E-learning for textile enterprises innovation improvement

M Blaga[1], R Harpa[1], I R Radulescu[2], Z Stepjanovic[3]

[1] Gheorghe Asachi Technical University of Iasi, Faculty of Textiles, Leather and Industrial Management, 29 D. Mangeron Street, 700050, Iasi Romania
[2] INCTDP, L. 16, Patrascanu Street, Bucharest, Romania
[3] University of Maribor, Smetanova Ulica 17, Maribor, Slovenia

rodica_harpa@yahoo.com

Abstract.The Erasmus Plus project- TEXMatrix: "Matrix of knowledge for innovation and competitiveness in textile enterprises", financed through the Erasmus+ Programme, Strategic partnerships– KA2 for Vocational Education and Training, aims at spreading the creative and innovative organizational culture inside textile enterprises by transferring and implementing methodologies, tools and concepts for improved training. Five European partners form the project consortium: INCDTP – Bucharest, Romania (coordinator), TecMinho - Portugal, Centrocot - Italy, University Maribor, Slovenia, and "Gheorghe Asachi" Technical University of Iasi, Romania. These will help the textile enterprises involved in the project, to learn how to apply creative thinking in their organizations and how to develop the capacity for innovation and change. The project aims to bridge the gap between textile enterprises need for qualified personnel and the young workforce. It develops an innovative knowledge matrix for the tangible and intangible assets of an enterprise and a benchmarking study, based on which a dedicated software tool will be created. This software tool will aid the decision-making enterprise staff (managers, HR specialists, professionals) as well as the trainees (young employees, students, and scholars) to cope with the new challenges of innovation and competitiveness for the textile field. The purpose of this paper is to present the main objectives and achievements of the project, according to its declared goals, with the focus on the presentation of the knowledge matrix of innovation, which is a powerful instrument for the quantification of the intangible assets of textile enterprises.

1. Introduction

E-learning is a powerful instrument to reach decision-making staff for improving innovation within own enterprise. The e-learning concept can be broadly defined as the use of Internet technologies to create solutions that support and facilitate the teaching, learning and assessment processes.

It is revealed by the specialists, that combining e-learning strategies with face-to-face strategies in a blended learning solution, increases the educational effectiveness when compared to either type of strategy used individually [1].

The design and development of computer-assisted lessons are current requirements of the higher education system. Nowadays, the advantages of teaching by using interactive lectures which contain pictures, photographs, videos, animations, exercises, glossary, tutorials and further readings, are highly recognized [2].

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The e-learning instruments continue to be developed and to be used in teaching textiles technologies, in a modern and efficient style. However, it is assumed and expected that the highest level of knowledge will be reached only by adapting a blended style of lecturing, under tutor guidance.

The complexity of the technical contents imposes such an approach, besides face-to-face teaching, an alternative and complementary method, exploiting so, both way benefits in the student's interest and favour.

2. Need and rationale of the TEXMatrix project

Many textile enterprises face difficulties in finding the best solutions to compete on the global market.

They face the challenge of skill development and innovation without having the focused resources and the strategic vision to adapt to the rapid changes of trends and technology in the textile field. The enterprises need qualified personnel, while the young workforce needs to cope with performance requirements of the enterprises.

The strong competition in the textile industry on an international level imparts better flexibility to the industry as well as investment in education and adaptation of new skills for young textile specialists [3].

3. Project specific objectives

The Erasmus Plus project- TEXMatrix: "Matrix of knowledge for innovation and competitiveness in textile enterprises" is financed through the Erasmus+ Programme, Strategic partnerships– KA2 for Vocational Education and Training, aims at spreading of creative and innovative organizational culture inside textile enterprises by transferring and implementing methodologies, tools and concepts for improved training. Five European partners form the project consortium: INCDTP – Bucharest, Romania (coordinator), TecMinho - Portugal, Centrocot - Italy, University Maribor, Slovenia, and Technical University "Gheorghe Asachi" of Iasi, Romania. These will help the textile enterprises involved in the project, to learn how to apply creative thinking in their organizations and how to develop the capacity for innovation and change.

