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Recommendations

WP1-D1.4: Recommendations

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Abbreviations and Acronyms

Abbreviation/acronym	Full name
EU	European Union
HEI	Higher Education Institution
ISET	High Institute of Technological studies of Ksar-Hellal
ISMMM	Higher Fashion Institute of Monastir
USF	University of Sfax
CRNS	Sfax Numeric Research Center
SME	Small and Medium Enterprises
WP	Work Package

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INTRODUCTION - FOREWORD

The present report, named Recommendations, constitutes the fourth deliverable of Work Package 1 (WP1) of the WINTEX project. Thus, this document summarizes project objectives and characterizations as well as the challenges of the textile sector in Tunisia. It also deals with government actions for the promotion and support of this sector. A particular interest is being paid to the cooperation of textile industrial sector with the academic sector including Academia Council objectives, as well as the training needs and tests needed for the textile sector (related to the innovation centers equipment and the complementary of the proposed services). A business model is proposed for the sustainability of such centers (inspired from the best practices. Finally, a synthesis of best practices and the tools (i.e., survey, templates for collecting data, guidelines for the focus group, template for the collection of best practices) allows to partners to know how to carry out the research activities. This will include three components: desk research, field research through survey and field research through focus groups.

1. Objectives of WINTEX project

Actually, textile and clothing sector is considered to be one of the main export activity areas in Tunisia and the second largest manufacturing sector. However, this vital sector faces several problems including job and business losses due to fierce international competition. In addition, the textile sector must improve its competitiveness through innovation, enhance its know-how and compensate for its deficiencies in raw materials. This will make it possible to migrate business models from subcontracting to co-contracting and brand named and innovative finished products with higher added value, often involving the mastery of sophisticated and modern production techniques. For this, producers must take into consideration important measures in order to strengthen the competitiveness, rationality and social responsibility of the consumer, and to create a stable ecosystem favorable to investments by the State.

Textile products are based on better safety, in addition to sustainability and well-being, constituting a potential market for companies in the Tunisian sector. They have a higher added value; thus, the market is developing with rapid growth in line with world demand. This activity may have repercussions on other sectors of the manufacturing industry (automotive, aeronautics, etc.), which should go as far as forming clusters. However, this rise of the sector requires the development and

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strengthening of the value chain of the textile and clothing industries sector through access to the production of raw materials and high-tech products.

The stake of the objectives of the WINTEX project is situated in this context. The project aims to facilitate the provision of Tunisian students, researchers and industrialists in the textile field on the skills and qualifications necessary to these markets.

Several higher education and training institutions specializing in textiles and clothing are expected to enable this competitive advantage, but still need support to do so. The support of Erasmus + program received by WINTEX is expected to help 3 Tunisian institutions to get, with the help of EU Partners, expertise, exchange ideas and experience, financial support, capacity building and to brainstorm ideas to help textile clothing sector in order to better shape training courses and specialized education in textile field and encourage close interactions of authorities with the concerned companies, with two objectives:

The short-term objective is to define roadmaps to guide future innovations on textile and fashion businesses, and to allow ideas to better fit industrial constraints and address current market needs. The long-term objective is to offer mentoring services to all partners and to give help to companies interested in developing new sustainable technologies and textile products, aligning social modernization and culture preservation.

Thanks to WINTEX it is expected to develop a more professional and complete approach that will federate experts for several disciplines to support the best projects and allow their transfer within a textile company partner of the project. The new training model will be disseminated and promoted through this project network and during related competitions after the end of the project.

Practically the project aims the fostering of enterprise-university collaboration in Tunisia by the establishment of three innovation textiles' centers at each participating HEIs, which will boost the collaboration among textile SMEs and participating HEIs and will become focal points for industry encounters providing support and guidance to HEIs' students for embracing innovation and entrepreneurship in the textile sector. They will provide services for innovation development, matching industry needs with research results, promoting cooperation between researchers and industry, developing and promoting of new products and opening of new markets, providing support to researchers and to business owners to commercialize their innovative ideas. They will integrate green technologies and Key Enabling Technologies in the textile sector with particular emphasis at each of the institutions in each to not overlap services and provide better and more comprehensive support to local SME needs.

