Report

Circular economy business models research group

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THE FUTURE OF THE CIRCULAR ECONOMY OF TEXTILES

- ANALYSIS OF TEXTILE INDUSTRY STARTUPS

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INTRODUCTION

The textile industry is currently in a transitional phase, and the direction in which it will develop will be seen soon. The development of technology, bio-based and recyclable fibres and people's interest in responsibility and sustainability have now surfaced and will also steer the industry in a certain direction in the future. On the other hand, fast fashion and ultra-fast fashion and their popularity are taking the textile industry in the opposite direction.

As a result of fast fashion, a lot of clothes are purchased, and individual pieces of clothing are worn little. According to a report by the European Environment Agency, more textiles are consumed in Europe than before, but at the same time less money is spent on them than before. In Europe, the average consumer is estimated to purchase 26 kilograms of textiles annually, but the number of times clothes are used has decreased by about a third during the same period. Every year, consumers waste up to 460 billion dollars' worth of clothes by throwing them away when they are usable. (Finnwatch 2022.)

The goal of this work was to examine and reflect on the future of the circular economy of textiles through startup companies in the field. This work is a continuation of the work already started, where the students involved in the Telavalue project researched and compiled a report related to startups in the textile industry in the fall of 2022. This work was based on this previously compiled report, as well as an Excel table made of startup companies (Startup list 2023) and the source material used for these. Startup companies were found in the Ellen MacArthur Foundation's Circular Startup Index. The work also used the PESTE analysis as an aid when examining startup companies in the textile industry. It was used to get a broader and all-inclusive picture of the companies and thereby the future of the textile circular economy.

1 METHODS AND LIMITATIONS

The work is based on previous work, which was started in the fall of 2022. The work has used previously conducted research as source material, as well as new sources, studies and reports related to the future of the textile circular economy. There are also sources related to future research and PESTE analysis in general.

1.1 Methods

The work started by getting to know previous materials compiled by students. The materials were based on the PESTE analysis, Sitra's weak signals report, and the report of the Future scenarios in Finland - CICAT2025 project. The startups were found in the Ellen MacArthur Foundation Circular Startup Index. Links to these can be found in the list of sources at the end of the report.

 In the fall of 2022, an Excel table was made of startups (Startup listing 2023), which was used in this work and updated. Some of the information in the startup listing was out of date, so the work started by updating it. Almost half of the companies were no longer in the Ellen MacArthur Foundation Startup Index, so they had to be removed. However, new companies had entered the Index, so they were checked and added to the list.

All relevant information about the companies is listed in the table, such as a brief description of the company's operation and what makes the company compatible with the circular economy. PESTE is an operational environment analysis that provides a comprehensive picture of the subject. Using the PESTE analysis, the companies were categorized into political (P), economic (Ec), social (S), technological (T) and environmental (En) related companies. A company whose activities promote sustainable development reporting was classified as a political company. A company that, through its own operations, creates competitiveness and new alternatives to the existing ones was classified as an economic company. A social enterprise was classified as a company whose business involves a sharing platform or other similar interaction between people or companies that change consumer behaviour in some other way. An example of this is

companies that offer reusable packaging for clothing orders, in which case consumers are responsible for returning the packaging. A technological company was classified as a company that uses a digital platform in its operations or utilizes technology in, for example, the manufacturing and recycling process of clothes. The environment category included companies that strive to improve the state of the environment on some level with their operations.

1.2 Limitations

There were more than 100 companies listed in Excel (Startup list 2023), so we wanted to limit the list a bit. Some of the companies were also several years old or had stopped operating completely, in which case they no longer fit the definition of Startup. In the end, it was decided to limit the companies, so that only operators that were founded in 2020 or later were listed in Excel. This reduced the company listing to 77 companies. The companies were selected from the European region, but some are not actually established in Europe, but their operations take place in the European region. It was also noticed that most of the companies in the Index are in any case in Europe, so the list would not have changed significantly even if the limitation had not been made. However, we wanted to make a more precise delimitation of the work, and for the sake of clarity, these few non-European companies were left out.

