

# D2.2 Mapping market & professionals needs – VET, HEI and Professionals.

## Transitions Project

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## Executive summary

This report aims to map target and market needs and skills mismatches for a future circular economy transformation. The data presented in the present report is the result of the survey launched by Transitions project at the end of 2022 around Europe and beyond.

Based on the results of the survey, in which 158 respondents from the textile and fashion (T&F) industry participated, an analysis was produced to investigate the needs of the market and professionals that emerged from the survey.

To complement this document, a more concise version of the findings has also been developed and will be published on the Transitions project website, social channels and disseminated to stakeholders in the sector (Annex 2)



## About Transitions Project

TRANSITIONS (Erasmus+ Project) is a strategic alliance for innovation formed by research and technological centres, Vocational Education and Training (VET), Higher Education Institutions (HEI), public policy actors, SMEs, and other sectoral organizations from Spain, Italy, The Netherlands, and Sweden. The aim is to nurture the textile and fashion transition to a 4.0 system and a circular economy by developing new learning methods, tools, and practices to help students, young designers, and professionals to face real challenges.

The objective is to create collaborative and real work-based training where the different actors in the value chain work on how to take advantage of technology to generate new value proposals and new business models within a circular economy.

Transitions propose a multidisciplinary pedagogical approach based on transition design theories and emerging disciplines and practices at the intersection of textile, biology, and digital fabrication.

General objectives:

- To foster new, innovative and multidisciplinary approaches to teaching and learning, fostering innovation in education design and delivery, teaching methods, assessment techniques, learning environments and developing new skills;
- Facilitating the flow and co-creation of knowledge between higher education and vocational education and training, research, the public sector and the business sector.

Specifically, TRANSITIONS will:

- Create a modular training programme based on Industry 4.0 for a T&F new circular system.
- Set up innovation-focused training modules based on real practice and challenges (Transition Labs) to skill, reskill and upskill students and professionals.
- Develop new ways to generate innovation in textile and design processes, production and commercialization.



## Deliverable's Objective

### a. Objective

Based on the results of the survey, launched in December 2022 by the TRANSITIONS project, this report aims to show what are the major needs necessary to promote green and digital transition.

The goal of the project is to map the different needs of textile and fashion categories above presented, going to briefly present what are the top needs of each category investigated.



## Mapping Market & Professional needs

### a. Methodology

In order to map market needs and skill gaps for future circular economy transformation, NTT, in collaboration with project partners, created a survey to be disseminated to all stakeholders from textile and fashion sector.

In particular, this survey was addressed to the following target audience:

- SMEs from the fashion sector and other cross-sectoral areas;
- Fashion start-ups;
- Fashion textile design students;
- Young designers;
- Universities and researchers in fashion and textile design;
- High Education Institutions (HEI);
- VET providers in fashion and textile design;
- Knowledge Institutions;
- Cluster organizations from the fashion and textile industries and the sectors interconnected in the TRANSITIONS project (circular economy, environmental and digital);
- Technological centres;
- Fashion networks and professional associations;
- All the specialists in design and training development in fashion and textile.

The survey was launched on December 5<sup>th</sup>, 2022 and remained open until mid-March 2023. The responses presented in this report represent the perspective predominantly of VET, HEI and Professionals of T&F sector of six European countries: Italy, Spain, Sweden, the Netherlands, France, Germany. Albeit to a lesser extent, responses have also been gathered from other European and non-European countries (Australia, Austria, China, Finland, Iceland, Mexico, United Kingdom, and United States).

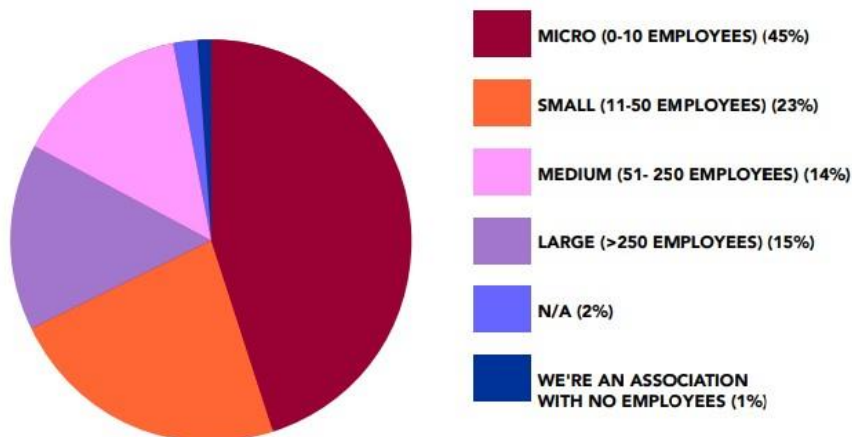
Many respondents work for companies within the industry: more than 2/3 of the responses came from SMEs, start-ups, and larger companies. HEIs, VETs, and R&D centers represent 12% of the respondents.

Looking at the numbers in another way, companies, and organizations with less than 50 employees stood for 67% of all responses. Medium-sized and large companies (51 to more than 250 employees) represent 29% of the responses.

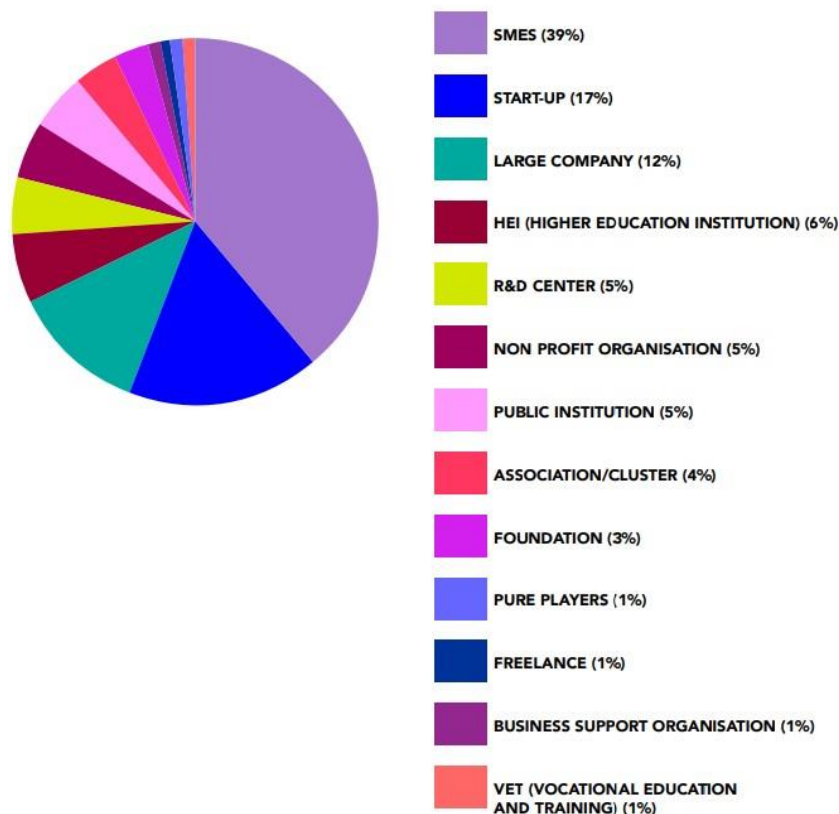




### ORGANISATION DIMENSION



### TYPE OF INSTITUTION



The results of the survey will serve for a basis for the development of new training methods to address green and digital transformation and possible opportunities for collaboration



between VET, HEI, Research Centers, Enterprises, and the Public Sector.

## Textile and fashion sector: circular economy and sustainability

Textile and Fashion are priority sectors for the European transition towards sustainability and a circular economy.

The T&F industry is among the largest in the world and an important part of European manufacturing. However, the production and consumption of textiles have significant environmental, climate and social impacts, as they use resources, water, land and chemicals and emit greenhouse gases and pollutants.

For this reason, promoting a transition to a circular economy is becoming increasingly crucial, as this transition enables the preservation of the value of products, materials, and resources by reintroducing them into the product cycle at the end of their use, minimizing waste generation (Eurostat, n.d.).

### **a. The present and future level of sustainability for textile and fashion operations**

Before investigating what market and professional needs are considered necessary for the transition towards a circular economy, the TRANSITIONS project investigated the current level of sustainability of textile and fashion operations through the survey. Survey participants were asked what percentage of their operations they considered connected with methods or practices that could promote sustainability, circular design/economy, or regenerative design/economy. The majority of the respondents declared that from 50% to 80% of the operations of their company they consider to be linked with methods and practices related to sustainability, circular design/economy, or regenerative design/economy.