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2. Characterization of the textile sector

On a global level, as well as on a national level, the textile sector is a factor of economic growth for many countries. However, the textile activity has been marked in recent years by both new opportunities for some and high uncertainty for others. Textile and clothing is one of Tunisia's main export sectors and the second largest manufacturing sector, but has faced job and business losses for decades due to fierce international competition. Textile products based on better safety, sustainability and wellbeing are a potential market for companies in the Tunisian sector. They have a higher value-added and the market is expanding with rapid growth following global demand.

The textile is a multidisciplinary sector; it is an activity which requires skills in design, materials, chemistry (organic, polymers, mineral), physics, mechanics, management, supply-chain, etc. that ensure its impact on innovation, creativity and quality.

In terms of imports, the European Union remains the leading textile importer. With its 508 million inhabitants, the European Union is the world's largest market and importer of clothing, ahead of the United States. In 2014, its clothing imports amounted to 73 billion Euros. They cover more than three quarters of European clothing consumption.

In2018-2019, the European Union's clothing imports will reach 99 billion Euros. Thus, the integration of the circular economy is a current imperative in the textile sector since the textile industry is the second most polluting industry in the world.

Indeed, a significant investment is necessary, particularly in Tunisia, to develop recycling technologies so that recycled materials become as profitable as virgin materials. From there, the circular economy aims to decouple the creation of value from our impact on the environment. It involves the implementation of new design, production (eco-design, industrial and territorial ecology, functional economy, etc.) and consumption processes that are more sober and more efficient. It also invites us to consider waste as a resource. Not escaping this global imperative, Tunisian textile companies are in close contact with many suppliers of global brands.

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The evaluation of these brands therefore involves assessing the performance of the Tunisian company at this level. Collaboration is one of the keys to success towards a circular economy. A powerful innovative ecosystem is necessary to ensure the scaling up of the right existing solutions.

The textile industry today is governed by the model of "fast fashion" which is based on very fast collection cycles where styles are constantly renewed. The volume of production and sales is the priority. It is an approach to fashion that rests on three fundamental pillars:

- Time: a quick response is needed;
- Consumer needs: we must rely on the consumer's wishes;
- Design: we must always be in tune with demand and fashion.

The consumer is a key element of the "fast fashion" strategy. In twenty years, this model has considerably modified the relationship with textile consumption, generating the phenomenon of "compulsive buying". This is why Europeans are consuming a lot more textiles than before.

In Tunisia, trade openness has increased sharply over the last two decades. The gradual easing of tariff and non-tariff barriers, the signing of free trade agreements and the creation of an attractive regime for fully exporting companies - the so-called offshore regime - have played an important role. In addition, the rise of fast fashion has, fortuitously, regularized the market especially between Asian countries and traditional suppliers of the European Union, including Tunisia. The fast fashion has introduced a new segmentation of the product portfolio of brand names divided between basic products, core collections and news.

The Tunisian textile sector is strongly export-oriented. Thus, to improve its performance and better manage its information and material flows, it is led to exploit the pillars of digitalization. Faced with Asian competition, Tunisia has successfully turned the corner of value added and is entering a second stage of growth and innovation based on the following key concepts: Design, Technical Textiles, Finishing, Restocking, Small and Medium Series and Logistics Services. The Tunisian textile industry is already focused on the niche markets of high-end clothing, technical textiles, hosiery, finishing and finishing of fabric and design and pattern making.

Tunisia has many assets to become a hub of technical textiles in the Mediterranean region. It is thus full of multidisciplinary talents that the university trains each year.

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In order to maintain the level of competitiveness and know-how of the Tunisian textile and clothing industry, the Tunisian State has set up a system of university and vocational training covering almost all sectors and placing on the market increasingly advanced qualifications. In this context, higher education offers training in textile engineering and textile design for various qualifications: bachelor's degree, professional master, research master, engineering degree and doctorate by deploying educational strategies based on creation and innovation.

