

SMART TEXTILES: THE NEED FOR "STEM EDUCATION" IN ROMANIA

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REZUMAT. Producția de textile inteligente este în zilele noastre o realitate datorită legăturilor de succes dintre tehnologia textilă tradițională cu știința, tehnologia, ingineria și matematica. În acest sens, resursele umane din cadrul companiilor textile cu un mediu de lucru inovator trebuie să fie îmbunătățite pentru lucrătorii profesioniști calificați, pentru a concura pe piața mondială. Pentru accesul pe piața muncii în acest domeniu, trebuie să apară și modificări ale modului de educare a tinerilor. În cadrul proiectului Erasmus + Skills4Smartex, a fost lansat un sondaj la nivelul consorțiului, pentru 60 de companii textile europene extrem de competitive, cu 21 de organizații respondente din România. Scopul acestei lucrări este de a prezenta principalele rezultate obținute în urma unei analize a sondajului adresat companiilor textile românești care vizează producerea de textile inteligente.

Cuvinte cheie: Textile inteligente; Educație STEM; Educație și formare profesională; Proiect Erasmus.

ABSTRACT. The production of smart textiles is nowadays a reality due to successful links between traditional textiles technology with science, technology, engineering, and mathematics. In this respect, human resources within textile companies with an innovative medium of working, require to be improved for skilled professional workers, to compete on the global market. As a result, for access to the labour market in this field, changes in the way of educating young people must also occur. Within the Skills4Smartex Erasmus + project, a survey was launched by the consortium, for 60 European highly competitive textile companies, including 21 organizations as respondents from Romania. The goal of this paper is to present the main outcomes achieved after an overall analysis of the survey applied to Romanian textile companies, aimed to produce smart textiles.

Keywords: Smart textiles; STEM education; Vocational Education and Training; Erasmus project.

1. INTRODUCTION

Nowadays, the progress in textile field involve technical textiles and moreover, the smart textiles topics of interest due to the growing recognition of their economic and strategic potential for textile field thought is not about single and coherent industry sector, nor the market but with an relevant impact upon entire human economic and social life/1/. In the literature there is an agreement about the technical textiles' definition: "textile materials and products manufactured primarily for their technical and performance properties rather than their aesthetic or decorative characteristics" [1].

The next level of development from the technical textiles goes to the smart textile goods. An agreed definition of the smart textiles is that they are intelligent textile structures that can sense and react to environmental stimuli (i.e. mechanical, thermal, chemical, biological, and magnetic, etc.) According

to the literature, the smart textiles were designed to include technologies that provide the wearer with increased functionality. Consequently, the global markets reacted positively, and the innovative solutions are expected to grow constantly so the manufacturing in this nice. The production of smart textiles is nowadays a reality after successful links between traditional or technical textiles and clothing technology with other branches of science (i.e. material science, structural mechanics, sensor, advance processing technology, communication, artificial intelligence, biology, etc.) [1, 2, 3].

In this regard, human resources as employees within the textile companies with an innovative medium of working require to be improved. When the smart textiles come in the company's product portfolio is mandatory to continuously develop the quality of human resources for skilled professional workers, in order to compete on the global market.

As a result, for access to the labour market in this field, changes in the way of educating young people must also occur. The quality of Vocational Education and Training in technical fields at European level means competitiveness leverage in the international context so, it is imperative for VET learners to benefit from proper training, which for smart textile field of interest should imply to developed the STEM key competences. The speed-up of technological development is a challenge for the young VET students, while the development of the textile industry needs well prepared specialists in multidisciplinary fields[4,5].

STEM Education is defined as an interdisciplinary approach to learning where students understand and apply science, technology, engineering, and mathematics in real contexts, and the development of smart textiles should be a good topic for them. In this context, Erasmus+ project "Smart textiles for STEM training" aims to improve the knowledge, skills, and employability of VET students by specific education. Promoting STEM Education and the application of technology and multidisciplinary work through smart textiles should empower students to use their creativity and develop their skills.

The paper intends to present the main outcomes achieved after an overall analysis of the survey applied to Romanian textile companies aimed to produce smart textiles.

2. SKILLS4SMARTEX PROJECT FRAMEWORK

With support from the European Commission, the Erasmus+ project "Smart textiles for STEM training" is a strategic partnership, within a consortium of six partners from five European countries (Romania, Belgium, Slovenia, Portugal and Czech Republic), in the field of transfer of innovation from research providers towards textile enterprises & VET schools.

To reach the main outputs of Skills4SmarTex project, was launched from the beginning a survey, from the project consortium, for 60 European highly competitive textile companies, including 21 organizations as respondents from Romania. This was considered a strategy for best practice research and overall, the industry survey collected answers from 63 textile enterprises, as follows: Romania (21 respondents), Portugal (12 respondents), Belgium (10 respondents), Slovenia (10 respondents) and Czech Republic (10 respondents).

