onto flexible substrates (polyester films, polyester textiles) by printing techniques which will be characterized by significant operational stability, long lifetime (1-2 years), high efficiency (4-5%) and the their flexible use on textile products (e.g. clothes). 2. The development of electronic circuits which will drive the OPV devices for the utilization of the energy produced to charge external portable electronic devices. 3. The integration of OPVs and electrical circuits onto textile products (e.g. clothes, jackets, tents) for the passive production of electric energy from the functional textile and its use for charging portable electronic devices (mobile phones, MP3 players, electronic book, etc). 4. The exploitation and transfer of the results for further research on the field for the integration of other flexible electronic devices onto textiles, such as sensors, biosensors, flexible displays, antennas, etc.

Industry	
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2. Identification of projects and documents at national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 on the adoption of new working methodologies in **industry.** □ Target application areas of the producers of textile materials in your country □ Specific needs at the level of the most emerging skills that result in occupations that will best respond in the short and medium term to the market needs. □ Areas of knowledge development for new cross-cutting knowledge and business models	
Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	https://hacktex.eu/
Relevant information:	Please explain when was conducted, the target group, and the main results achieved. Duration of the project: 01/11/2021 – 01/05/2024

	ERASMUS+ HACKTEX project aims at developing innovative pedagogical tools to improve the skills of engineering students on higher education in relation to innovation and, particularly, in the field of smart textiles. The Project raises a proposal that is oriented to the reassessment of the sector dynamics by enhancing and targeting the skills of the future workforce generations, producing competitive products, developing the 4.0 industry and giving to the sector adaptability to external inputs and demands… in conclusion, endow the textile industry with resilience starting from the beginning of its value chain: the students' education and training. Deepening in smart textiles and matching the science field with new technologies and the textile sector, means giving a renewed potential, a consolidated competitivity and an important green component to the European textile industry.

Industry	
Country	
Partner name	
3. Identification of projects and documents at national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 on the adoption of new working methodologies in **industry.** □ Target application areas of the producers of textile materials in your country □ Specific needs at the level of the most emerging skills that result in occupations that will best respond in the short and medium term to the market needs. □ Areas of knowledge development for new cross-cutting knowledge and business models	
Typology of resource	□ Strategy □ Project □ Report, study □ Other - Financial Instrument
Website, link, contact:	https://www.espa.gr/el/Pages/programs_21-27.aspx http://21-27.antagonistikotita.gr/enisxush-epixeirimatikothtas-antagwnistikothtas/
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **Partnership Agreement for Regional Development (ESPA) 2021-2027:** **The shift of production to environmentally friendly processes and the support of SMEs for their digital transformation are two main areas where the Greek national development policy focuses on. In this framework Greece has set up**

	the "Competitiveness" Operational Programme 2021-2027, which is the principal financial instrument to support research and innovation during this Programming Period. (National and European Funding of 3,9 billion euro) for: a) The support of research and innovation (773 million euro) b) The support of enterpreneurship and competitivenss (1584 million euro) c) Improvement of companies' access to funding (921 million euro) d) Development of Human Capital (531 million euro) Its objective is to connect research and innovation with entrepreneurship and enhancing national and regional advantages and alignment with EU policies on digital and green transformation. Specific objectives of the programme are: • The strengthening of research and innovation capabilities and of the utilization of advanced technologies • The development of skills for smart specialization, for the industrial transition and for entrepreneurship • The exploitation of the benefits of digitalization for businesses (eg development of digital innovations) • The strengthening of sustainable development and competitiveness of SMEs and the creation of jobs in SMEs, including productive investment (eg. Adaptation / modernization of the production process with emphasis in the green transition) • The promotion of adaptation of workers, businesses and entrepreneurs in change (eg the Upskilling or reskilling of professionals, training, certification knowledge, skills and professional qualifications of workers based on modern recognized standards or reskilling-upskilling of workers in green transition skills) <u>Strengthening of Research and Innovation</u> The promotion of research and innovation is fully aligned with the country's strategy to place innovation at the heart of a sustainable and resilient recovery from the pandemic, to accelerate the green and digital transition and ensure Greece's technological development. Accordingly, human resources need to develop the required skills to support upgraded business activity across all sectors. <u>Enhancing Entrepreneurship and Competitiveness</u> At the heart of the national development policy is the upgrading, expansion and shift of the production base to environmentally friendly processes, the enlargement of the manufacturing sector, the interconnection with international markets as well as support for the digital transformation of Greek small and medium enterprises so that they can face international challenges and remain competitive. <u>Development of Human Capital</u> The human capital of enterpreneurship will be supported through the development of SMEs and very small enterprises and priority will be given to innovative business ideas aiming to the creation of sustainable jobs that will contribute to the adaptation of companies to the new requirements.

