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## ANALYSIS OF DIGITAL SKILLS IN THE TEXTILE AND CLOTHING INDUSTRY THROUGH E-LEARNING

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### ABSTRACT

The importance of digital skills has drastically increased over the last decades. Also in the Textile and Clothing Industry, numerous software tools improve the efficiency of the work. To make sure that students acquire the necessary digital skills, an Erasmus+ project has been set up. The ICT-Tex project is a Knowledge Alliance aiming to improve the competences in information technology (ICT) for people working in the field of the Textile and Clothing Industry (TCI). This will be done by developing syllabuses that will be provided on an online platform, made available on the project website to all interested parties; The 12 project partners come from all over Europe and join forces by making their expertise available to the project. By the end of 2022 16 courses will be freely accessible. This paper describes the methodology used to develop the content of these courses.

### KEYWORDS

Textile higher education, Information and Communication Technology (ICT), Apparel Design and Production, entrepreneurial skills, digital skills.

### INTRODUCTION

Erasmus+ Knowledge Alliances are transnational and result-driven activities between higher education institutions and businesses aiming to strengthen Europe's innovation capacity and foster innovation in higher education [1]. The ICT-TEX project is part of this programme and is a cooperation between 12 partners geographically spread over Europe [2], forming a balanced group of universities (5), companies (4), and non-profit organizations (3). The Project is coordinated by the **Technical University of Sofia**, Department of Textile Engineering (Bulgaria). The other project partners are **Sofia University**, Faculty of Mathematics and Informatics (Bulgaria), **Ghent University**, the Centre for Textile Science and Engineering (Belgium), **Technical University of Dresden**, Institute of Textile Machinery and High Performance Material Technology (Germany), **University of Zagreb**, Faculty of Textile Technology (Croatia); **STOLL**, producer of knitting machines (Germany), **Materially**, International consulting network for innovative and sustainable materials (Italy), **MAK**, company for weaving, knitting and sewing (Bulgaria), **ALMA**, clothing production, and textile trading company (North-Macedonia); **SCIAT**, Specialized Cluster Institute for Apparel and Textiles (Bulgaria), **CIAPE**, Italian Centre for Permanent Learning (Italy), and **AUTEX**, the Association of Universities for Textiles (Belgium). The project started on 1 January 2020 and runs for 3 years. AUTEX [3], as one of the project



partners, can reach out to a large community of textile students in Europe and beyond. Currently, 38 universities are members of the AUTEX Association.

The structure of this paper is as follows: the next section briefly presents the approach, Section 3 discusses the findings and results of the work and Section 4 concludes the paper.

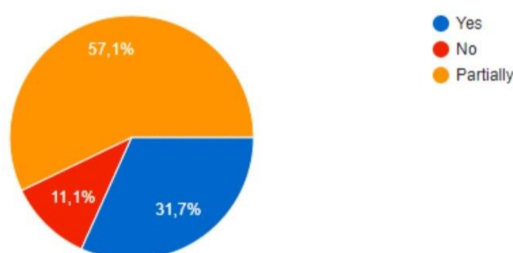
## MATERIALS AND METHODS

The project responds to a need from the textile industry, especially employees who work with CAD<sup>1</sup>, CAM<sup>2</sup>, CAE<sup>3</sup>, and PLM<sup>4</sup> systems, that require a higher level of ICT skills of their employees. The curriculum of "Information Technology in Design of Textile and Clothing", which is to be created, aims precisely at providing knowledge and skills for engineering design and production of textiles and clothing on programmable machines, and to improve transversal ICT and entrepreneurial skills. For the curriculum to be as responsive as possible to the requirements of the Textile and Clothing Industry, the project supported the development of a survey as a preliminary needs analysis among European companies. Also, to better understand the educational needs, the current situation had to be mapped. This was performed by doing field research and a gap analysis. The long-term experience of the partners in the training of specialists (in the field of textiles, ICT, and Entrepreneurship) and the results of the survey allow for the development of a curriculum, the content of which will be in line with the requirements of the business.

## RESULTS AND DISCUSSION

As a result of the performed Gap Analysis and Mapping of the digital and entrepreneurial needs, the specific topics of the courses were defined. From the survey performed, 63 people from the Textile and Clothing Industry replied, of which 66.7% currently use CAD systems, 38.1% use CAM systems, 31.7% use ERP<sup>5</sup> and 30.2% use PPC<sup>6</sup>. However, 22.2% of the companies showed not to use computerised systems.

Concerning the ICT skills, 32% of the companies believe their employees have the needed competencies, while 57% think they only have partially the required skills, with most companies (48%) assigning themselves to have an average integration of ICT in their processes (Fig. 1). On the other hand, only 20.7% of the respondents consider the level of integration of ICT in their company is below average (Fig. 2).