The project aims to bridge the gap between textile enterprises need for qualified personnel and the young workforce. It develops an innovative knowledge matrix for the tangible and intangible assets of an enterprise and a benchmarking study, based on which a dedicated software tool will be created. This software tool will aid the decision-making enterprise staff (managers, HR specialists, professionals) as well as the trainees (young employees, students, and scholars) to cope with the new challenges of innovation and competitiveness for the textile field.

The TEXMatrix project envisages the following specific objectives:

- Improvement of the innovation capacity and training methodology of textile enterprises with contribution of research providers;
- Delivering key competences both to employers and employees in the textile field;
- Elaborating new forms of practical training schemes and studying of real life cases in textile enterprises;
- Development and implementation of project-based transnational collaboration between enterprises and trainees;
- Development and delivery of new VET training methods, including work-based learning;
- Providing tools and methods for the professional development of VET trainees in textile enterprises.

4. Knowledge matrix of innovation

The focus within this paper is on the presentation of the knowledge matrix of innovation (KMI), which is a powerful instrument for the quantification of the intangible assets of textile enterprises.

Knowledge matrix for innovation quantifies the intangible assets of an enterprise on two dimensions: the horizontal dimension describes the intangible assets from point of view of their target use (existing /envisaged assets) and the vertical dimension presents the assets from point of view of

their nature (innovation strategy; training methodology; relationships portfolio; IPR). Examples of intangible assets of an enterprise are: innovation strategy/culture, informational resources, training methodology, relationships portfolio, IP rights etc. Their identification and improvement for a textile enterprise is of utmost importance for their competitiveness and capacity to implement innovation [4].

One of the project goals, was the elaboration of the KMI, meant for supporting innovation and competitiveness in textile enterprises.

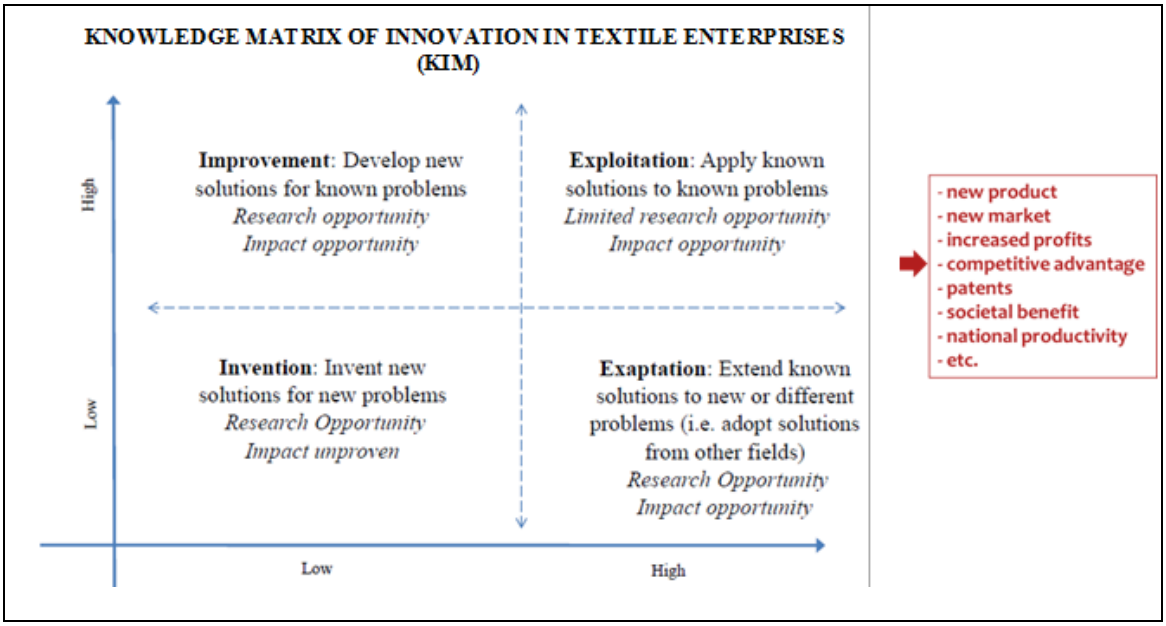


Figure 1. The general structure of the KMI [4].