2 STARTUP COMPANIES

In this work, companies from the European region were studied and their business ideas were relatively technical or otherwise highly developed. The companies' operations focused on technological solutions and various online platform functions related to clothes. With the help of startup companies, we wanted to study the general picture of the circular economy of textiles and what kind of problems there are, as well as what kind of solutions they require.

2.1 Definition of a startup

There are many definitions for startups, but the European Startup Network's definition was used as the basis for this work. The European Startup Network defines a Startup as follows: a startup is an independent, less than 5-year-old organization whose goal is to create, improve and expand a scalable, innovative, technology-based, fast-growing product (European Startup Network).

2.2 Overview of startup companies

The work started by comparing startup companies with each other by observing the companies' founding countries, target groups, descriptions, and websites. In this report, we only looked at information that was publicly available and, for example, the companies in question were not interviewed.

Many companies have different sharing and other digital platforms for renting, selling and repairing clothes. The users of these platforms are both consumers and brands. In general, technology plays an important role in many companies. The digital wardrobe is also part of the concept in a few companies, for example with the repair and maintenance service. In the future, repair and maintenance services will be made more attractive or easier to reach, these services will be made accessible to consumers and brands. In several startups, maintenance services were brought either directly to the consumer or indirectly through the brand. Brands are encouraged to resell their products or repair them, either for resale or back to the owner of the product. (Startup list 2023.) By looking at the countries where the companies were founded, it was noticed that many of the

companies were founded in Great Britain. In addition, it was noticed that although the delimitation was made within Europe, some of the companies were established outside of Europe, for example in the United States or Canada. However, their operations take place in Europe, so these companies also remained on the list. Before these restrictions, it was noticed that almost all companies' founding countries were in Europe. From this we can conclude that Europe is a pioneer in the circular economy of textiles compared to other continents, or that Ellen Mac Arthur's listing is focused on Europe. (Startup list 2023.)

Some of the companies were not directly textile industry companies, but with their own activities or through ideal, they still contribute to the circular economy of textiles. For example, a company that manufactures a substitute for plastic is not directly a company in the textile industry, but its product can also be used in the textile industry. (Startup list 2023.)

In several startups, the target group was families with children. This is probably perceived as important by the target group, because in families with children, a lot of clothes are bought during the first years, both for the children and for the pregnant parent. The financial situation may also be one of the reasons why families with children may be more likely to choose, for example, maintenance and repair services, rather than constantly buying new ones. The same applies to used clothes, and in addition, the ease of buying and selling will certainly bring busy families with children to these services. (Startup list 2023.)

2.3 PESTE analysis of target companies

The companies were compared using the PESTE analysis and were divided into different categories based on their operations. The political (P) category of the PESTE analysis did not include a single company, and the environmental (En) category included all companies on the list. This is explained by the fact that all companies supported the circular economy and improved the state of the environment through their own activities. 12 of the companies were classified as economic (Ec), these companies create competitiveness and new alternatives to existing ones with their own operations. For example, companies in this category develop more environmentally friendly and better alternatives for certain materials/raw materials, such as plastic, leather, chemicals, and palm oil. 18 of the companies were classified as social (S), and from this it is easy to see how many

companies used a social sharing platform or something similar in their operations, through which they can communicate with others. Companies that try to influence consumer attitudes with their activities were also counted in this category. 65 of the companies belonged to the Technology (T) category, and through them the textile industry is moving to the Internet and that technology is being utilized more and more in the circular economy of textiles. Among the technology companies, there were plenty of different online platforms where either brands or consumers can buy, rent or service clothes. (Startup list 2023.)

The PESTE analysis shows that technology and the sharing economy will be the most important cornerstones of the textile circular economy in the future. Technology will help in the future to trace the entire value chain and life cycle of textiles, and to extend the life cycle of textiles with the help of various online platforms. The sharing economy can be seen as an increase in renting, borrowing, and donating and selling among consumers. Maintenance and repair services as part of the sharing economy are also likely to increase.