The questionnaire was prepared by the project's partners and included 31 multiple answering questions related mostly to the following objectives: analyzing the interest and capacity of textile enterprises to perform technical and smart textiles as pursued in their strategies to reach new market with products of high added value; analyzing the need of STEM education for the adequate skilled professional workers profile accordingly to each company's future strategy regarding the innovative development.

3. ANALYSE OF THE NEED FOR STEM EDUCATION IN ROMANIA

Most of the Romanian companies surveyed activate in Technical Textiles field (40%), followed by Clothing and Fashion (27%), Textiles and Fabrics (20%) and Dyeing/Finishing field (13%). Of these, 80% are medium and large enterprises, with more than 50 employees.

The Romanian companies revealed positive trends in the development of innovation highlighting the links with the sector in which they operate: they have positive expertise in the areas of Products and Technologies with reduced cost (80%), New Products in Niche Markets (55%), and Products with Brands (55%) but, only 35% of them declared that have expertise in the area of Intelligent Communication Systems or Protection Systems. An amount of 40% from the Romanian companies within the group have showed Technical Textiles as the main sector of activity; in addition, another 48 % declared their strategic interest to work for the Technical textiles goods.

In this respect, as questioned, the responded declared that are interested in developing technical textiles, as follows: Mobiltech: 17%, Protech (17%), Sporttech (12%), Medtech (12%), Clothtech (10%), see Fig.3.1. Accordingly, considering the policy about the infrastructure, 67% of the Romanian companies surveyed are considering investing in innovative technologies as a priority, compared to the choice to enlarge the facilities (33%).

Going at the upper level of innovative products, namely the smart textiles topic, 38% within the Romanian companies, declared that have no expertise in creation and/or manufacture of smart textiles.

However, the others declared to have expertise as follows: about 23% related to the "first generation", 8% related to the "second generation", another 23 % have expertise related to the "third generation" and the last 8% of companies have expertise related to the "fourth generation" of smart textiles, see Fig.3.2.

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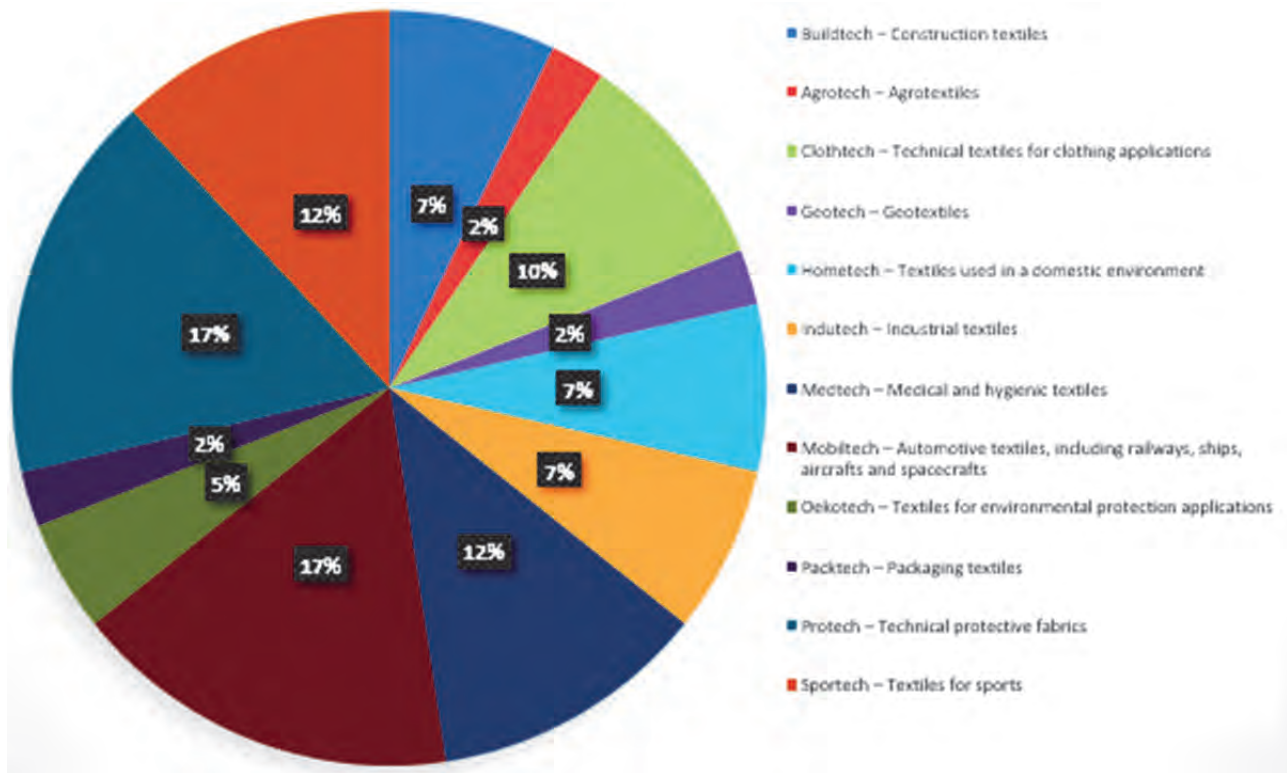


Fig. 3.1. Romanian companies surveyed share of interest in developing technical textiles.