Knowledge matrix is based on two key dimensions (figure 1), respectively:

- Application domain maturity (opportunity, need, *problem)*;
- Knowledge maturity (*solution*, artefact, theory).

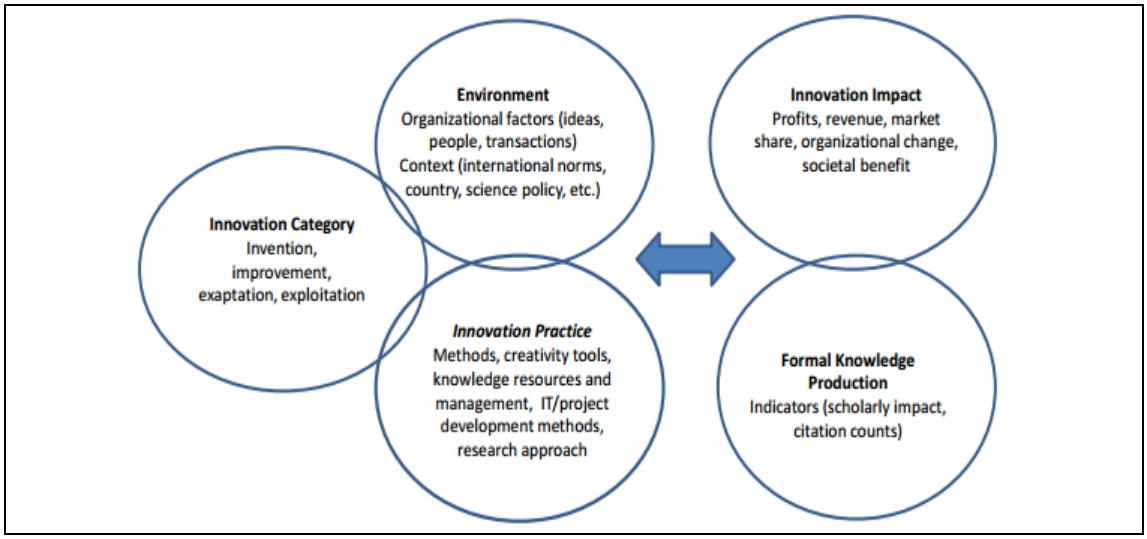


Figure 2. A conceptual model of innovation research and practice [4].

Figure 2 provides additional insights on how the KMI innovation categories support an improve understanding of the innovation economy. The development of the KMI has been carried out following the next tasks:

- Identification of all relevant factors for the knowledge matrix for innovation and adaption to the textile field
- Elaboration and validation of the final structure for the knowledge matrix for innovation;
- Elaboration of the dedicated questionnaire for textile enterprises.

The resulted matrix has on its vertical dimension the list with the assets by nature, namely: **conditions, resources, activities and results**. Each of these elements has been defined through a certain number of criteria and factors, resulting as shown in table 1, the agreed matrix structure, by the 52 factors in total.

Table 1. The KMI developed within TEXMatrix project.

No.	Element	Criteria	Factors
1.	**Conditions**	Innovation culture	5
		Innovation strategy	5
		Leadership	4
2.	**Resources**	Human resources	5
		Organizational structure	4
		Material resources	3
		External relationships	4
		Financial sources	1
3.	**Activities**	Management of ideas	2
		Management of innovation projects portfolio	2
		Surveillance and knowledge management	3
		Innovation promotion	2
		IPR	3
4.	**Results**	Evaluation and monitoring	5
		Image (Brand)	3
		Learning from failures	1

The Knowledge matrix for innovation has the following importance for textile enterprises:

- an adequate classification of an intangible asset and their relation with other assets an improved of knowledge inventory
- the assets may be evaluated against their costs and overlapping assets can be eliminated
- non-productive assets may be better exploited
- all asset data of a certain criteria can be easily identified with all its relations
- certain gaps in the knowledge base can be bridged.

The KMI will be applied into the textile enterprises through the developed the Benchmarking Matrix for Innovation in Textile Enterprises questionnaire. Some examples of the questions elaborated in the Likert scale, are displayed in the table 2.