The research showed that among the startups there were not many companies focused on the manufacture or production of clothes, but rather services that extend the use and maintenance of clothes (Startup list 2023). From this it can be concluded that probably soon the primary focus will be on encouraging consumers to reuse and recycle, and to increase the length of the life cycle of clothes by repairing and maintaining clothes, and to shape consumer attitudes and habits in general. Manufacturing and production cannot be modified until consumers' attitudes and habits are modified. Laws and regulations can interfere with the development of fast fashion to some extent, but if there is demand, there will also be parties who take advantage of this.

2.4 The biggest problems and possible solutions

Overproduction of textiles and insufficient recycling of textile waste are major problems now and in the future. In Finland alone, 70–100 million kilos of textile waste are generated annually (Kuluttajaliitto). Globally, the figure is 92 million tons of textile waste annually (Finnwatch 2022). Many of the startups tackle this problem, recycling clothes and utilizing or reusing the waste generated at the end of the clothes' life cycle (Startup list 2023). In the future, waste will be a usable raw material for many operators, and its utilization in companies can provide a new market niche. Development and innovation are

also needed for the utilization of cutting waste and other textile waste. A few startups are looking for a solution to this problem, for example by bringing together a company that utilizes cutting waste and a company that produces cutting waste (Startup list 2023).

The value chains of clothes and textiles are currently long and global, every step of the product, from the cultivation of cotton to the sale of the garment, may take place in a different country. In addition, each step may involve a different company. (Finnwatch 2022.) It was noticeable in the startups that there is a desire for improvement and transparency in this problem. New technology is being developed to track waste streams or different stages of production/manufacturing. Many companies pay attention to supply chains and to where the clothes end up. Everything starts from product design and its improvement, product design should consider the entire product life cycle, including the end of the life cycle. (Startup list 2023.) The digital product passport is also mentioned in the description of a few companies, it collects information about the product in a versatile way and helps to increase its transparency (Startup list 2023). The product passport can also collect information about the product's entire value chain, such as product use, maintenance, and recycling. The digital product passport benefits many actors, for example authorities and manufacturers. (Teknologiakeskus 2022.)

In the future, responsibility will also be shared with brands in the fashion industry, for example in the form of clothing resale or repair service. The startups included companies that wanted to facilitate the resale of brands' clothes through their own activities or to offer brands a repair and maintenance service that the brand in question can offer to its customers or use itself before reselling the products. (Startup list 2023.)

Single-use plastic is often used as packaging material, and replacements are now being sought. More ecological alternatives are needed for packaging materials, for example reusable packaging. One solution to this problem is that the same packaging would be used again and again in the clothes rental service, and it would be made so durable that it would not break down even with long-term use. (Startup list 2023.)

2.5 Interesting companies from the material

Here are some excerpts from the material, examples of different types of companies, all of which offer solutions to the unsustainable situation in the textile industry in their own way. The business idea of the presented companies differs from others or in some other way brings a solution to a central problem.

2.5.1 Cellulotech

A company from Canada that was founded in 2020. The company has developed a green chemistry process that makes paper water, grease, steam, and oxygen repellent. This material is supposed to act as a substitute for plastic. In the process, the recycled mass, biodegradability, and composting properties of the paper are preserved. Cellulose-based products could replace unsustainable materials. (Cellulotech.)

2.5.2 Circular Concierge Ltd

The company originates from Great Britain, where it was founded in 2022. The company has developed a digital wardrobe mobile application where consumers can digitize their wardrobes, connect to services for extending the product life cycle, and calculate the effects of clothes before and after sales. The operation is based on extending the life of the products and on the fact that the consumer can easily contact repair and maintenance services. The consumer can also sell or rent their clothes with the help of the service's partners. (Cicon.)

2.5.3 DressX

A company from the United States that was founded in 2020. The company offers digital clothing for social media updates. The company's operations can be in line with the circular economy if it reduces the purchase of new clothes and may become more common in the future if, for example, virtual reality increases. (DressX.)

2.5.4 Re-born

A company from Slovenia, founded in 2022. The company manufactures baby products from a new biomaterial made using a local waste source, i.e. walnut shells. The company aims to reduce plastic in baby products by replacing them with this biomaterial. (Re-born.)