	Small and Medium Size Enterprises The main aim is to improve the position of Greek production in the international markets, through the operational flexibility and performance of businesses, faster production speeds and the organization of partnerships and new business models in smart value chains based on environmentally friendly processes and products.

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4. Identification of projects and documents at national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 on the adoption of new working methodologies in **industry.** □ Target application areas of the producers of textile materials in your country □ Specific needs at the level of the most emerging skills that result in occupations that will best respond in the short and medium term to the market needs. □ Areas of knowledge development for new cross-cutting knowledge and business models	
Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	General Secretariat for Research and Innovation (GSRI). https://gsri.gov.gr/en/research-innovation-strategy-for-smart-specialization-ris3/
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **Research & Innovation Strategy for Smart Specialization (RIS3)** Developing a Research and Innovation Strategy for Smart Specialization (RIS3) was among the conditionalities for securing funding for research and innovation actions under the 2014-2020 Partnership Agreement (PA). At national level, the GSRI was responsible for defining the 2014-2020 RIS3 which was approved by the Greek government in 2015. For the 2021-2027 Programming Period, the new national Smart Specialization Strategy is a comprehensive economic transformation agenda in conformity with the European Structural Funds Policy objective 1 (PO1): "A smarter Europe – innovative & smart economic transformation". PO1 specific objectives include: • enhancing research and innovation capacities and the uptake of advanced technologies;

	• reaping the benefits of digitization for citizens, companies and governments; • enhancing growth & competitiveness of SMEs; • developing skills for smart specialization, industrial transition and entrepreneurship. In order to formulate the new Strategy, it is imperative that all co-competent ministries and departments cooperate closely; to this end, in line with the Ministry of Development and Investments' mandate, the General Secretariat for Research and Innovation cooperates with the General Secretariat for Industry, under the coordination of the General Secretariat of Public Investment and NSRF. 2. THE METHODOLOGY USED FOR DEVELOPING THE STRATEGY CONSISTS IN: Identifying dynamic thematic areas or sectors expected to contribute to the country's growth; Specifying the thematic areas/sectors and identifying (together with the business sector and the research community) activities which, capitalizing on Research, Technology and Innovation, can facilitate structural change (e.g. modernization, differentiation and transition etc.) in enterprises of the sector concerned, and improve their competitiveness; Highlighting the critical research areas/technologies (and appropriate policy tools) that should be included in the national RTDI strategy, taking into account the regional strategies developed by each Region. At regional level, Greek regions and local communities are expected to identify, structure and make optimal use of their competitive advantages, support innovation and concentrate investments, in order to achieve the intended transformation of local economies through engagement of stakeholders in all stages. This is the so-called entrepreunerial discovery process, a bottom-up approach focusing on enterprises identifying new, innovative activities and the relevant technology needs.