The transition project also aimed to investigate the developments in the coming years. According to the survey results, this percentage will tend to increase over the next 3-5 years: more than 50% of survey participants declared they would like to achieve a percentage of sustainability within their company, ranging from 80% to 100%.

These data show us how sustainability in the industry and the transformation to a circular economy are also seen at the business level as critical aspects to be promoted in the coming years.

The impact of the textile and fashion industry on the environment is becoming a real concern: after food, housing, and mobility, European textile consumption holds the fourth position in terms of its impact on the environment and climate change (European Commission, 2022).

The European Union and its Member Countries have already been trying for years to envisage and adopt measures that can go towards reducing the environmental consequences.



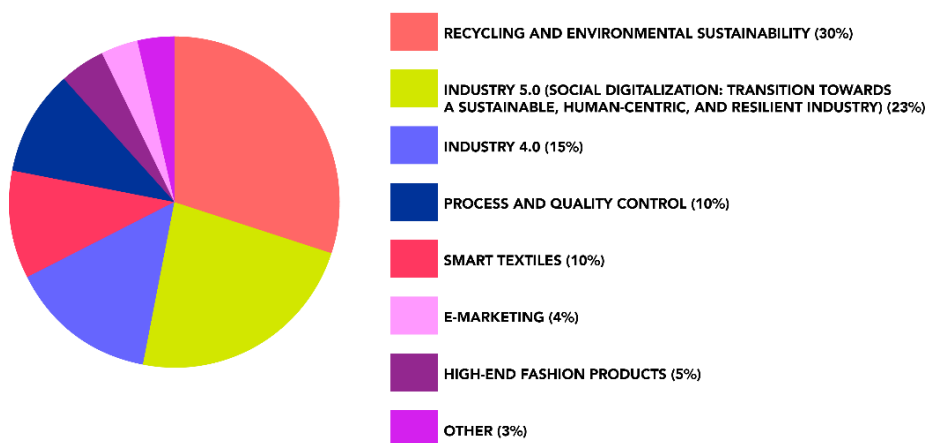
## b. The most strategic areas in the textile and fashion industry for the next 3-5 years

As illustrated in the previous section, the transition to a circular economy and a more sustainable textile and fashion industry is at the heart of many players' present and future plans in this sector.

In light of this, it is essential to investigate the most strategic areas for the textile and fashion industry in the next 3-5 years to promote this transition.

The survey found that among the areas highlighted in the graph, those considered most strategic were recycling, industry 4.0 and 5.0, and process and quality control.

**AREAS CONSIDERED MOST STRATEGIC FOR THE TEXTILE AND FASHION INDUSTRY IN THE NEXT 3-5 YEARS**



### Recycling

Recycling is the area considered most strategic for the textile and fashion industry to foster a greater environmental sustainability of the sector. T&F sector is a highly resource-intensive and waste generating industry: material production represents a large share of greenhouse gas emissions (around 38% of total clothing and textile industry emissions), resource usage (for example, freshwater), and pollutants (i.e. chemicals) (Hedrich et al, 2022). Worldwide, the fashion industry generates approximately 40 million tonnes of textile waste annually, with the majority either ending up in landfills or being incinerated. For this reason, a shift to closed-loop systems needs to be implemented: it represents an opportunity to reduce extractive production of virgin raw materials and limit textile waste (Amed, I., 2022).

The generation of textile waste has several negative consequences for people and the environment.



However, on the horizon is a notable transformation that could give rise to a substantial and sustainable new industry, transforming waste into valuable resources.

Certain technologies, like mechanical recycling of pure cotton, are already in place, even if they are in need of a strong update and uptake of R&D results.

Additional technologies, such as the chemical recycling of polyester, have undergone rigorous research and development and are on the verge of entering the commercial market. Once fully mature, recent studies (Hedrich et al, 2022) indicate that 70% of textile waste could be fiber-to-fiber recycled. The remaining 30% would require open-loop recycling or other solutions like producing syngas through thermo-chemical recycling. However, today less than 1% of textile waste is fiber-to-fiber recycled due to several barriers to scale that need to be overcome.

Scaling textile recycling not only brings forth direct economic advantages but also unveils numerous environmental and social benefits. For example, around 15,000 new jobs could be created, with a high need for upgraded skills aimed at performing recycling cycles of textile waste and setting up new value chains; CO2 emissions could be reduced by around four million tons.

Textile and fashion operators will necessarily have to deal with the requests of more recycled and bio-based products. This is a trend of the market that will not be inverted in the next years but will see an exponential growth instead. Hence, disposing of expertise able to design, manage and commercialize recycled materials (fibres, accessories etc.) is a stringent need for all kind of operators, even SMEs or artisans. Skills are required to face the many different aspects of the recycled-based textile products. New and improved skills are needed in all different domains of recycling: eco-design, manufacturing technologies, certification and standardisation, upcoming legislation (EPR, Digital Product passport), communication and marketing. And, very importantly, in designing the end-of-life part of the product cycle (see the specific section more ahead in this document about categorisation of skills for the sustainable and green transition).

### *Industry 4.0 and 5.0*

According to latest EU statements, the European industry plays a pivotal role in driving the ongoing economic and societal transitions.

The EU industry of the future, namely Industry 5.0, goes beyond prioritizing efficiency and productivity as exclusive objectives. Instead, it emphasizes the role and contribution of the industry to society, and here is where skilling and upskilling human resources become a key element, especially in the manufacturing sectors.

In the 5.0 paradigm, the focal point of the production process is the well-being of the worker, leveraging new technologies to foster prosperity beyond mere job creation and economic growth, while respecting the production limits of the planet.

This approach complements the established "Industry 4.0" putting research and innovation at the service of the transition towards a sustainable, human-centered, and resilient European industry (European Commission - Industry 5.0, n.d).



As at the centre of I5.0 will stand the empowerment of workers, as well as the evolving skills, the T&F industry demand for new and upgraded skills and knowledge in terms of production capacities, able to meet the challenges that the new industry of the future is putting in front of the sector enterprises, and the medium–small ones in particular. To maintain its attractiveness towards (young) talents, tailor-made programs are required by manufacturing companies, but also by other important actors of the sector, like fashion specialists, designers, market accelerators, experts and service providers. Being ready to face the challenge of the “Industry of the future” with upgraded skills in terms of production technology, digital solutions and human resilience allows industries, and SMEs in particular, to be also able to tackle the challenge of the green transition. And an essential part of this is the recycling opportunities that SMEs and operators of the sector must be able to grab, or, in best cases, generate. But grabbing or generating opportunities will only be possible by having a full domain of the new skills. New skills to be created by disposing of new training program and professional curricula.

Revising existing value chains by introducing new professional profiles skilled for the digital and green transitions can also make industries more resilient against external shocks, such as Covid-19 crisis.

### *Process & Quality Control*

Process and quality control have always been a very pressing issue felt by T&F operators, especially for those involved in the manufacturing part of the value chain. To be considered that a big part of the pre-consumer textile waste produced today is coming from imperfect or out-of-date quality control systems.

Traditionally, the textile manufacturing process is marked by ex-post quality controls, meaning that controls occur after the product is processed or the manufacturing operations are completed. What is hindered behind the I4.0 (and I5.0 to a broader extent) is the opportunity to introduce a real-time quality control that would allow the achievement of near-zero textile product defaults. This goal, if achieved, would drastically contribute to the reduction of pre-consumption (and post, as a consequence) textile waste production.

To be considered that process and quality controls are falling within the macro-category of I5.0, but evidently sector operators repute this sub-category as extremely important for the improvement of their operations towards the green and digital transition, to the extent that this can be considered a self-standing priority for the future competitiveness of EU textile and fashion sector.

### **c. Extended producer responsibility in the sector**

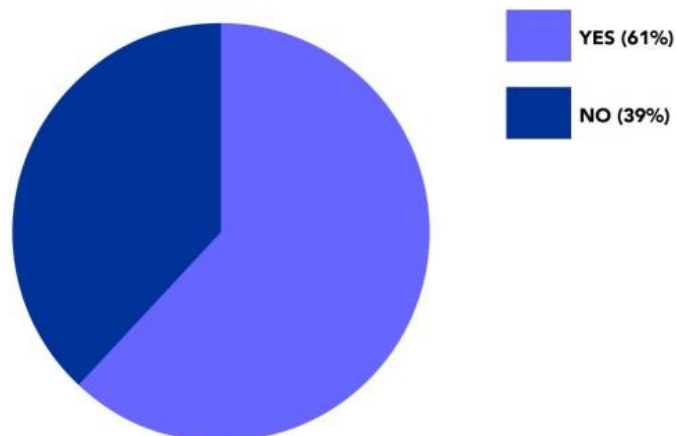
Extended Producer Responsibility (EPR) is one of the market tools used necessary to promote a transition to a circular and sustainable economy. According to the survey results, 61% of respondents were aware of this tool.