Several institutions of higher education are set up to train these skills in favor of the textile sector: the engineering school of Monastir (textile department), the higher institute of fashion of Monastir, the higher institute of technological studies of Ksar-Hellal and the higher institute of arts and crafts of Sfax.

Value chain is seen as an integral part of this sector. In this way, and placing itself in a holistic vision, the product development process and innovation in the sector inevitably go through the mastery of sourcing, the search for work processes combining performance and respect for the environment, development the design component and reinforcement of good managerial practices, in particular those related to marketing and prospecting for international markets and the dissemination of cultures of innovation.

3. Challenges of the textile sector

Taking into account the policy of job creation outside the capital and significant export figures, textile manufacturing has long been considered an important part of the Tunisian economy. Indeed, the presence of well-trained workforce working at competitive costs, in addition to the proximity to European markets has made Tunisia a preferred destination for clothing manufacturers. Taking advantage of the relocation regime put in place in the 1970s, European textile and clothing manufacturers channeled their production capacity to the country. However, instability at home and increasing competition abroad have eroded Tunisia's strong position as a regional center for textile manufacturing in recent years.

Furthermore, the Tunisian government has put in place a strategy to revive Tunisian industries and increase their competitiveness in a local market which suffers from a flood by foreign products, in particular from China and Turkey. Itis also seeking to modernize the leather and footwear industries through technologies updates using artificial intelligence.

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Textile and clothing sector in Tunisia are characterized by limited technical and financial capabilities regarding innovation & research and development activities. On another side, they hold huge latent innovation capacity due to the large amount of employment textile industry has and the strong network of universities and training centers.

WINTEX project seeks to provide the textile sector of Tunisia with a push toward more added value products or advanced textiles. This will be done with the setting up of three innovation textiles' centers that aim to become innovation catalysts cornerstones. The laboratories will be equipped with quality control equipment in order to offer testing of advanced textiles and production to improve the quality of the products and become more competitive. The placement within universities will offer a synergistic effect by closing the gap between academia and industry, promoting innovation and facilitating a bridge for university students towards industry. The centers will become the seed for the establishment of the Academia Textile Industry Council that will provide information about new trends, training in innovative and environmental friendlier manufacturing techniques, innovative ways of organization of production, certification of products, ways to lower production costs and increase of productivity, development of quality products, information about investment and funding opportunities.

The strong commercial links between EU and Tunisia in the textile sector require a profound and continuous collaboration among all the institutions. In this way, the added value of this project relies on the successful implementation in Tunisia of the advanced research centers for textiles, training their staff, and enhancing the exposure of the European experience in establishing and managing those centers. Thus, the EU cooperation is crucial for the successful implementation of this project.

The EU partners from the academic area, research and training, non-profits and business associations have proven experience and expertise in this field and will provide their experience from implementing similar projects in EU and elsewhere to set up strategies for collaboration with industry and promoting entrepreneurship. The acquired expertise is crucial for the successful implementation of WINTEX.

Training will be conducted by EU partners in EU countries as well as locally in Tunisia. ERASMUS+ capacity building program is one of the best choices for such a project.

The basic results of the project activities are the establishment of three innovation textiles' centers at Tunisian HEIs (ISET, USF, ISMMM). The goal for all three centers is to become focal points for innovation in each country promoting them as meeting point between industry and universities while promoting and supporting new products' developments. In order to obtain these results, there

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will be preparation activities (research and state of the art), which are depicted in WP1. ISMMM will lead this activity with support from all other Tunisian partners.

At this stage, the centers will be equipped with advanced testing equipment focused on textiles innovation and the relative books and standard protocols, after their staffs have undergone an advanced Capacity Building training in the EU textile centers' premises, based on appropriately developed training material. EU partners as well as ATCTex, CRNS and MFCpole will help in the setting up of the centers and in testing their operation. A business model will also be developed for the innovation textiles' centers, to support their sustainability as well as a collaboration platform that will be used as a shared workspace and the ground of new projects and joint activities.