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	https://greece20.gov.gr/wp-content/uploads/2021/07/NRRP_Greece_2_0_English.pdf
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **Greece 2.0: Greece's Recovery and Resilience Plan** contains a comprehensive and coherent set of reforms and investments, structured into four (4) pillars: a) Green transitions, b) Digital transformation, c) Employment, skills, and social cohesion and d) Private investment and transformation of the economy The investements and reforms include among others: for Digital transformation • The digital transformation of small and medium enterprises via procurement of equipment, cloud services and on-line services, such as modern technologies of electronic payment, work from home, digital office etc. for Employment, skills and social cohesion • Additional skilling, up-skilling and reskilling programmes boosting employment, with an emphasis on green and digital skills • Reform of the Vocational Education Training and Apprenticeship system • Reforms and investments promoting the performance of Greek Universities in research and innovation, private sector sponsored research programmes, and the quality of education offered to students, in terms of skills and relevance to the labour market

	• The digital transformation of education in terms of curriculum, infrastructure and services Private investment and transformation of the economy • Establishment of new, next-generation industrial parks and acceleration of smart manufacturing

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify) Programme (national/European funding)
Website, link, contact:	https://greece20.gov.gr/?calls=exypni-metapoiisi
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **Smart Manufacturing Programme** aiming at the modernization and improvement of the resilience of the main sectors of the Greek economy Target groups: very small, small and medium sized enterprises. Budget: €73.227.620,00 Investment projects of very small, small and medium-sized enterprises of the Greek industrial ecosystem are subsidized to strengthen their technological infrastructure and upgrade their manufacturing equipment using smart cutting-edge technologies with low environmental impact. Investment plans should aim to improve business resilience through upgrading digital production management and control systems, procurement of advanced and digitally controlled industrial equipment, digitization of interconnection

	systems throughout the supply chain, and production systems and technology that support digital transformation. Indicative interventions that can be implemented, concern: digitalization of production lines using Industry 4.0 technologies, automation and interconnection of supply chains, design and production of smart products and services, application of Smart Manufacturing technologies

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	https://gsri.gov.gr/en/tomeis/final-proposals-for-thematic-interventions-and-research-and-innovation-priorities-of-the-sector-november-2021/
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* The **Greek National Strategy for Research, Technological Development and Innovation (National RTDI Strategy)** sets out the country's strategy in the sectors of basic and applied research, technology and innovation in Greece.. The General Secretariat for Research and Innovation (GSRI) is the lead coordinating institution for developing the National RTDI Strategy. In this context, it conducts extensive consultations and closely cooperates with co-competent Ministries, the NCRTI, as well as with scientific community, business sector and social and economic partner representatives. The areas of intervention of „Materials, constructions and manufacturing" priority sector of the National RTDI Strategy for 2021-2027, include many areas of intervention relevant to advanced materials and innovative production processes such as „Processes, Equipment & Systems for the transition to a digitalized industrial production", „Materials, Processes, Devices and Production Systems for

	Circular Economy & Industrial Symbiosis", „Materials, Devices and Technologies for Health Applications", „Surface Treatment Materials, Coatings, Technologies", „Raw Materials, Industrial Materials, Packaging, Mass Consumption products – Production Processes" and „Nanotechnology, nanoelectronics, photonics".

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	http://nanorganic.physics.auth.gr/index.html
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* **NanOrganic – Development of Nonostructured Organic & Inorganic materials and Thin Films for the Production of Organic Electronic Devices** The main idea of **NanOrganic project** was to create a full organic electronic technology which includes: a) the development of advanced organic semiconductors (polymers and small molecules), transparent electrodes and nano-structural barrier materials with printing techniques and vacuum, characterized by improved properties (optical, electrical, structural) and morphology, by determining the chemical microstructure, b) the combination of printing technologies and vacuum for the development of organic electronic devices such as a hard and flexible substrates such as organic photovoltaics (OPVs) and organic circuits (Organic Thin Film Transistor-OTFT) under NanOrganic c) the compatibility of materials and technical development processes scale and low cost (large-scale, low-cost) for direct application in industrial scale to

	manufacture electronic devices on polymeric substrates. To achieve these objectives, the NanOrganic combines all the Greek excellence and expertise in this area. The technology developed in NanOrganic can be used beyond the scope of the project, to produce a variety of other organic electronic devices such as sensors, OLEDs, RFIDs, etc., or more complex electronic devices and systems. Duration: December 2010 – December 2013 Funding: NanOrganic was funded by the NATIONAL ACTION: COOPERATION» SUB-ACTION I:«Small Scale Cooperative Projects»