According to the OECD, the EPR is characterized as a market-driven tool aimed at fostering total life cycle environmental improvements of product systems. It broadens



the manufacturer's responsibilities across various stages of the product's life cycle, particularly focusing on take-back, recovery, and final disposal. This financial responsibility is implemented through a levy incorporated into the market price of the product (European Union, 2021).

**ARE YOU AWARE OF THE EXTENDED PRODUCER RESPONSIBILITY SCHEME (EPR) AND DO YOU BELIEVE THEY COULD IMPACT THE NEED FOR UPSKILLING THE EMPLOYEES OF YOUR ORGANIZATION REGARDING SUSTAINABILITY AND DIGITALIZATION?**



Concerning textiles, the European Commission is implementing EPR as a regulatory measure to promote sustainable textiles and the proper handling of textile waste, aligning with the waste hierarchy. At the Member State level, France stands as the sole European Union country currently having an EPR scheme for textiles.

Harmonised EPR regulations across the EU provide substantial economic and environmental advantages. These regulations enhance the economic feasibility of reusing and recycling textile waste, diverting textiles away from landfills and incineration. EPR also serves as a means to finance essential systems and infrastructure for the collection and recirculation of products and materials (Boiten, V., 2022).

Nonetheless, the new regulations deriving by the EPR initiative, will induce textile and clothing actors to adopt new practices, behaviors and policies, aimed at increasing sustainability and green way of thinking/acting. Many of these operators see this as an additional burden, some as an opportunity. Regardless of the different subjective judgements, EPR will imply new knowledge and new operations to be adopted by sector operators, companies in first instance.

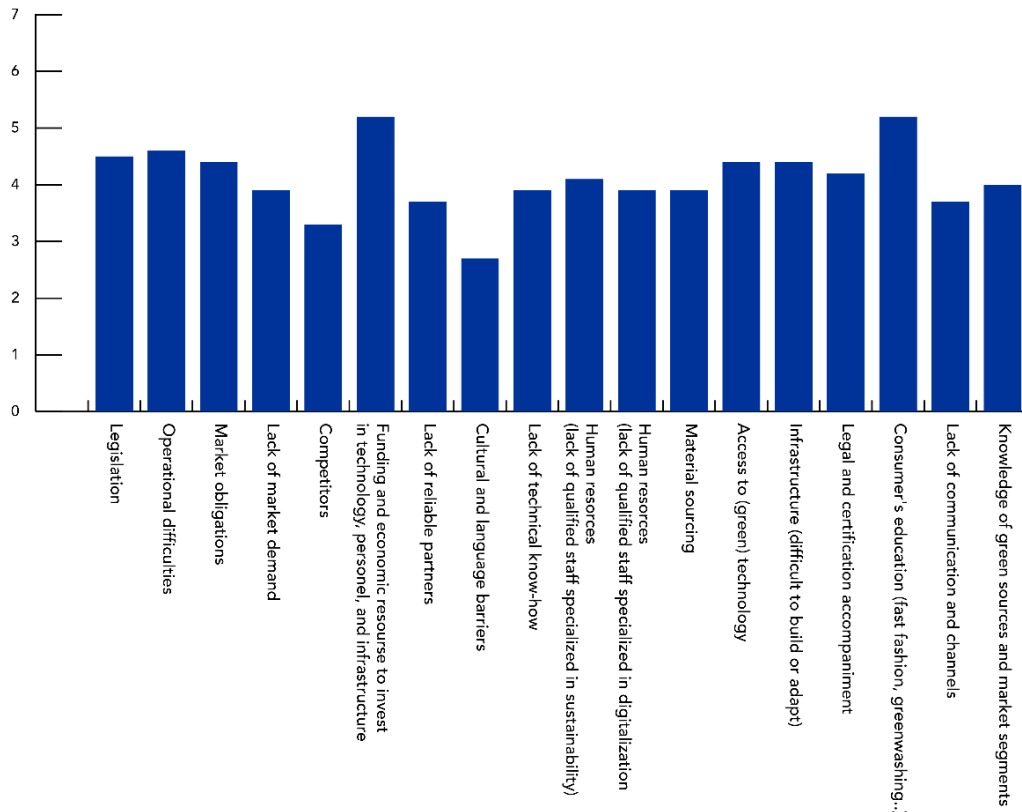
Operators of the sector will be in need of knowing legislation, management procedures, communication practices, corporate systems, financial issues in order to comply to the new regulations. The skills need is strong in this domain and cannot only be covered by outsourcing to external (presumed) experts.



## Challenges in fashion and textile industry for the transition towards circular economy

The following graph gathers information from the respondents, rating from 1- unimportant to 7 - very important the challenges faced in the industry.

**ORGANIZATION’S MAIN DIFFICULTIES OR CHALLENGES IN TRANSITIONING TOWARDS MORE SUSTAINABLE OR CIRCULAR PRACTICES**



The Ellen MacArthur Foundation defines the circular economy as an economic system where products and services are traded in closed loops or ‘cycles’. A circular economy is characterized as an economy, which is regenerative, by design, with the aim to retain as much value as possible of products, parts and materials. This means that the aim should be to create a system that allows for the long life, optimal reuse, refurbishment, remanufacturing and recycling of products and materials.

However, there are many factors that block this transformation or make it challenging to undertake. The survey results show us that the top 3 difficulties faced by the organization are: Funding and economic resources to invest in technology, personnel and infrastructure; consumer's education (fast fashion, greenwashing...); and operation difficulties.



## *Funding and economic resources to invest in technology, personnel and infrastructure*

Funding is available both on European level through the European funding program as well in each State of the union that finances R&D as well other program for SMEs developing innovation in collaboration with R&D. A possible example is Horizon Europe, which is the EU's key funding program for research and innovation with a budget of €95.5 billion. The program fosters collaboration and amplifies the impact of research and innovation in developing, supporting and implementing EU policies aimed at addressing global challenges. It promotes the creation and broader dissemination of excellent knowledge and technologies (European Commission – Horizon Europe, n.d). Despite these efforts, there is a gap between innovation and the implementation of innovation in the industry. Indeed, companies have different access to technology. Some companies already use 3D programs in the design phase when production companies in Europe do not have access to the technology. There is a need to increase technology availability across Europe, especially in the producing regions. Furthermore, recruiting adequate personnel is proven difficult for several reasons. The matching process between the available workforce and the requested qualification for employment of personnel shows a remarkable lack of educated personnel for the posts necessary to fill in the industry.

In addition, we have to consider that SMEs are the last to benefit from EU grants and programs. There are other several programmes at EU level financially supporting SMEs. By the way, T&F SMEs still find many difficulties in getting access to them, for a very diverse number of reasons:

- Lack of internal skills able to deal with the application process (hence need to rely on external providers);
- High competition;
- T&F sector was often reputed to be a less strategic one during the evaluation, if compared to other domain like IT, chemistry or transports;
- Bureaucracy (too much committing for a small company);
- Difficulties in finding partners;
- Other barriers (mindset, language, social factors etc.).

Still, a big desire to be part of EU programmes can be registered when SMEs of T&F sector are concerned, but many of the listed obstacles impede a large participation and a more proactive approach by entrepreneurs.

## *Consumer's education (fast fashion, greenwashing...)*

In the EU, approximately 5.8 million tonnes of textiles are discarded annually, which equals 11.3 kg per person (European Commission-Environment, a). Regarding this highly profitable business model, the European Commission has declared, "*fast fashion is out of fashion*", referring to the mass production of clothing replicating recent high- fashion





trends.

Indeed, the impact fast fashion has on our resources and the waste it generates is no longer sustainable, as it depletes our resources and generates tonnes of waste (European Commission, Environment, b). The fashion industry is one of the most poorly regulated global industries. It is also among the most globalised, with highly complex value chains, and as such is associated with a wide range of environmental and social issues. We are seeing an increase in consumer awareness and concern about these issues. This increased awareness has also led to an increase in the visibility of certification schemes, which are used as a mechanism to reassure and build confidence. However, as reported in the report “Licence to greenwash” (Changing Markets Foundation, 2022) *“the majority of schemes represent a false promise of certification for textiles and represent a highly sophisticated form of greenwashing as few have the time or inclination to look beyond a certification or initiative’s stamp of approval”*. Often, they are a “patchy promise of sustainability”, able to offer a degree of assurance on a small production practice or section of the supply chain (Changing Markets Foundation, 2022).