The main outcome from this activity is the textile centers' pilot operation, which will provide validation of the successful operation of the centers and their readiness to enter into a sustainable cooperation with businesses from the textile sector as a synergistic driver for innovation and the cooperation with the Academia Textile Industry Council.

The establishment of an Academia Textile Industry Council will also play a crucial role in establishing long-term cooperation between HEIs and industry of the textile and clothing sectors in Tunisia that will become the grounds for the implementation of the innovation triangle in Tunisia for the textile and clothing sectors.

So, the present national rapport aims to:

- Assess the importance of the innovation in the textile sector for the economies of Tunisia and collaboration between universities and companies in the textile sector.
- Assess training needs for experts in innovation textiles' centers in Tunisia.
- Assess the most favorite pedagogical approach for experts in the innovation textiles' centers.

4. The governmental actions for promoting and supporting

In order to promote and support textile and clothing industry, Tunisian government has undertaken several actions detailed as follows:

First of all, numerous institutions of higher education offer training courses in textile with different degrees: Bachelor's degree, professional Master's degree, research Master's degree, engineering degree and doctorate. It should be noted that the training offered covers both technical and managerial aspects. Moreover, these institutions are mainly located in the region of Monastir: the

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engineering school of Monastir (textile department), the higher institute of fashion of Monastir, and the higher institute of technological studies of Ksar-Hellal.

In addition to these institutions of higher education, there are several others public research structures dealing with research topics in the textile and para textile field and contributing to the development of the sector through applied research. Among these public research structures, we quote: Textile Engineering Laboratory (LGTex-ISET KH), Mechanical Engineering Laboratory (LGM-ENIM), Thermal and Energy Systems Studies Laboratory (LESTE-ENIM), Research Unit in Textile Materials and Processes (MPTex-ENIM), Research Unit in Applied Chemistry and Environment (URCAE- FSM).

Then many public structures were created by the Tunisian State to support innovation in the textile sector, such as the Agency for the Promotion of Industry and Innovations (APII), the Technical Center of Textile (CETTEX), National Agency for the Promotion of Research (ANPR), National Institute for Standardization and Industrial Property (INNORPI).

Finally, several financing mechanisms are available upstream at the level of research laboratories. These mechanisms cover the entire innovation process from the project idea to commercialization and if necessary, the creation of the company. These funding mechanisms can be grouped into three broad categories: individualized support, incentives for collaborative research and equity support for entrepreneurial developers.

Research incentive programs are funds intended mainly to research structures and managed by the Ministry of Higher Education and Scientific Research: federated research projects (PRF), projects to encourage young researches (PEJC), projects to encourage young teacher-researchers (PEJEC), etc. In addition to these funds, there are other incentives particularly in the context of higher education modernization projects aiming to finance the best end-of-study projects in order to move from study to realization, such as the PAQ to support the quality of higher education project, namely PAQ post PFE and PAQ collaborate.

The second set of incentive programs is oriented towards strengthening of cooperation between companies and research structures: The National Program for Research and Innovation (PNRI), the Research Valorization Fund (VRR), the programs for mobility of researches (MOBIDOC, POSTDOC).

Existing companies may also benefit from a number innovation incentive programs such as Upgrading Program (PMN), Priority Technology Investment (ITP), the Research and development Investment Premium (PIRD) and the service Vouchers. At another level, in order to support the

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creation of innovative companies, financing funds may intervene at the stage of constitution of equity capital or the consolidation of the financial structure of the "start-up" by means of bank loans. Among this category of funds, we quote the funds for industrial promotion and decentralization (FOPRODI), the incentive scheme for creativity and innovation in the field of ICT (RIICTIC), venture capital mutual funds (FCPR), spin-offs, venture capital investment companies (SICAR), the Financing bank of PME (BFPME) and the "Tunisian Guarantee Company" (SOTUGAR), the Tunisian Solidarity Bank (BTS, micro-credit).