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	https://imegsevee.gr/ Gavroglou S., Kotsios V., "Skills – Myths & Reality", 2021
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* In Greece, in most sectors, proportionally fewer people are employed in high-skilled positions than the average of the Eurozone countries, with the exception of two sectors, Education and Health, where in Greece proportionally more people are employed in high-skilled positions Greece lags behind most Eurozone countries in the proportion of high-skilled jobs. In Greece, 32% of jobs are in high-skilled occupations, while the average of the Eurozone countries is 44%. Medium-skilled jobs in Greece constitute 61% of total employment, while in the Eurozone 47%.

	In the Manufacturing sector, Greece presents a proportion of high-skill jobs that does not exceed 19%, while in the Eurozone this ratio is 34%.

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Typology of resource	□ Strategy □ Project □ Report, study □ Other (please, specify)
Website, link, contact:	Savvidou Aspasia, "Business Strategies in Clothing And Textile Industry in Greece", master thesis, 2021, University of the Aegean, Greece https://hellanicus.lib.aegean.gr/handle/11610/24316
Relevant information:	*Please explain when was conducted, the target group, and the main results achieved.* The study suggests the following indicative support measures for the sector of textile/clothing industry: • Promotion of modern technologies and innovations through subsidised programmes • Employment of specialized and well-trained staff • Training and specialization support, both from university programs and from human resources seminars • Strategy for research and innovation and development practices, pioneering work in the design of clothing and textiles • Use of high technology in production • Implementation of environmental policies and production techniques

4. Impact of the Green, Digital and Smart processes in the industry

- What does innovation relevant to green mean for companies and where is innovation in the processes implemented? What target impacts need to be achieved?

For many companies in the local market, innovation is seen and developed through technologies used for minimising costs. For example, all of the companies that participated in the living labs, mentioned that the digitization of their activities, i.e. the 3D technologies, have decreased waste, time spent in the product development, and have been implemented in most of their stages. Another example given by one company was the laser cutting technology used for minimising the waste of garments.
A very strong variable for green activities is the use of fabrics which are organic, and this is a fact that most of the companies base their identity on. 3quarters, is a sustainable brand that produces accessories (bags and backpacks) using only vegan leather and instead of fabrics, they buy textile remnants from companies that produce balcony tents. Because the production of balcony tents is huge in Greece, the companies that have leftovers, they usually discarded them, and the two founders of 3quarters are now buying these remnants and use them solely in their production.
Essentially companies mentioned that all processes associated with reducing and saving resources are considered essential and sources of innovation. Due to the low production in the textile industry, local brands are trying to save up starting from small sustainable steps. Another important issue that brands raised, was the training of their staff and/or the selection of already aware people in regard to green activities.

- What does innovation relevant to smart mean for companies and where is innovation in the processes implemented? What target impacts need to be achieved?

For most companies there was correlation of the smart and green, mentioning that nowadays being green means also being smart in their product development.
For example, one company mentioned that their laser cutting method, which is initially meant for decreasing the waste, therefore being green, has led to faster production processes, which means being smart.

- What does innovation relevant to digital mean for companies and where is innovation in the processes implemented? What target impacts need to be achieved?

The turn to digital means for most companies, the technological growth and innovation in their activities. From 2D patterns to 3D patterns, 3D cutting and 3D printing, to digital advertisement and e-shops, were the things that were mentioned from companies as digital transformation and innovation. Another important factor of turning digital, was the choice given to consumers, into customisable products, which was also mentioned as being green as well.

Another company presented a point of turning digital, the fact of 3D presentation of its products in its homepage.