**Figure 1.** Extract from the survey. Question: *“Do you think your company employees have the competencies needed to introduce these kinds of technologies?”*

<sup>1</sup> CAD Computer Aided Design

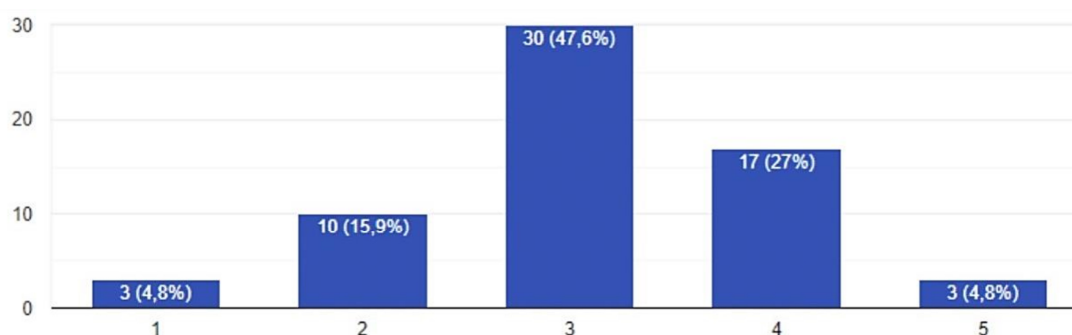
<sup>2</sup> CAM Computer Aided Manufacturing

<sup>3</sup> CAE Computer Aided Engineering

<sup>4</sup> PLM Product Lifecycle Management

<sup>5</sup> ERP Enterprise Resource Planning

<sup>6</sup> PPC Production Planning and Control



**Figure 2.** Extract from the survey. Question: “How high is the level of integration of ICT in your company?”

Among the key findings on the needs for ICT and digital skills in these companies are:

- Knowledge and ability to apply and manage: Radio Frequency ID (RFID) tasks, sensors and Internet of Things coupled with new software, Augmented Virtual Reality (AVR), Block chain and Artificial Intelligence.
- Ability to use ERP systems to better manage production planning and control, supply chain, logistics, costumers' relationships, workloads and work distribution, environmental impact, quality.
- Ability to use advanced design software, i.e., software able to detect contours and body shapes for tailor-made designs.
- Ability to use specialised software and analyse big data to study current market trends and predict the future ones.
- Ability to use marketing techniques and tools to better target specific consumer categories and groups.
- Ability to use social media to engage and interact with customers and influence their buying behaviour.

The full report with detailed results of the survey is available on the project website [4].

Based on these findings, ICT-TEX courses are developed. The courses are structured within eight different modules, corresponding with major textile subareas: Design and Production of Knitwear; Design and Production of Woven Fabrics; Apparel Design and Production; Design and Production of Technical and Smart Textiles; Industrial Engineering, Quality Control and Management; Finishing, Printing and Functionalization; Digital Skills and Entrepreneurship. For each of the courses within these modules, clear course objectives and learning outcomes (in terms of knowledge, skills, and responsibilities) were defined. The courses are made available on the ICT-TEX web platform, that has been developed on top of the well-known Moodle™ [5] open-source management platform. It is user-friendly and flexible in its use to implement learning material and offers many possibilities for interactivity. This way, all courses will be available for online study, via both the ICT-TEX and the AUTEX websites.

Currently, five pilot courses are ready and online available for the public: Entrepreneurship in TCI, Digital Skills, 2D CAD Pattern Making, 3D CAD Simulations, and Apparel Production. The latter three courses are part of the module Apparel Design and Production. This elaborated study material will be tested for its applicability with students, teachers, and staff during pilot training sessions to give feedback and improve the material and tools.

These pilot courses are described in a little more detail in the following paragraphs.

## **1 Module on Entrepreneurship in TCI**

This course focusses on basic and practical knowledge that is needed when starting, managing, and growing a business in the textile and clothing industry. The student will obtain a deeper understanding of topics such as market analysis, project management and planning, financial management, and network building.

## **2 Module on Digital Skills**

The purpose of this course is to improve the digital skills of the participant to become more professional and competitive. The course has two levels: one with the more basic concepts such as text formatting of electronic tables and a more advanced section that deals with, amongst others, Artificial Intelligence and Machine Learning.

## **3 Module on Apparel Design and Production**

### **3.1 2D CAD Pattern Making**

This course is a knowledge-intensive and creative course that will lead learners through different pattern making techniques taking into consideration used materials, colours and style combinations. Specialised CAD software such as AccuMark by Gerber Technology and Modaris by Lectra are part of the course material. Also, modelling techniques and algorithms for pattern making are part of the topics.

### **3.2 3D CAD Simulations**

Three-dimensional virtual prototyping is becoming increasingly important, also for apparel design. Not only does virtual product development enable a faster way of working, but it also allows garment designs with higher accuracy of cloth fitting. During the course, participants are taught to create their virtual garments by using specific software such as CLO3D.

### **3.3 Apparel Production**

Automated equipment and IT solutions are most important for a garment industry that is working with very short fashion cycles. These automations are in practice in various steps of apparel production, include sewing, spreading, cutting, welding, material management, and CAD/CAM for pattern making. These technologies facilitate garment producers to be more productive and cost-effective. This course trains the participant to achieve the required technical skills.

## **CONCLUSION**

The ICT-TEX project aims to fulfil the need to update and improve knowledge and skills in Information and Communication Technology (ICT) of employers and employees in the Textile and Clothing Industry so that the European textile industry can maintain its leading position. Therefore, curricula and syllabuses are being developed within the ICT-TEX project and made openly available on the project website for any professional in the Textile and Clothing Industry needing to improve his/her skills, more specifically in one of the eight topics worked on in this project. During the year 2021, pilot courses become available, but most of the courses will come out on a Moodle™ platform in the year 2022.

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