5. The cooperation of textile industrial sector with the academic sector

Until not very long ago, university and industry in Tunisia occurred and developed independently of each other since university-industry cooperation is a long process with its economic, social, political and cultural results. This is not the case for modern and developed societies, where Industry needs university for applying new inventions and innovations in basic sciences into production and continuously growing and increasingly expensed universities need industry in order to find subject and financial source for their research. Actually, it an evidence that university-industry cooperation is not a choice for both university and industry, it is rather a vital obligation. So, weaving the connections between industry and education is a key vector for fostering cooperation among both sectors using the centers and the council as cornerstone for thriving an open innovation community in Tunisia.

In fact, this cooperation will provide Tunisian textile HEIs with better tools for adapting their training program with students by aligning the core courses with competencies and skills needed by the market. In this context, WINTEX project aims at bringing and creating the innovation textiles centers at the core of the universities for fostering participation of students in innovation with real case studies and to actively participate in traineeships. This will further develop student's skills and competencies that are needed by the market.

For this reason, the EU experience is considered as a major component in the success of the project. Indeed, the EU countries in this project, such as Spain, Greece, Italy, Romania and France have an excellent experience in the field of higher education training and strong links with industry. These countries managed similar projects in other regions (Egypt, Jordan), and thus, they can transfer the experience to Tunisia.

The project would not reach its purpose without a transnational partnership ready to apply at the local level the innovative approaches devised together and to assess their impact on the research

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and industrial systems. The partners proved very soon to be enthusiastic about the project philosophy and very much committed to the achievement of results. The actions which will be implemented within the project seem to be closely related to the target groups' needs and expectations and quite interconnected with regional and national strategies priorities. This project will attract an overall interest both in the research community and among academics and companies.

In this context, the Academia Council of the Textile Industry (CAIT-ATIC), which is an organization supporting the development of the textile sector, contributes as a support structure to the establishment and development of academic and industrial policy in the textile field. In conjunction with institutional and industrial partners in the region, it plays a coordinating role between the various stakeholders, but also a system and initiatives developed in the field of textile industries. It performs the following roles:

- Inform the teaching team on the current and prospective situation of employment in the field covered by the various diplomas provided by the various players in the textile sector,
- Facilitate communication between the university establishments responsible for the diploma and the economic or associative fabric concerned by the graduates,
- Help set up a skills approach and participate in the constitution of the diploma training reference system,
- Assume missions of advice, training, communication and establishment of partnerships with the various structures concerned,
- Carry out prospective analyzes of the most promising outlets to promote the development and changes of companies in the textile sector,
- Ensure a digital watch in complementarities with the various partners. It regularly feeds the academic site with information relating to educational resources and remarkable projects developed in the textile sector.

Constitution

The Academia Council of the Textile Industry could be made up of graduates, representatives of the teaching team (academic personalities recognized for their skills in the field taught), representatives of students and industrialists (from the economic world or associations, professional integration support structures)

The constitution of the Academic Council for the Textile Industry is presented to the university for validation before each new accreditation period.

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The Academic Council for the Textile Industry meets at least once a year when convened by its president. At the end of each academic year, an activity report supported by quantitative and qualitative data is submitted to the university.

Educational coordination

This new CAIT council coordinates the action of institutions tasked with forming the economic perimeter of the textile sector in order to promote the development of an academic network between institutions in this field. As such, the CAIT can:

- Encourage and guide the development of educational resources according to national and academic priorities,
- Pool and harmonize information and communication practices.

Consulting and training

Thanks to its very diversified structure (academics, industrialists and graduates), the CAIT finds all its legitimacy in helping to develop and monitor the training provided as well as the establishment of new training courses based on the real needs of the industrial fabric. It helps establishments to co-construct new courses with manufacturers and support structures.