4.1.1 Green

Table 4. Green

Technology/innovation/changes	Level of importance	State of art of the innovation/technology/changes	Processes impacted by the technology and how	Solutions adopted or planned to face the changes
Urban textile remnants repurposing	High	3QUARTERS is an innovative circular brand from Athens, Greece. The company addresses the textile waste problem by creating one-of-a-kind products from waste or deadstock urban fabrics. They employ a fully circular and zero-waste policy throughout its business model.	The company works only with local leftover, deadstock or waste textiles, focusing on synthetic fabrics. More specifically, the company works with synthetic fabrics from Athens, calculating more than 300 tonnes annually of these fabrics' remnants and having already processed more than 3 tonnes keeping a fast growing capacity. The production is kept in house and applied 100% zero waste policy. The company also keeps and repurposes its products without throwing any waste including offcuts, spent threads and other waste. The trims of the products are of no virgin plastic, the accessories are from	The people working in the company follow individually and as a team a sustainable based thinking, focusing on the LCA of their products. By trying to follow the products even after the purchase, the company has managed to create a zero waste policy and expands into bringing awareness to the market from advertisements to participating in conferences regarding leading sustainable oaths in the local production and market. The company has already managed to process and repurpose more than 3 tonnes of urban textile waste and aims to lead the

			recycled materials and the raw materials follow strictly the higher standards of sustainability.	path into expanding the ideas of further repurposing of the remnants. Also the company participates in collaborations and aims to create more, with various industries and elite institutions in creating value from waste.
Sustainable and zero waste production	High	Most of the companies addressed this as a major issue and the set of their basis for their activities in order to follow respective strategies. A sustainable growth is depicted on product development processes, raw materials to be organic, supporting local communities and minorities as well as maintaining a transparent activity.	The companies use organic products. Support local communities and production. They have digitised many steps of the product development for faster and less wasteful production.	By supporting only local products, to ensuring that the product they are using follow the regulations of a sustainable based thinking, the local companies struggle and have large costs to cover.
New technologies	High	An innovative technology used by company Cutcutuur, is that of laser cut garments, aiming to minimise waste.	The company base its production on laser cutting patterns, but also for making designs that would be difficult to make by hand and would bring more waste to the production. With this way, the process also requires lesser amounts of sewing.	The knowledge around the processes of laser cutting is low in the local market and it is difficult to find people who understand and are able to work in this sector, while having a background in garment making.
International and national projects participation	High	During the CLEANTEX project, which focuses on circular economy in the textile industry, the company of 3quarters participated in the main	During the research stage of the project, the company participated and	All companies mentioned the lack of resources as main cause of

		research regarding the local market and provided also with information of its activities for the handbook of the project. They considered it an opportunity to spread the word in order to intrigue ideas that some might have towards a more sustainable based thinking. Moreover, than international projects, companies participate also in national conferences and actions, such as the "Crafting the future" by Onassis Stegi, a cultural institution based in the capital. Another action regarding a greener future for the Greek market is "Sustainability: The future is now" which was organised by the American College of Greece alongside Chatzigakis Foundation and hosted many greek brands to talk about their own green actions and exchange ideas with the audience. The main focus was to emphasise on small and medium-sized enterprises of the fashion industry and talk about other environmental issues.	had a main part into realising the barriers in the Greek market, regarding the knowledge around sustainability and how to act on it. Also, the company mentioned the lack of education and incentives for industries dealing with textiles to repurpose their waste. Most do not even understand the need to deal with fabric waste and the real impact of it. It is extremely challenging to communicate and consequently acquire old fabrics. All in all, what they referred to as important is that the greek market is yet too young and short in resources in order to support new technologies and still has a lot to learn.	the faded industry of textile Greece. A whole new remodelling should be considered as a solution as well as the start of collaborations between the HEIs, VETs and companies of the industry is very important. However this should not stop there, and companies should also start to invest in greener and smarter technologies. The funding is a big issue for SMEs but not so much for the larger scale enterprises.
Clean energy commitment	High	The local company Siamidis, which produces military, law enforcement and firefighting accessories equipment and garments, is committed to having a clean energy.	By using solar panel installations in the area of the main production, they operate three solar	Solutions in energy has been a barrier for small and medium-sized enterprises due to costs. However,

			energy installations with a total capacity of 2.1 MW. Therefore, the annual consumption of their energy is less than 0.5M KWh and the green activity is equivalent to 3.6M m^2 of forest. The total operation of the solar panel system	larger production companies are already finding ways and invest in greener processes.