The consequences of the textile sector on the environment and social aspects are considered as one of the discriminating factors for the perception of the value of a brand (Ghezzi et al, 2018). Consumer education is one of the top priorities to achieve the desired goals of the textile and fashion green transition. Consuming too much and too often is in need of corrective measures.

This can be achieved by awakening consumer’s consciousness about the consequences of his/her careless consumption behavior. And the education has to start since the early stages of the learning mechanism of the human being, and continue up to the latest ones, especially for population already in the mid-late segments of their life. For the latter the consciousness about what they consume is already formed, so training actions have to intervene to correct unwanted behaviours. For the young generations even more intense training actions are needed, to make them understand the consequences of their attitude and to channel their way of thinking into the right sustainable models. In other words, make people aware of what they are doing when they buy fast and cheap fashion, and what the consequences are for the environment, the people and the planet. Another large area for education to the green transition is represented by the end-of-life product treatment and disposal and the regulations to be followed. Consumer education in this field would require time and dedicated actions, maybe customized according to the specific geographic location and market segment affiliation. The Extended Producer Responsibility is another macro-topic on which the need for education is strong, as reported in the dedicated section of this document.



## *Operation difficulties*

Operations of T&F sector can be categorised as:

- Manufacturing process
- Work procedures
- Value chain coordination
- Others

The main drawback of T&F operations, in terms of production process, lies in the level of technology in place and the related obsolescence degree. Many SMEs are lacking of an adequate level of technology upgrade, as described in the section related to digital technologies. One good example is the recycling technology for wool fibres present in the manufacturing area of Prato (IT). Here, since the end of Second World War, a special and unique technology for the collection and recycle of woolen based textiles was developed and industrialized. The important feature of this process is that it can use fibers of different lengths, in blends of the most variable composition. For more than a century, regenerated wool has offered an exceptional chance for the expansion and progress of Prato's textile district in global markets. The techniques of the "recycling process" reflect a culture that prioritizes environmental awareness, respect for human resources, and a tradition of skill and dedicated professional entrepreneurship (Cardato, n.d).

Today, after many decades, this (mechanical) process is still in place; machinery and techniques have remained almost unchanged and a strong need for revising, updating and efficiency- improvement is felt by all sector operators.

The use of green chemistry in manufacturing and the treatment of polluted wastewater is another field where technology upgrade is needed at factory level.

Work procedures are often based on manual and visual activities, efficiency could extensively be provided by evolute systems, like AI, sensors, algorithms, automation and robotisation. Instead, T&F is still a labour-intensive industry, where heavy and risky tasks are performed by humans (think about the great weights to be transported or the product/process quality control still visually performed by human operators; additionally, some working environments, like dyehouses or finishing plants are unhealthy and risky for humans). Procedures can be speeded up and made safe if those most advanced solutions would be adopted by operators and working units.

Another important point is the value chain coordination, still performed by human intelligence, operators placed in specific regulatory units supervising the whole production. This is mainly the case of smaller value chains where SMEs are involved. Dedicated programming and controlling (digital) tools are not extensively adopted, creating lead time extension, relations difficulties, delays in communication flows, customer dissatisfaction.



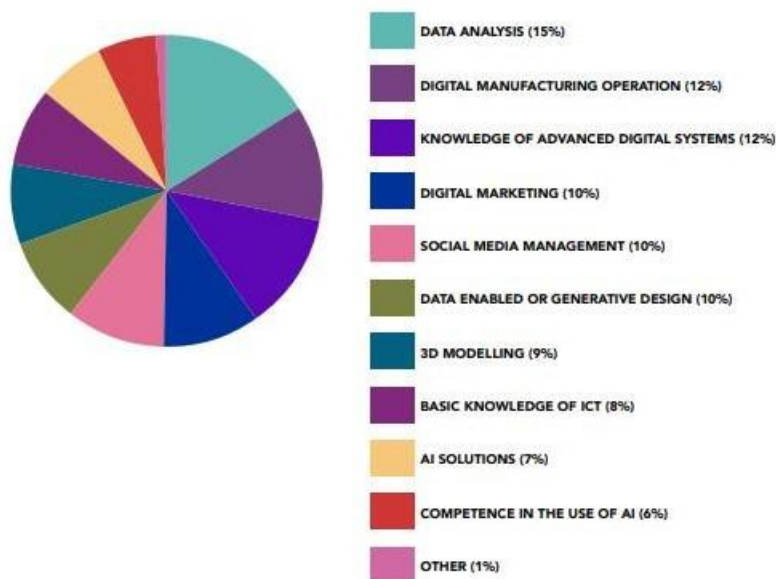
Many other operations could be improved in T&F, like specific actions performed for marketing and social conformity, that are also really important. There would be many aspects to be considered, especially in terms of social equity and solidarity, working conditions, employees exploitation (this is mainly referred to extra EU territories), gender equality and others.

## Skills needed for the transition to circular economy

The core of this deliverable is to define the professional and market needs. Which among the most relevant needs to promote a green and digital transition is certainly to have in the textile and fashion industry, workers and experts with specific characteristics and capabilities.

### a. Digital skills

DIGITAL SKILLS



In the transition to a circular economy, digital skills play a key role. Investing in digital capabilities in the textile and fashion industry means working on advanced technological innovation to make production more precise, more sustainable, combining production automation, product technology, big data, AI and machine learning as the main innovative tools.

Among the benefits, there is certainly higher speed, faster delivery times and lower costs. This would also bring benefits to the circular economy transition: the combination



of digital and green would lead to reduced shipping times and inventory, better waste management and reduced production defects.

The three main areas within digitalisation that survey participants deem most important for the upcoming circular transition are Data Analysis, Digital manufacturing operations and Knowledge of advanced digital systems. This translates directly to the roles we saw emerging in Industry 4.0, and the evolution of these roles for industry 5.0, such as those defined in the Erasmus+ project Skills4Smart TCLF Industries 2030, namely: Clothing CAD pattern maker, Textile Technologist, Digital Supply Chain Analyst, Digital Marketing Professional and Process & Production Timeline Analyst. The roles listed above are also mirrored in the Fashion Tech Alliance report: *D1.3 Fashion-Tech job profiles portfolio*, through similar roles, such as: Digital Experience Manager, Digital Product Manager, Sustainability Lead, Data Scientist and Microfactory Manager.

These roles, and the skills required to fulfil them are noted as essential to the future of the fashion and textile industries, as defined in the FTAlliance report. *“Digitising the design and development processes [of garments, accessories and services], will allow new types of customer experiences, such as use of interactive technologies - holograms, AI, digital avatars, 3D printing”* (FTAlliance, 2021).

The integration of interactive technologies, including programmable models, patterns, and data w/AI enabled design, in new design processes will lead to a deeper integration of digitization across the sector. Three key areas with the highest potential for future revenue streams in Fashion-Tech include those centered on capturing value from sustainable and circular business practices, such as subscription-based revenue streams; new eco-system/platform enabled revenue streams, and revenue streams based on selling data (FT Alliance, 2021).

## Data analysis

Following this guideline, we can imagine then why data analysis is deemed most important across the board. Understanding, analysing and making use of data is central to circular business models such as rental services, digital fashion AR subscription services, repair and remake methodologies (e.g, how does a garment wear over time?) and digital product passports: where garments are made, what they are made from, by whom they are made, where they are sold, how often they are worn/how many lives a garment has as first hand, second hand, etc.

## Digital manufacturing operations

Digital manufacturing operations are voted second most important within Digital Skills. This is mirrored in the roles defined by the Skills4Smart TCLF Industries 2030 profile ‘Process & Production Timeline Analyst’ (Skills4smart, n.d.) and FTAlliance’s ‘Microfactory Manager’.

- The Process & Production Timeline Analyst will *“be responsible for gathering, elaborating, storing, using and sharing digital process data in reference to*



*compliance to customers' requirements, process performance, including technical sheets and production instructions, duration, energy efficiency, as well as production and machinery maintenance. He/She analyses and applies method and time studies on manufacturing operations and tasks, in order to provide solutions for optimising the production processes" (Skills4smart, n.d.).*

- The Microfactory manager will "help target and deliver value through the digital transformation of their core Manufacturing and Operations processes, design future ways of working - operating models, business functions and processes, and technology, whilst working closely with business and technology strategists, process owners and subject matter experts. They will leverage digital technologies to enable clients' future-state business capabilities and drive targeted business outcomes. They will also possess knowledge of existing, new and emerging digital technologies and be able to practically apply them across Manufacturing and Operation processes, have knowledge in all aspects of designing and constructing end-to-end Manufacturing and Operations business processes, functions and organizational structures, and the ability to create original concepts and theories for improving growth and efficiency through digital Manufacturing and Operations transformation". (FT Alliance, 2021).