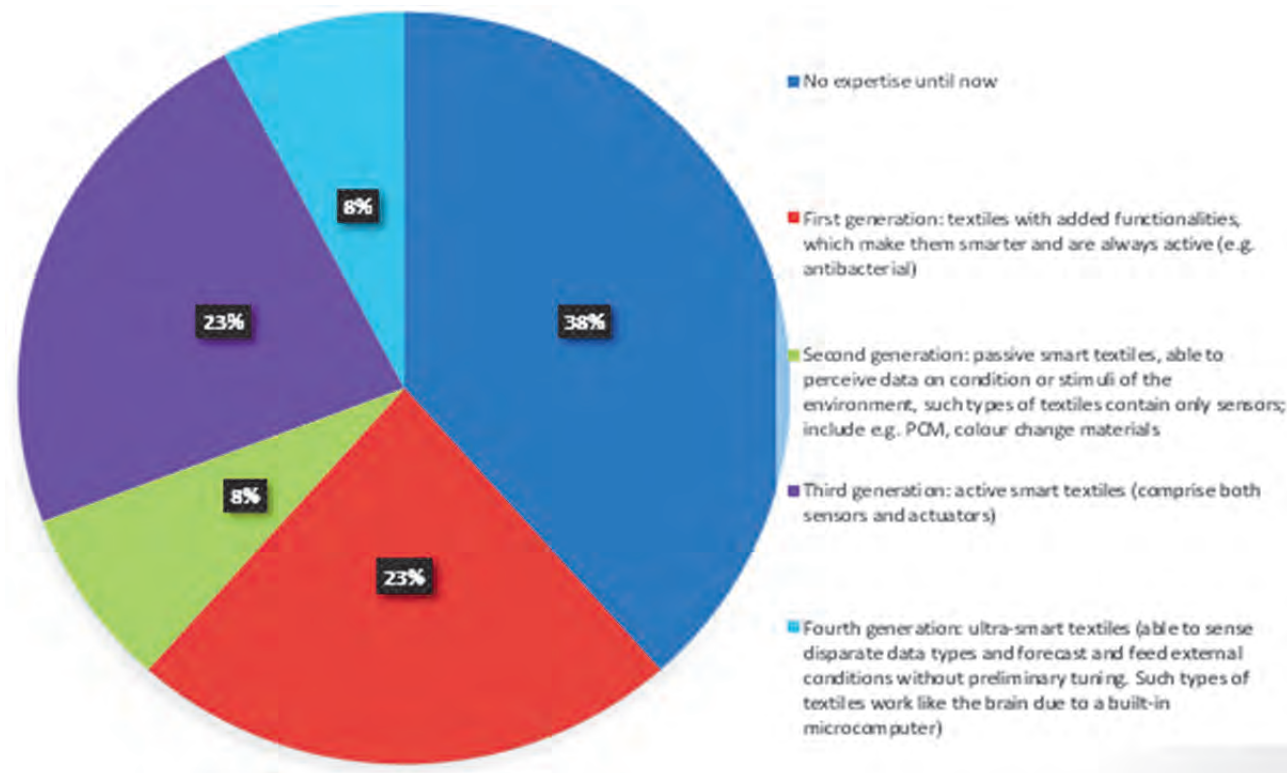


Fig. 3.2. Romanian companies surveyed share on the ability in smart textiles processing.

The Romanian companies surveyed responded that they are interested with a moderate interest, to be involved in smart textile products development of the first generation of smart textiles with following features: conductive thermal / electric (17 % of respondents), water resistant (17 % of res-

pondents), stain resistance (15% of respondents) and UV protection (15% of respondents). A lower share of respondents is willing to join in developing expertise in the second generation of smart textiles with the following features: heat involving (21% of respondents), thermally regulated (18% of

respondents), heat fabric storage (18 % of companies), colour changing fabric (14% of the companies) and fabric with memorizing shape (11% of respondents).

For a mutual understanding of terms regarding the smart textile level of development, the example of an article of clothing was provided within the questionnaire, starting from the “level 0” (the basic article of clothing): the “first generation” (functional with thermal properties or antibacterial functions, etc); the “second generation” (article of clothing with passive smart properties like phase change materials, colour change, etc.); the “third generation”(article of clothing with attached components like sensors for monitoring heart rate, temperature, etc.) and the upper level, the “fourth generation” (article of clothing with embedded components like communication sensors - GPS).The above two situations were alike with the overall interest of the 63 textile companies surveyed within the consortium.