4.1.2 Digital

Table 5. Digital

Technology/innovation/changes	Level of importance	State of art of the innovation/technology/changes	Processes impacted by the technology and how	Solutions adopted or planned to face the changes
Digital advertisements and eshops	High	All have stated that funding digital advertisements and holding an e-shop can be more profitable than the physical store.	A very specific comment was that e-shops have been more and more profitable, and especially during sale seasons. Moreover, the distribution of the companies' identity and products through online platforms of sustainable based content, bring awareness to the market.	Had to train staff or hire younger people for specific positions, who would know useful channels and tools.

3D design and pattern	High	All companies use the method of digital design and pattern creation in the supply chains.	Faster processes and lesser time. Also, the digital methods have reduced drastically the waste from several stages of the supply chain. A barrier that is soon to be overcome is the lack of knowledge or the limited amount of it.	Creating new channels and finding new collaborators who can support the new processes.

4.1.3 Smart

Throughout the meet ups, all companies correlated the digital and green transmissions into being smart and there was no significant deviation between those three.

5. Initial and further education on advanced textiles

- Identification of strategies, documents, programmes, tools (i.e. systems of qualification, educational platforms, …), projects at EU, national and regional level with a focus on the advanced materials targeted on green, smart, digital knowledge and impact of COVID 19 in the area of education in VET and HEI

The pandemic of COVID-19 and later on the war in Ukraine, have affected Greece and it resources of energy and electricity, by bringing high rise in prices making most of the SMEs in the market to turn their focus on cost-effective activities. However most notable work and projects performed are:

1. **YFATRONIC – Development of Integrated Flexible Textile & Electronic Products (National funding)**

Project Duration: December 2010 - December 2013

The main idea of YFATRONIC was the technology development for the integration of flexible organic photovoltaic devices onto textile products (e.g. textiles for tents, clothing etc.) and the design of the appropriate electronic circuits which will support OPVs for the charging of external portable electronics devices. The know-how acquired from this project will be the base for the integration of other kind flexible electronic devices onto textile products, like sensors, displays, antennas, etc. For the achievement of the above goals YFATRONIC combined all the Greek excellence and know-how in this field.

The goals of YFATRONIC were:

1. The development of organic photovoltaic devices (OPVs) onto flexible substrates (polyester films, polyester textiles) by printing techniques which will be characterized by significant operational stability, long lifetime (1-2 years), high efficiency (4-5%) and the their flexible use on textile products (e.g. clothes).

2. The development of electronic circuits which will drive the OPV devices for the utilization of the energy produced to charge external portable electronic devices.

3. The integration of OPVs and electrical circuits onto textile products (e.g. clothes, jackets, tents) for the passive production of electric energy from the functional textile and its use for charging portable electronic devices (mobile phones, MP3 players, electronic book, etc).

4. The exploitation and transfer of the results for further research on the field for the integration of other flexible electronic devices onto textiles, such as sensors, biosensors, flexible displays, antennas, etc.

2. **Greece 2.0: Greece's Recovery and Resilience Plan** contains a comprehensive and coherent set of reforms and investments, structured into four (4) pillars: a) Green transitions, b) Digital transformation, c) Employment, skills, and social cohesion and d) Private investment and transformation of the economy

The investements and reforms include among others:

<u>for Digital transformation</u>

- The digital transformation of small and medium enterprises via procurement of equipment, cloud services and on-line services, such as modern technologies of electronic payment, work from home, digital office etc.