6. The training needs for the textile innovation centers

The WINTEX project aims to fill the lack of specialized services in the Tunisian textile sector with the creation of three textile innovation centers located in the participating universities in Tunisia: University of Sfax, University of Monastir and the Higher Institute of Technological Studies of Ksar-Hellal (ISET). These centers will be equipped with high-tech equipment to promote innovation in close collaboration with textile companies within the framework of university-industry collaboration and the strengthening of technology transfer. They will offer the opportunity to provide new services to textile companies such as the prototyping of innovative textiles and the optimization of their performance, advanced quality controls, certification, specific trainings, workshops and seminars, support for projects, organization of events to encourage innovation, support for participation in exhibitions, promotion of entrepreneurship and the integration of innovative ideas in the textile industry.

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Furthermore, new services will be developed, such as quality testing, product certification, training, information seminars on fashion trends, new ways of organizing production, etc.

In fact, the three centers will be equipped with additional equipment covering various technical textile specialties but always in a dynamic of smart and circular economy:

- Pilot lines for the development of nonwovens by dry process and by melt-blown spinning intended for medical, industrial, automotive applications, etc.;
- Machines to develop eco-designed products with high added value
- Computer-aided simulation and creation tools and software
- Design and fashion 4.0 equipment
- Advanced metrology and analysis devices

The preliminary list of equipment for textile innovation centers to be created as part of the WINTEX project funded by the European Union is cited below:

- **ISET Ksar-Hellal Center**: Electrospinning unit, Extrusion and melt-blown die assembly, Web forming, edge-cutting & winding unit, Vacuum furnace and ultrasonic bath, Lab calendaring machine, Manual hot press, Hand tufting equipment and Warping machine.
- **IS2M Center:** Scanning electron microscope, Fourier Transform Spectrometer (FTIR), Differential scanning calorimetric (DSC).
- **ISAMS Center:** 3D Body scanner cabin, transfer printing machine, Digital printing machine, Automatic lab Knitting flat machine, 3D print+ design software+ 3D scanner, Head Laser Engraving Cutting Machine, Digital embroidery machine with software and 3D Simulation textile design software.

The three textile innovation centers will aim to respond to societal challenges related to Sustainable development to transform the entire sector by making smart technologies accessible, integrating digital transformation into business lines and minimizing its environmental foot +-print, developing value ecosystems and deploying new business models (functional economy, circular economy).

To achieve these objectives, these centers need to:

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- Organize training sessions for industrials, academics and textile researchers on various mechanisms for promoting and valorization research results, on circular economy and eco-processes, on the respect for intellectual property and the fight against unfair competition
- Meet certain needs of manufacturers in terms of training based on cultures of innovation and mastery of value chains and development and prototyping of innovative products
- Develop virtual research and innovation platforms
- Strengthen the mobility of researchers towards the companies
- Strengthen the promotion of scientific research work, technology transfer and the dissemination of knowledge
- Improve the system of internal governance and quality assurance of research structures
- Provide eco-constructed training adapted to the needs of the sectors
- Prospecting sources of evaluation and funding for research and innovation in the textile-clothing sector
- Strengthen interactions between institutional players and manufacturers (interfacing, interaction and synergy)

7. Sustainability of the innovation centers, proposed business model

Business sustainability is directly related to business models and managerial decisions grounded in financial, environmental and social concerns. It is important to:

- Create financial value,
- Knowhow their actions affect the environment and actively address those impacts,
- Care about their employees, customers and communities and work to make positive social change,
- Give visibility and improve the presence of these centers on the real (trade shows, fairs, etc.) and virtual spheres (site referencing, newsletters, presence LinkedIn, etc.)

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Compared to companies that focus on short-term profits and make decisions based solely on the bottom line, sustainable companies think long term. They forge strong relationships with employees and members of the community. They find ways to reduce the amount of natural resources they consume and the amount of waste and pollution they produce. As a result, sustainable companies survive shocks like global recessions, worker strikes, executive scandals and boycotts by environmental activists.

The centers' staff will be trained in innovation and technology transfer. Capacity building includes study visits and training.