### *Knowledge of advanced digital systems*

Lastly, knowledge of advanced digital systems is voted third-most important. As can be seen in the above desired roles, most positions require an agile approach and collaboration with other key players across the supply chain. In order for successful collaboration, a common understanding of contemporary technologies being used in the industry is useful. Examples of these technologies might be: Artificial Intelligence, Big Data, Automatization, Augmented and Virtual Reality, Smart textiles and wearables, Blockchain, Tracing, Repair and Recycling systems, Digital prototyping and additive manufacturing.

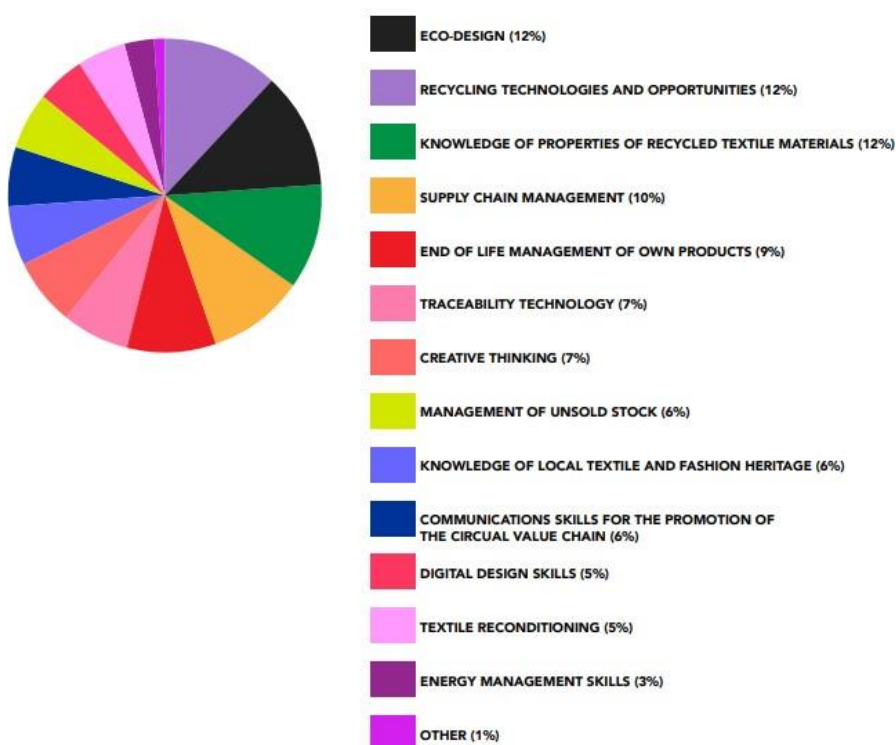
Each of these advanced digital systems requires various levels of specialism, data and software knowledge. Awareness and adoption of these systems and technologies may be a current barrier to transition for many companies due to a lack of personnel trained in these advanced digital systems, and the constant evolution of these technologies.



## b. Essential capabilities contributing to sustainability and circular economy

Among the most relevant needs for fostering a transition to a circular economy are also important "green skills" that the transition project investigated through the survey. The three capabilities that have emerged as essential for approaching the transition are: eco-design, recycling technologies and opportunities, and knowledge of properties of recycled textiles materials.

**ESSENTIAL CAPABILITIES FOR CONTRIBUTING TO SUSTAINABILITY AND CIRCULAR ECONOMY**



### Eco-design

Ecodesign emerges as the most relevant capability necessary to contribute to the circular economy. Ecodesign aims to optimise production chains: it includes maximising energy efficiency, reducing production steps, reducing or eliminating surface treatments, reducing waste (Ghezzi et al, 2018).

As better we design in the first steps in the design processes, the better will fit the product into the cycles we need to create in the circular economy. Designing for durability and designing for passing through different life cycles, is key to creating a textile circular economy.

The Eco-design is strictly connected with the second and third essential capabilities emerged in the survey: recycling technologies and opportunities, and knowledge of properties of recycled textiles materials.



Recycling technologies and opportunities

Textile recycling is one of the main solutions identified to address the textile-waste problem: it would simultaneously address upstream production by replacing virgin materials with recycled materials, while also addressing the end-of-life waste challenge that currently exists.

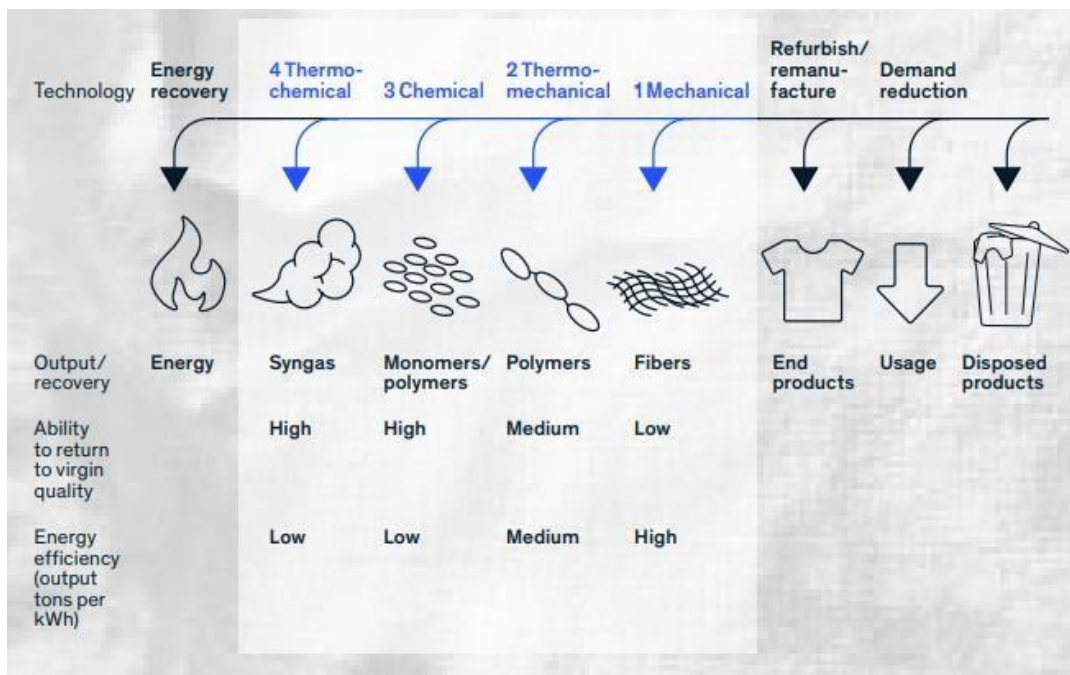


Figure 1 - Four types of recycling technologies at the centre of attention for textiles in Europe (Source: Hedrich, S., et al, 2022)

Below are reported the four archetypes of recycling technologies that are at the centre of addressing textile waste in Europe.

**1. Mechanical recycling**

Mechanical recycling uses physical forces such as cutting and grinding to convert textiles into usable fibers. It is a commercially proven, low-energy, and cost-efficient recycling method.

**2. Thermo-mechanical recycling**

Thermo-mechanical recycling uses a combination of pressure and heat to melt synthetic textiles (such as polyester and polyamide) and recover polymers. The technology cannot be used for natural fibers (such as cotton or wool) or MMCF (such as viscose). It is relatively low in energy usage and has the potential to achieve less quality degradation than most mechanical recycling technologies. Thermo-mechanical recycling is a mature technology, tested, however, on a demonstration scale for textiles: there are still specific techniques to be solved for textiles and raw material requirements are now very strict, which limits the availability of raw materials.



### 3. Chemical recycling

Chemical recycling uses chemical processes to break down fibres to the polymer or monomer level. Chemical recycling processes require more energy than mechanical recycling, but have the key advantage of returning (near) virgin quality fibres. Overall, chemical recycling of textiles does not yet exist on a commercial scale, but many companies are building pilot and commercial plants for both cellulosic and synthetic recycling.

### 4. Thermo-chemical recycling

Thermochemical recycling is compatible with all forms of fiber due to the use of gasification to produce syngas through the partial oxidation reaction of polymers. Thermochemical recycling as a basic technology exists on a commercial scale, however, this technology needs some adaptation or development for the treatment of textile waste (Hedrich, S., et al, 2022).

The four main types of technology presented above differ significantly in terms of volume potential and waste material requirements. However, considering the fiber mix in Europe, potentially 70% of textile-waste volume could be addressed by the technologies (Hedrich, S., et al, 2022).