<u>for Employment, skills and social cohesion</u>

- Additional skilling, up-skilling and reskilling programmes boosting employment, with an emphasis on green and digital skills
- Reform of the Vocational Education Training and Apprenticeship system

- Reforms and investments promoting the performance of Greek Universities in research and innovation, private sector sponsored research programmes, and the quality of education offered to students, in terms of skills and relevance to the labour market
- The digital transformation of education in terms of curriculum, infrastructure and services

Private investment and transformation of the economy

Establishment of new, next-generation industrial parks and acceleration of smart manufacturing

3. NanOrganic – Development of Nonostructured Organic & Inorganic materials and Thin Films for the Production of Organic Electronic Devices

The main idea of **NanOrganic project** was to create a full organic electronic technology which includes:

a) the development of advanced organic semiconductors (polymers and small molecules), transparent electrodes and nano-structural barrier materials with printing techniques and vacuum, characterized by improved properties (optical, electrical, structural) and morphology, by determining the chemical microstructure,

b) the combination of printing technologies and vacuum for the development of organic electronic devices such as a hard and flexible substrates such as organic photovoltaics (OPVs) and organic circuits (Organic Thin Film Transistor-OTFT) under NanOrganic

c) the compatibility of materials and technical development processes scale and low cost (large-scale, low-cost) for direct application in industrial scale to manufacture electronic devices on polymeric substrates. To achieve these objectives, the NanOrganic combines all the Greek excellence and expertise in this area.

The technology developed in NanOrganic can be used beyond the scope of the project, to produce a variety of other organic electronic devices such as sensors, OLEDs, RFIDs, etc., or more complex electronic devices and systems.

Duration: December 2010 – December 2013

Funding: NanOrganic was funded by the NATIONAL ACTION: COOPERATION» SUB-ACTION I:«Small Scale Cooperative Projects».

6. Conclusions

Research showed that the Greek textile industry and especially the advanced textiles sector is very scarce and quite unknown to the audience. Because there not many enterprises that produce locally, there is a very vague amount of information regarding specialisations. Subjects as Artificial intelligence, Advanced textiles, Robotics, Augmented Reality, Metaverse, Internet of Things, etc. do not own grounds in the local industry, and if they do, they are small. However, aside from the digital and smart transitions, the Greek industry is trying to reach out to new ideas and developments, innovations and technologies for holding more sustainable productions, manage their waste accordingly and with the lesser possible impact. On the other hand, SMEs are trying through their resources to and processes to maintain a sustainable future, identity and bring awareness to the market. Some companies focus on their production, other on their customer experience, others on their materials, and others try to combine all and disseminate their actions. However, all companies agreed that a major issue that concerns them all is that of raw materials and to what extent they follow the regulations and ISO standards. In all cases, all companies focus a lot on their transparency.

In the field of digital, there is a lot of input coming from many companies, but they lack in human resources and specialists. 3D design and pattern, digital marketing and CAD software hold major roles in the production, even though there is still lack of human resources who know and are ready for the field.

Another major issue that was addressed in all sessions, is the poor connection between the education and the industry. One is hard to reach the other even if education provides specialties and knowledge on several green, digital and smart subjects. All education institutes insisted that the textile sector is very low in production compared to other EU countries. Even though the institutes educate and research on specific input such as chemical engineering or CAD systems, it is the textile sector that is nowhere near connected to those departments, because of its scarce activity in Greece. One more topic addressed is the general textile education in Greece. The only department in HEI that worked solely on textile, used to be a department itself, but due to political reasons it was submerged under a different department, losing its name, and therefore its communication to future students. Another fact, also in HEIs, is the lack of 3D, AI, education in textile and fashion specifically. There is one department which is slowly trying to grow. On the other hand, VET providers are still learning and trying to keep up with recent technological growth in the sector, but have already started focusing their activities in sustainability, recycling, smart and sustainable based thinking, etc.