The activities of building capacity in higher education are:

- Development of blended training program for Technology transfer Officer, based on the training program. The program will have an e-learning part followed by a face-to-face workshop.
- Development of training program for Innovation Lab facilitator, based on the training program of the EU project I-Lab.
- Organization of training courses. Output: One program for Technology Transfer, e-learning and workshop in Spain, Greece, Italy and Romania during the project meetings
- Organization of study visits.

The design and research centers staff will get better conditions to facilitate the access of companies to research results. This will improve the innovation capacity building (both technical and managerial) of local communities, because through aggregation models (productive districts, technology clusters, academia-industry partnerships) innovation ecosystems will be supported, new business investments will be encouraged and the whole territorial system will become more stable, dynamic and mature, thus generating qualified jobs and slowing the brain drain process.

In general terms, within a global framework in which the speed of the connection between knowledge and market is decisive to sustain innovation, the project intends to give a contribution to how to implement an efficient and effective use of knowledge for the generation of economic value.

The project objective of setting up innovation textiles' centers at each HEI in Tunisia will provide with modernized infrastructure and equipment that will benefit the HEI in several aspects including technical capacities to provide services to the textile sector and modernize equipment for teaching

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purposes within their current programs (for instance having traineeships and internships of students within the centers).

The equipment that will be installed will be validated during the preparation work package allowing targeting specific regional needs and aligning with the overall institutional strategy for modernization.

The establishment of centers is aligned with the Tunisian national policy of HEI development for competitiveness increase by facilitating the skill matching with the industrial needs.

In addition, the active leadership of USF, ISET and ISMMM in the Academia Textile Industry Council will also favor the flourishing of cooperation among the different HEIs and with industry at large, generating trust and joint agendas for further investments.

8. Best practices

The methodology approach aims to provide information about the main needs of textile sector, main strategies and how to re-invent the textile sector in Tunisia for more innovation, creativity, added value, design textile clothing strategies for more sustainability. It is based on two complementary components: Desk research and Field research which have been started at the same time. Desk research has provided information to adjust field research. The strategy is based on the collection of data from the two resources, and then a work of framing and refinement has been carried out. In a second period, field research has been restarted and readjusted.

The Desk research objective is to collect data on the sector by analyzing relevant reports and strategic documents in order to diagnose the textile sector in Tunisia: the learning needs, the relevant skills of people working in textile centers and the most relevant training methods. This field research is based on the Delphi approach based on an iterative suite of questionnaires sent to target groups (researchers, academic staff, trainers, innovation experts, BIOs, manufacturers, etc.) on specific subjects in order to generate ideas and identify the expectations and needs of the various stakeholders for development and innovation in the textile sector.

The analysis of industrialists' and researchers' strategic visions, as well as their needs expressed in the survey carried out in this study, allow us to reach the following conclusions:

- The commitment and the need to lead research and innovation in the textile sector. This is the case of LEITAT center which offers testing as well as research services to industrialists

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willing to improve the sustainability of their production processes and to define new materials for innovative applications. In this case, TEX-MED ALLIANCES is a project which proposes an innovative approach that will help textile and clothing MSMEs expand internationally inside/outside the Mediterranean area, fostering job creation and technological upgrading.

- The need to strengthen industry-research. For example, we quote Cebotex, which in collaboration with UPC-INTEXTER have developed an innovative research project based on developing nanofibers for the treatment of soft tissue SARCOMA.
- Strengthening the openness of research structures regarding the socio-economic environment and dealing with subjects that meet the needs of industrialists. It is the case of AEI TEXTILS which offers several services to its members in the textile clothing sector for more than ten years and allowed the fostering of 12 innovative and strategic projects in the fields of smart textiles, sustainability and circular economy...In this case, Technology Transfer Offices are created in Tunisia since 2012 to support the exploitation of research results and the creation of partnerships between suppliers and users of technology. Although the TTOs have not yet produced the expected results because they are not sufficiently connected to markets due to the limited resources allocated to them. So these TTOs must be more developed and strengthened to achieve the objectives of their creation.
- The need to rationalize the management of research and innovation equipment for better use.
- The need to promote and simplify research and innovation funding mechanisms. As the project of Gtex (Switzerland) which aims to stimulate employment and income generation along the value chain for all six priority countries, respectively: Egypt, Jordan, Kyrgyzstan, Morocco, Tajikstan, Tunisia. In this case, some mechanisms for financing research and innovation in the textile and clothing sector are used in Tunisian industries showing the synergies between industrialists and researchers such as MOBIDOC programme, PNRI and VRR