#### *Knowledge of properties of recycled textiles materials*

Knowledge of properties of recycled textile materials is an essential capability to manage a supply chain following the rules of Eco design.

Euratex in their report "*Prospering-in-the-Circular-Economy-2020*" (Euratex, 2020) have mentioned the importance of knowledge in selecting the materials that have an impact on end of life of the product.

Buyers and designers have a crucial role in every textile and clothing supply chain: they select the materials, the finishes, the products and its haberdashery and they define the target group for the products. In a circular supply chain, their role will become even more difficult and complex, as they also have to take into account the end-of-life strategy for the product and to look into the use of secondary materials. In some sense, they can be seen as the circular chain manager. However, many designers are lacking the technical background to be able to fulfil that role. In the future, they have to be assisted by a more technologically skilled person or an expert system. Together they will have to manage the circular supply chain in textiles and clothing. One of their most important roles is to connect stakeholders in order to optimise the whole chain with respect to the reduction of the environmental impact. Although there is not one correct Design manual for the textile and clothing chain, important aspects are given by the specification of the requirements of the end-product in terms of service life, mechanical properties, physical properties and aesthetical properties.

These specifications define:





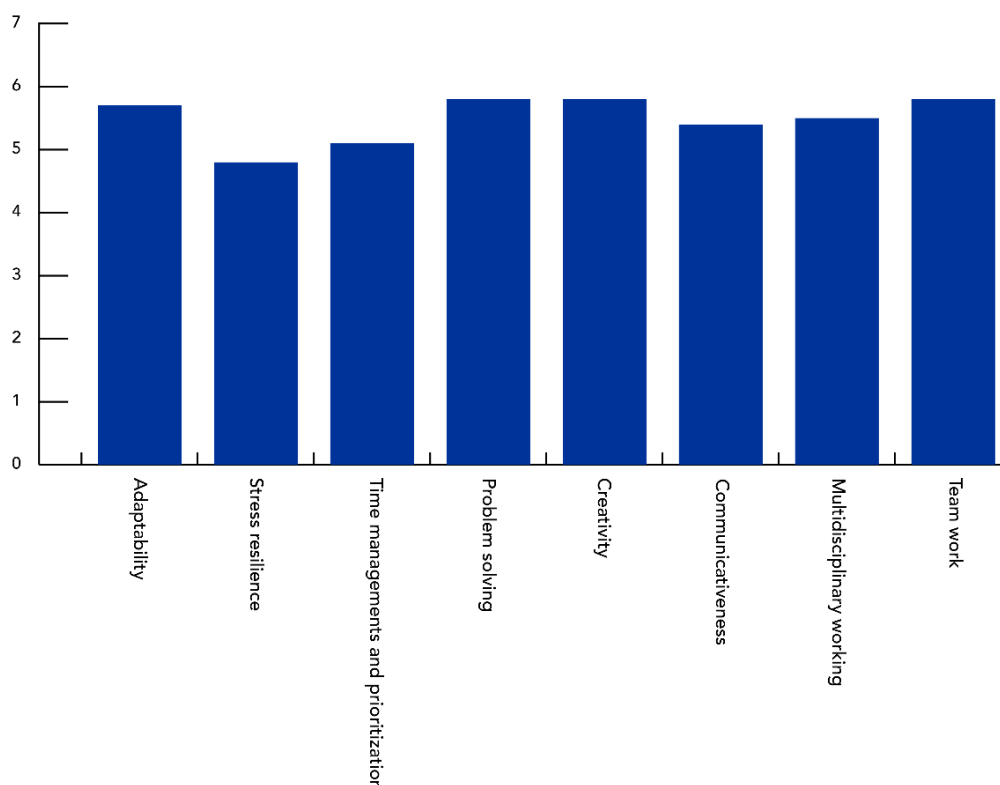
- Election of materials: type, virgin or recycled, mono material or blend;
- Yarn: Yarn count, twined yarns, monofilament or multifilament;
- Construction: Woven and weaving techniques, Knitted and types of knits, Non-woven and bonding method;
- Textile finishing: Type of dyeing, printing, finishing (mechanical, chemical); coating, lamination;
- Production of end-product: combination of fabrics/materials or accessories, assembly method, Haberdashery/trims;
- Use, Care method(s), Expected time of service, instructions, way of disposal.

All these aspects are interrelated to each other and all have to be dealt with in a circular system. As designers might not be aware of some of these aspects, it might be difficult to design a product suitable for recycling at the end of the functional life of the product (Euratex, 2020).

### c. Soft skills

The following graph gathers information from the respondents, rating from 1- unimportant to 7 - very important the soft skills needed in the industry.

**SOFT SKILLS NEEDED IN THE TEXTILE AND FASHION INDUSTRY FOR THE TRANSITION**



To support a green and digital transition, it is necessary to have green and digital skills. However, it is also very important that these profiles have skills that go beyond technical capabilities: The results of the survey show a high interest of the respondents in these



kinds of skills. In the survey, they were asked to rate from 1 (unimportant) to 7 (the most important) the various types of soft skills they considered essential.

As can be seen from the results in the graph, all the skills were rated quite high: this shows us how essential these skills are in view of many Professionals, VET, HEI, textile and fashion professionals.

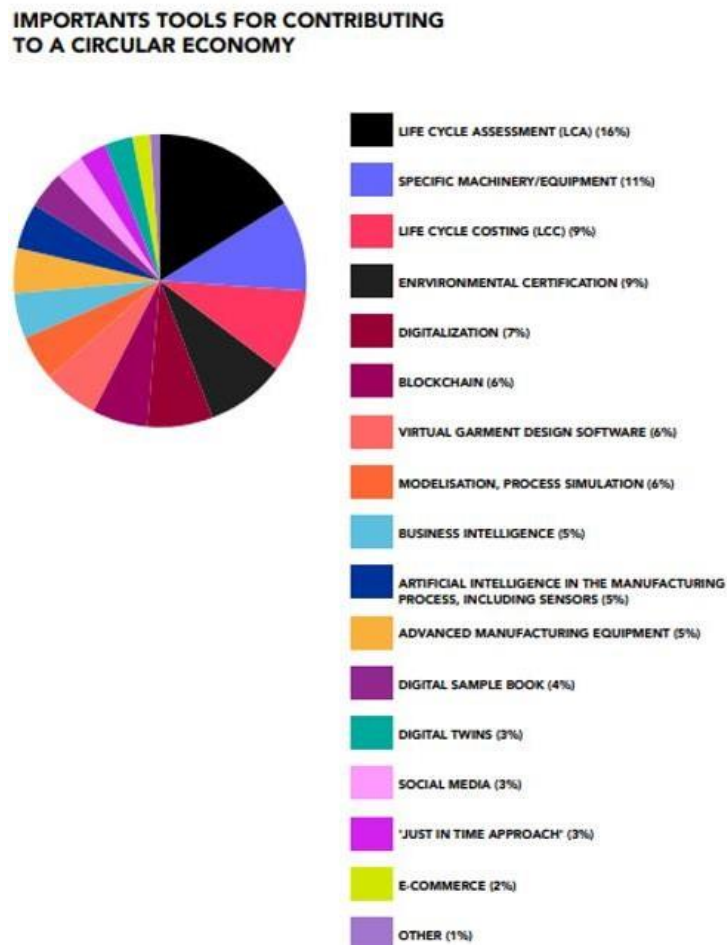
Flexibility is a key word for T&F operators, workers in particular. A high level of adaptability in terms of environment, working conditions, working under pressure, industrial and human relations, product/process technological know-how is required to textile and clothing workers. Soft skills play a very important role in this respect, at the same level of technical and operational capacities.

Many T&F operators are very focused on their technical capabilities, whether they are designers or production managers. Sometimes flexibility and adaptability are considered as less important than technical know-how, leading to fail in front of important business opportunities.

The training offer for T&F has been changing a lot in this domain, as it includes now a remarkable amount of space to transferring the soft skills to young students; nevertheless, more effort has to be put in preparing profiles able to make available their personal charisma and personality in the work they enter; this is what can really make the difference in this sector.



### d. Important tools contributing towards a circular economy



Among the tools for contributing to a circular economy, those emerged from the survey as most important are: the Life Cycle Assessment (LCA), Specific machinery/equipment, the Life Cycle Costing (LCC), and the environmental certification.

#### Life Cycle Assessment (LCA)

LCA is the most important tool for the companies in their transition to a circular process. Apparently, the companies need to find out where in the value chain the environmental impact is greatest in order to identify what measures they need to take to reduce it. In this regard, the term “life cycle” refers to “the time span between the raw material phase of a product and its first market introduction until its final withdrawal” (Furferi R., Volpe Y., Mantellassi F., 2022).