The KMI developed will be followed by a benchmarking study, which will establish the position of an enterprise on local/regional/national/European (consortium) level and statistical reports and charts upon the current situation of the textile industry on local /regional /national/European (consortium) level, will be done.

Afterwards, a guide with new solutions for textile enterprises, containing new solutions based on the gap analysis of the benchmarking study, will be proposed by the project consortium, and its content will be transformed into one e-learning tool.

Table 2. Selected questions for benchmarking matrix for innovation.

Question #1 **Conditions of the enterprise: Innovation culture**

Please rate from 0 (= non), 1 (= lowest) to 5 (= highest)

	0	1	2	3	4	5
Innovation is one of the company's values;						
The company promotes innovation initiatives on a regular basis						
The company has mechanisms for technological surveillance of the sector and of the competition to feed the strategy of innovation (surveillance-competition, environment, technology)						
The company encourages continuous change						
The company's communication integrates diverse formal and informal knowledge sharing mechanisms						

Question #6 **Resources of the enterprise: Material resources**

Please rate from 0 (= non), 1 (= lowest) to 5 (= highest)

	0	1	2	3	4	5
The company seeks access to innovative materials and technologies						
The company has a regular technological update plan						
The company has access to specialized resources in the textile area, like databases, critical information and reports						

5. The e-Learning platform

The e-learning tool is the most powerful instrument for the sustainability of TEXMatrix: it will be available on the INCDTP server, even after project's end.

The e-learning tool will have the main aim of rendering solutions to the textile enterprises participating in the benchmarking study, based on the guide with new solutions. The solutions from the guide, including research results and new ideas for improving innovation capacity for textile enterprises, will be transformed in e-learning content, the e-learning content will have text, graphics and videos. The content will be scheduled interactively, in order to attract the young trainees in textiles.

The target group of the e-learning content are young trainees in textiles:

- young employees
- textile students and scholars
- young unemployed workforce

The e-learning tool envisages of total number of 300 user accounts (50 internal user accounts - consortium partners and 150 external user accounts). While e-learning is complex process it will have the following indicators:

- number of self-assessment tests and final tests (Moodle -Quiz)
- number of feed-back questionnaires completed
- time spent on the e-learning tool
- the visits of the dissemination page of the project's website will complete the number of indirect beneficiaries of the project:

The E-learning tool and work-based training, developed within the project, will be hosted at the web address: www.advan2tex.eu/portal/.

The TEXMatrix project is complementary with the Erasmus Plus Strategic partnership VET project – Advan2Tex – "E-learning platform for innovative textile fields" (2014-1-RO01-KA202-2909). This project is currently under implementation and the project consortium includes 2 of the TEXMatrix partners and is also in INCDTP coordination. Within Advan2Tex 7 training modules in innovative textile fields have been elaborated and uploaded on the e-learning platform with the URL address www.advan2tex.eu/portal/. Moreover, 6 blended courses were organized based on the e-learning platforms and 3 guides were created within the 5 joint staff events. The envisaged target group consisted in professionals in textile industry, young entrepreneurs and students in textiles, which were supported with the mentioned results of the project.

6. Conclusions

New technologies and research results offered by research providers have to be implemented and adapted within textile enterprises. The enterprises need qualified personnel, while the young workforce needs to cope with performance requirements of the enterprises.

A solution to these needs is given by spreading of creative and innovative organizational culture inside of textile enterprises by transferring and implementing methodologies, tools and concepts for improved innovation and training.

The concept of the Knowledge matrix, which quantifies the intangible assets of an enterprise, brings added value in its innovation and training capacity. The project partners support the enterprises by means of their latest research results and training methods. They are able to identify gaps in the innovation capacity of enterprises based on the Benchmarking study and to enrich it with new solutions.

Hence, main impact indicators on the enlarged target group are:

- acquiring improved training methods;
- better knowledge of innovation mechanisms in textile enterprises;
- improving the implementation of the innovation;

The main sustainable output of TEXMatrix, the e-learning tool, will be hosted on the INCDTP server even after project's end and will further support the textile world-of-work in improving innovation and training.

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