Moreover, the respondents were asked to write down the interest in developing ability in the third generation of smart textiles. They answered that would be interested mainly in smart textiles with the following features: temperature regulation (14% of

companies), heartbeat reading and sweat measurement (14% of the companies for each feature).

Regarding the interest in developing expertise in the fourth generation of smart textile, 40% of the questioned companies have no interest in developing ultra-smart textiles. However, among others, some agreed that they would be interested in developing smart textiles with the following features: interactive wear and wearable computer (20% of companies) and sport jackets (13% of the companies).

In the respect of the above answers and feedback for the consortium project, the companies agreed that among limitation in their growth of turnover, the lack of skilled workers is a relevant issue in the present and unquestionable, in the future. Considering this drawback, the Romanian companies surveyed answered that from the human resources point of view, is strategically important for their future development to involve the staff in the innovation activities. Accordingly, some of the most important human resources strategies, ought to be: involving employees in innovation activities (32%), involving employees in the training courses (22%), the young workforce inclusion (21%) and teamwork improvement (25%) , see Fig. 3.3.



Fig. 3.3. Romanian companies surveyed share of strategic development on the human resources.

Regarding the interest and capacity of Romanian textile enterprises to perform technical and smart textiles as pursued in their strategies to reach new market with products of high added value, the respondents revealed positive trends in the development of innovation highlighting the links with the sector in which they operate. Considering

the policy about the infrastructure, 67% of the Romanian companies surveyed declared that are considering investing in innovative technologies as a priority, compared to the choice to enlarge the facilities (Fig.3.4). This approach was alike with the overall interest of the 63 textile companies surveyed within the consortium.

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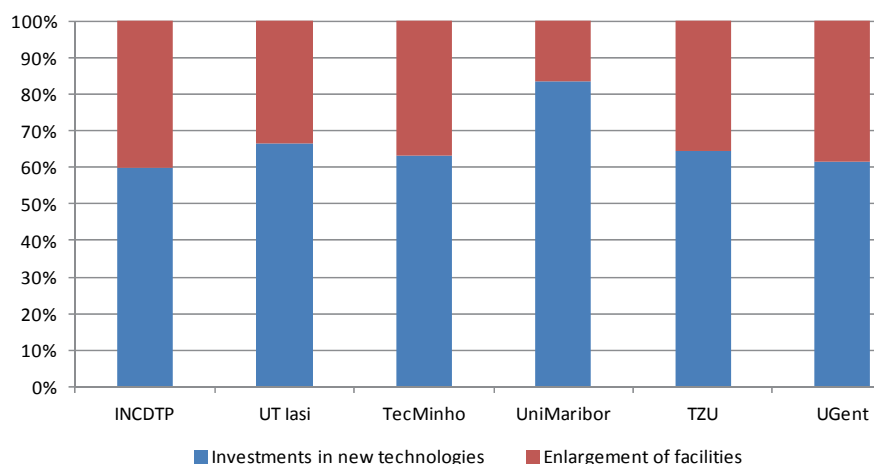


Fig. 3.4. Infrastructure policy of the respondent companies within the project consortium

Questioned about the upper level of innovative products, namely the smart textiles topic, 38% of Romanian companies, declared that have no expertise in creation and/or manufacture smart textiles. The other respondents declared to have expertise as follows: 23% related to the “first generation”, 8% related to the “second generation”, 23% have expertise related to the “third generation” and 8% of companies have expertise related to the “fourth generation” of smart textiles.

5. CONCLUSIONS

The Romanian companies agreed that among limitation in their growth of turnover, the lack of skilled workers is a relevant issue in the present, also unquestionable, in the future. Considering this drawback, the respondents answered that from the human resources point of view, is strategically important for their future development to involve the staff in the innovation activities. Accordingly, there is a need of STEM education for the adequate skilled professional workers profile, so to each company's future strategy regarding the innovative development.

In this respect, the education of VET students as future employees in textile companies, and their involvement in innovation activities were acknowledged as the key of performance for

companies' competitiveness in the specific areas of textiles, namely smart textiles.

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With expertise in the area of Knitting Technologies, CAD Systems, Functional textiles, e-Learning applied in textiles. She is currently the President of Association of the Textile Universities in Europe (AUTEX), President of Romanian Section of the International Federation of Knitting Technologists (IFKT), Chartered Member of Textile Institute of Manchester (Ctext ATI). Dr. Blaga is activating at EU commission, as expert evaluator for Horizon 2020 research programs. She is the head of the Research Center for Materials, Products and Processes from the faculty.

TECHNICAL TEXTILES PRESENT AND FUTURE SYMPOSIUM 2019

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