LCA is an internationally standardised methodology (ISO 14040), which according to the European Commission, provide the best framework for assessing the potential environmental impacts of products currently available (European Commission – European Platform on Life Cycle Assessment, n.d.).



LCA represents is regarded as an important tool to evaluate the environmental impact of textile processing and products. Its use allows:

- To obtain quantified and reliable information related to the environmental impact of textile products for use by industry and policy makers;
- To highlight areas where environmental impact information is still unknown or uncertain;
- To allow considerations of reducing material and energy flows throughout the life cycle of textile products;
- To enable comparisons between different textile materials, provided the products are used for the same purposes (European Commission – CORDIS EU Research results).

## Specific machines/equipment

The second tool is specific machines/equipment. The textile machines are as well improving their performance to contribute to the bettering of the circular economy. An example in this regard is given by Mr. Giorgio Cafaggi, General Manager and Head of Sales, Sperotto Rimar, wrote about Finishing with environmental friendliness in mind:

*“Finishing machine manufacturers have options to improve their products in a sustainable way. Continuous technological developments result in a smaller environmental footprint without compromising final fabric quality” (Cafaggi, 2023).*

The finishing sector represents a key stage in the value chain, which plays a crucial role in enhancing various properties in the final use of textiles. According to Cafaggi *“Bringing an ideal look, touch and functionality to numerous different applications smart innovations is a real challenge for machine manufacturers” (Cafaggi, 2023).*

Besides this, they also have to meet customers' demands for solutions that are resource and environmentally friendly'.

## Life Cycle Costing (LCC)

Life cycle costing (LCC) is a methodology for calculating costs along the life cycle of a product, from the production stages, through the use stages to disposal. This approach makes it possible to define, based on given specifications, what the most efficient responses can be, not only from an environmental point of view, but also from an economic one (Regione Piemonte, n.d.).

## Environmental certification

Related to the verification process, the environmental certifications emerged as a very important issue, because we need to know which kind of materials do we have in our garments so we can then recycle better. So, product passport and the integration of



information about the garments and the materials, will be key points to develop and create circular economy.

Environmental certification is of growing importance for T&F sector, as it will encompass the engagement of operators and actors of this sector in being part of the circular transition. Certification is relevant not only in terms of communication and social identity, but it is becoming fundamental to scout new customers and to establish a stable work relation with the already acquired ones. More and more the market and the operators in the final part of the value chain are demanding certification about the sustainability of the production and the commercial operations. This to be transparent, sustainable and reputable in the eyes of the final consumer. Being certified supports and accelerates the virtuous mechanism bringing textile people to be more respectful of the environment and to act in favor of the renovated production and consumption models. Certification is therefore at the basis of the T&F circular transition.

**e. Workforce in the textile & fashion industry: the main needs for being compliant with sustainable practices and circular economy transitions**

As reported above, in order to foster a transition towards a circular economy, it is necessary to have a workforce with certain characteristics that can cope with the changes such a transformation requires. The need highlighted above in terms of skills, show a shortage of skilled workers in many areas of the sector. As reported by Judith Bosch (Textile ETP, n.d), the T&F sector, particularly the textile industry, *“is facing a skills gap as many experienced workers are nearing retirement age and not enough young people are entering the industry to replace them”*.

In light of these considerations, the results in the following chart show which are the main needs in order to rely on a workforce which is compliant with sustainable practices and circular economy transitions.



**REGARDING WORKFORCE, WHAT ARE THE MAIN NEEDS IN THE TEXTILE AND FASHION INDUSTRY FOR BEING COMPLIANT WITH SUSTAINABLE PRACTICES AND THE CIRCULAR ECONOMY TRANSITION?**



The three main needs that survey participants deem most important for being compliant with green and digital transition are: re-skilling and up-skilling opportunities, training of new professional profiles, and attracting new talents.

## Re-skilling and up-skilling opportunities

### A. Digital skills

T&F industry, in light of today's 4th industrial revolution and rapid technological transformation, need to adjust by digitalising the supply chains, adopting photonics, real time process control, data analysis, additive manufacturing, the Internet of Things, Augmented Reality, e-commerce solutions, and more. Additionally, with the COVID-19 pandemic, e-commerce solutions and marketing became crucial. With these developments, the demand for digital skills and solutions is greater than the current supply. Older and more experienced T&F employees face difficulties adapting and acquiring new skills, and this represent a great drawback for the upgrade of the sector and the adaptation need to face the transition to the next manufacturing paradigm (I5.0). On the other hand, the digitally-savvy generation currently entering the job market is less interested in manufacturing jobs.

### B. Green Skills

Recent studies, and the results of the survey confirm them, show that customers' perceptions of sustainability, transparency of the supply chain, circular economy (including recycling) and increased cost of energy and raw materials are the most important factors influencing employment and production processes. These changes have a strong impact on an enterprise's occupational needs and the type of skills required, e.g., those related to sustainable production processes and products (eco-



design), or to the analysis of the environmental impact within the context of the latest standards and legislation.

### C. Ageing workforce

Moreover, the T&F industries are also facing the challenge of an ageing workforce. According to 2020 data, 36% of the workforce is currently over the age of 50, while young workers up to the age of 25 represent only 4% of all employees.

Due to different reasons, the sectors struggle to attract motivated and qualified young talent to study and take up employment in the sector. There is a generally unfavourable perception of these industries by society that results in the impossibility to match supply/demand of occupations. There is a demand for fashion designers and jobs in high fashion brands while other occupations, in particular at the manufacturing and shop floor level, are perceived as unattractive from a career perspective.

## Training of new professional profiles

The textile industry includes a variety of jobs, from machine operators and textile/garment workers to seamstresses and custom tailors, from product manager to process supervisor, from environmental specialist to marketing specialist. The kind and amount of training required varies for each of these jobs in textile production or clothing creation. The need of new professional profiles to be introduced in industries and workshops, but also in design studios and market related agencies is quite highly felt, as the survey demonstrate, probably with a higher level of need perception in large companies, decreasing together with the size reduction of the concerned venture. In other words, new professional profiles, with a high level of specialisation, are less perceived as stringently needed by small business units.

## Attracting new talents

As mentioned above, the textiles industry has an older demographic of workers. Targeted strategies to attract a younger generation to the industry have to be put in place starting from now. Textile workers population is overaged now and will be even older in 5-10 years if countermeasures will not be adopted.

The values of young workers today need to be analysed, and then new strategies have to be set, to allow the textile industry to respond to those values and attract/retain young talents. Often textile companies are not able to recruit workers, at every level of the organisation pyramid, from blue to white collars and corporate CEOs. This need is on top of the list of T&F industry priorities. Therefore, new strategies have to levy on:

- New communication tools;
- Rebuild the image/reputation of textile industry; shift the positive perception of young talents from fashion design towards textile production;
- Empower communication actions of manufacturing companies;
- Design new career paths;



- Textile industry reputation from bad (polluting) to good (recycling);
- Increase workers mobility;
- Push the lifelong learning of textile workers.



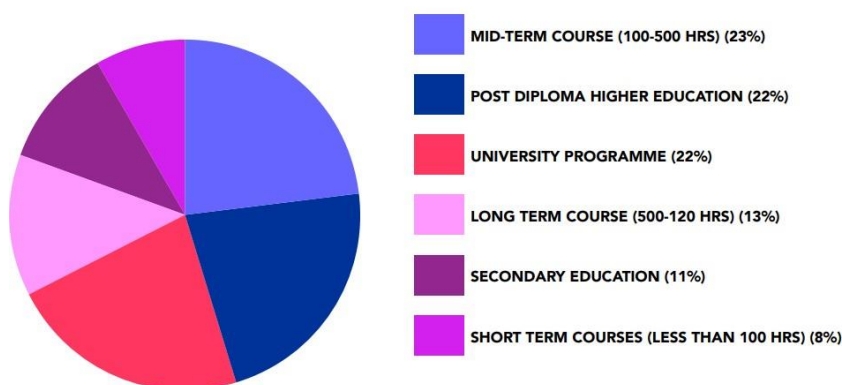


## Professional and market needs for training

Considering the lack of qualified personnel to deal with the transition to a circular economy, the TRANSITIONS project also wanted to investigate through the survey the T&F industry's needs in terms of training such figures.