- The importance of setting up specialized innovation centers to better implement research and innovation work. We quote as examples DESTEX, RESET and TEXSTRA which opted for a set of instruments used by students in the textile clothing sector such as: creating a book

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of lectures, creating a virtual platform, project handbook of practices and open challenges (training tools and methodologies to foster creative and industrial design in advanced textiles clothing sector) and organizing intensive summer course. Furthermore, in this case the Tunisian Textile Center CETTEX had piloted a programme to move from sub-contracting to the finished product: Reaching the threshold of 70 companies in 2007 to 300 companies in 2018 (20% of the companies) financed at 70% by FODEC.

- Needs of industrialists for specialized skills in innovation (innovation expert). It is the case of TEXSTRA which developed a training program and a learning content targeted to higher education.
- Specific training needs for researchers in management and management of innovative projects

CONCLUSION

(1) A Tunisian research report containing the current socio-economically status of the textile sector at each region within Tunisia, their needs for innovation and stakeholders identified and surveyed

(2) A recompilation of EU best practices, experiences and success stories about capacity building and implementation of innovation centers.

(3) A set of recommendations that will combine the current needs and the opportunities will define the capacity building structure and key components to address particular needs.

(4) A capacity building toolkit and e-book that will be used in the training of the staff for each of the three innovation textiles' centers and beyond as training kit for future employees and trainees in the centers. Those materials will also be available for training within Tunisian HEIs.

(5) The complete setup of the three INNOVATION TEXTILES' CENTERS: that of USF, that of ISET and that of ISMMM to provide services to textile companies and to be used as a support for education of bachelors and master's students in each HEI. Those centers will also include a set of services that will be validated during the project as part of a pilot program. The optimized set of services along with a sustainable business model that will be develop and validated will remain active beyond the project end. Each HEI will have their own strategy for their center.

(6) The launch and roadmap of a Tunisian collaboration platform: Academia Textile Industry Council. This is envisioned to set a lasting collaboration and networking platform to engage industry and

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academia in joint efforts and projects to impact the wider society in Tunisia. WINTEX aims to reach to the launching and road mapping. Continuity beyond the project horizon will be led by Tunisian partners both HEIs and industrial and professional associations.

(7) The project website will remain active for at least 5 years after the project ending in order facilitate the open access to the different training materials generated and also to promote the project as a best practice beyond the end of the action. It will serve as a major dissemination tool and for communicating widely the results and activities. The website will also provide visibility in the collaboration between EU and Tunisia and the innovation textiles' centers created.

(8) Additional dissemination and exploitation tools will be generated as videos (5) and posters (8) in order to promote the visibility of the innovation potential that is still latent in the region of Tunisia. Those will also be used to attract students and textile managers to the centers as points of encounter for innovation boost.

(9) A final conference in Tunisia will be organized as a major event for the "official" launch of the innovation textiles' centers on a sustainable way after the pilot that will have been conducted during the project. The conference will highlight the first users' innovations during the pilot phase, the staff of the center, the innovation potential as well as the different results from the project. Students from Tunisia will also participate with presentation of some of the innovative approaches they used with the support from the centers training.

All those results will positively contribute to the development of a framework for cooperation among Tunisian textile companies and HEIs leading to innovations that enables the sector to increase in competitiveness and internationalization. Ultimately, WINTEX aims at generating and structuring a Tunisian framework for promoting entrepreneurship and innovation in the textile area, while improving the flow of knowledge and cooperation between HEI and industry.

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