### a. Training new professional figures

TRAINING NEW PROFESSIONAL FIGURES



Among the various types of programs offered to the audience, the survey results show that those most indicated as most appropriate and necessary to train new professionals are:

- Mid-term course (100–500 hrs)
- Post diploma higher education
- University programme

The mid-term courses are probably preferred since they take not so much time (a course of 100–150 hours, done full time, can be finished in a month), but they have sufficient time to transfer a lot of information and skills, and to deepen some topics, that the students consider more interesting and useful for their future profession. The Academy model from Città Studi is right on this path, given the medium length and the integration of theory and practice, which makes the course appealing and versatile for different topics and target audiences. The University of Florence, Prato branch, confirmed that they follow this line too, with courses integrating theoretical and practical parts, and with a focus on the interaction of learner/teacher, and on the future development of the learner.

As for the post-diploma higher education, of which a good example are, in Italy, ITS (Istituti Tecnici Superiori – Higher Technical Institutes): they offer two years courses, and lessons in a specific educational field and high-level training for companies. Moreover, they offer teaching activities based on job projects, work simulations and laboratories



aimed at preparing highly specialized professionals (Skills4smart, 2022). Students can participate in tailor-made projects, and internships are the first work experience for super-specialist workers.

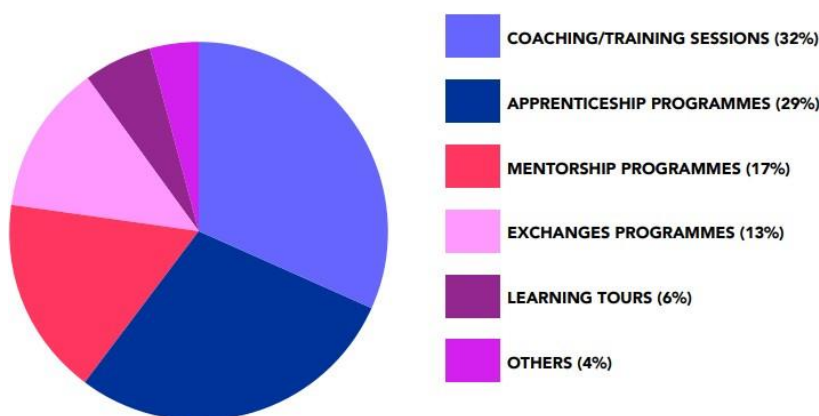
As for the University, perhaps it is preferred for higher profile figures (fashion designers, engineers, managers), who must have a deeper knowledge of management issues and of the whole “picture”, for taking decisions which take into consideration all the aspects of the problem, for “thinking out- of-the-box”, for being capable of design thinking.

All these three types highlight that what companies require right now is:

1. Integration of practical and theoretical parts;
2. Fastness of training, in order to have the new worker “ready” in a short time (it is given more time for super specialized figures and for higher profile ones).

### **b. Training for updating the active professional figures**

**TRAINING FOR UPDATING THE ACTIVE PROFESSIONAL FIGURES**



Concerning the need to update the active professional figures in textile and fashion sector, the most frequent answers are: coaching/training sessions; Apprenticeship programmes; and mentorship programmes.

These three most voted answers have been possibly preferred since they both combine theory and practice, and because they are tailor-made for the figure trained.



### Coaching / training sessions

In effect, the coaching/training sessions are designed just to transfer the knowledge/practical issues necessary for the learner to acquire a new skill or to update the previous ones, and it can be performed also by colleagues of the same company, who have more experience/are more skilled in that field.

### Apprenticeship programmes

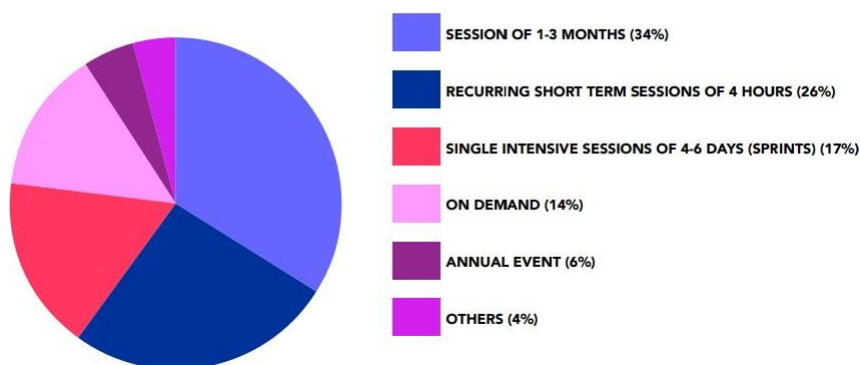
The apprenticeship, on the other hand, is aimed for younger figures (e.g. in Italy the Apprenticeship contract cannot be used for people more than 29 years old): therefore, it is less focused on a single skill/few skills, and more generally oriented to teach all the activities that person will do within a company.

### Mentorship programmes

As for the mentorship programmes, they are probably preferred because people that are very skilled in a job, since they have a long experience in that field, can transfer some of their knowledge to the learners, bringing personal experiences / information / advice, acquired directly on field; this kind of transfer is precious for the learners, since it's not theoretical but coming from the real world – also knowing how a mistake could be managed is priceless.

## c. Ideal length for training activities

IDEAL LENGTH FOR TRAINING ACTIVITIES



Among the various aspects considered when choosing a type of training there is also its duration. In this regard, the graph shows that the most selected answers are: sessions of 1-3 months; recurring short-term sessions of 4 hours; and single intensive sessions of 4-6 days (sprints).

### Sessions of 1-3 months



The most chosen answers are consistent with what has been said before: first and foremost are chosen the sessions of 1-3 months, which give both fastness of training and the possibility to go into deep on topics useful for/required by the learners. This is the modality that can be possibly preferred for new personnel.

On the other hand, recurring short term sessions would be possible preferred for working people, to reskill/upskill them, and to focus on specific topics. The short term, repeated, can also be useful for the learner in order not to stay away for too long from his/her job.

### *Recurring short term sessions of 4 hours*

The recurring short sessions can also be useful to transfer a bit of knowledge at a time, and the learner can reflect on what he/she has been taught, and possibly ask for clarifications / supplementary information in the following meeting.

### *Single intensive sessions of 4-6 days (sprints)*

Single intensive sessions (sprints) could be preferred in case of learners already in touch with the topic, that need to be upskilled/reskilled but, contrarily to the precedent answer, want to finish all the training/education in one shot, in order not to stop anymore afterwards.

## **d. Willingness to pay for training activities**

The cost of a training course depends on many factors: the number of workers to be trained, the type of training, and the duration for example.

To the question “Willing to pay for training activities”, 61% of survey participants consider useful to pay for this type of activity, in order to train or update employees and collaborators. However, a considerable percentage of respondents would not be willing to pay. This confirm one of the main challenges that emerged, namely the difficulty to have “Funding and economic recourse to invest in technology, personnel, and infrastructure”.

A remaining 20% gave a more detailed series of answers, many of which emphasized that the choice of access to training courses and activities was subject to the possibility of being financed, at least in part, by external grants.

In this regard, companies have the possibility to fund these courses in various ways.

Below is the example of Italy:

1. as for the Piemonte Region, they can fund them with:
  - new project “Academy di Filiera” (Academy for the Supply Chain), both for new personnel and for employees already present in the Company. The courses



can be agreed according to the Companies necessities, and they can last from 40 to 300 hours;

- FESR programme (European Regional Development Fund - ERDF) – the programme is already set by Piemonte Region, and they are little adjustable. These courses last from 600 to 800 hours.
2. As for the Italian Government, they can fund them with:
- FORMATEMP: it is the fund for education / training of outsourced workers;
  - FONDIMPRESA – Companies can access it for free, and they have three different modalities to access the funds:
    1. *Conto Formazione*: every Company has an “account”, in which they deposit sums, and from which it can manage and finance its employees’ education and training, freely and online; the Company has to prepare a Training Plan (Piano formativo);
    2. *Contributo Aggiuntivo*: directed to SMEs, it integrates the sums the Company pays with a general account;
    3. *Conto di Sistema*: directed to SMEs, it is a collective account, which allows the Companies to participate to common training courses, divided by territory or by field of activity.

These are just a few examples that can be found in Europe, of courses financed or co-financed by national or regional funds.



## Feedback reporting

Following it can be found the feedback contributions from Transitions partners to the production of the Deliverable.

Feedback summary TRANSITIONS partners on D.2.2			
Feedback areas	<b>Strengths</b>	<b>Weaknesses / Improvement needs</b>	<b>Action taken</b>
Graphics		Formatting and Graphics (ELISAVA)	ELISAVA took care of the formatting and graphics of the deliverable
Content		Analysis of the survey results (NTT, BORAS, CITTA' STUDI, NOoF, MODACC)  Grammar (ELISAVA)	NTT, BORAS, CITTA' STUDI, NOoF, MODACC analysed the survey results.  ELISAVA took care of the revision of the Grammar.



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