2.5.5 Redivivum Technology

The company originates from Great Britain and was founded in 2022. The company develops the industry's first automatic sorting solution for the fashion industry powered by artificial intelligence, so that used clothes can be better sorted from the post-consumer waste stream for reuse and recycling. The company's technology is based on the automation of textile sorting with the power of artificial intelligence and machine learning, to develop an intelligent process and provide a digital vision of the quality and quantity of processed textile waste. (Redivivum Technology.)

3 FUTURE REVIEW

The analysis of the operating environment is often the first step in a longer forecasting process, in which case it can lead, for example, to creating scenarios. The analysis of the operating environment can be used as an aid in forecasting the future. In this analysis, a comprehensive overall picture of the events, development trajectories, dependency relationships and emerging phenomena related to the subject under investigation is formed. These factors can often be of great importance for the company's future. (Tulevaisuudentutkimuksen Verkostoakatemia 2022.)

3.1 The future in the textile industry in general

Finnwatch has produced a report that discusses the transition of the clothing and textile industry to a carbon-free circular economy, and its effects on employment from the perspective of corporate responsibility. (Finnwatch 2022.) According to the report, bringing the environmental impact of the clothing and textile industry to a sustainable level requires a rapid and significant change, especially in the manufacturing methods of the products, but also in the production volumes. Ethical and ecological effects should be remembered to be considered and changes should be made quickly. The linear economy should move to a circular economy to achieve lower emissions. Often, the value chains of clothes and textiles are long, global, and many different companies can take care of their stages. In particular, the beginning of the chain may be divided into many different chains, and dozens of different companies may be involved in the production and logistics of one piece of clothing. Because of this, managing the value chain is challenging, and the things that happen inside it can easily remain hidden from the product manufacturer. (Finnwatch 2022.)

The textile industry's most important steps towards a more sustainable future start from design, clothing should be designed to be long-lasting both structurally and stylistically, considering the recycling of the clothing. In addition, raw materials should be produced sustainably, i.e. by increasing the production of more ecological natural fibres and reducing the use of harmful chemicals. The entire production should be sustainable, changes could be made, for example, by improving energy efficiency, reducing the use of natural resources, switching to renewable energy, and reducing the amount of waste material.

The use of clothes should be sustainable, and that means, for example, an increase in the recycling of clothes and the use of loan services. The last step is more efficient collection and recycling of used clothes as material. (Finnwatch 2022.)

The textile industry has recognized its large environmental footprint and targets have been set to reduce its own emissions. However, many actions are very superficial. To get the environmental impact of the textile industry to a sustainable level, it is necessary to give up fast and ultra-fast fashion. (Finnwatch 2022.)

Finnwatch's (2022) report states that the most significant emission reductions could be achieved in production by improving its energy efficiency and at the same time increasing the use of emission-free energy. In addition, production enhancements in the manufacture of raw materials would have a great impact. Significant reductions would also be achieved by reducing overproduction and longer-lasting use of clothes and maintenance of clothes.

However, the transition to these operating models is slow and many different variables and perspectives must be considered. One factor slowing down changes is production costs as a competitive factor. Factories and production countries are constantly competitive, and the production of brands is often carried out by subcontractors. This activity of subcontracting chains is limited, for example, by corporate responsibility laws and bans on the import of products made with forced labour. For example, trampling on working conditions could result in financial or legal sanctions. These laws have already been enacted in, for example, France and Germany, in addition, similar laws are being prepared in Finland and at the EU level. The European Union is also currently planning a ban on the import of products produced by forced labour, a similar ban is already in force in Canada and the United States. (Finnwatch 2022.) In addition, consumer attitudes and consumption habits can be seen as one problem or slow-down. Even if textiles and clothing are produced more sustainably in the future, are consumers ready to pay extra for the product to be produced responsibly.

3.2 The future in the textile industry based on the material

The necessary changes to get rid of fast fashion are still unknown to many people, such as renting clothes or extending their life cycle. However, these actions have already been piloted in many companies, but mainstreaming has not yet occurred. In addition to

consumers, it would require a change in companies and public actors (Finnwatch 2022.) Startups in the field can indeed act as trendsetters here, and new ideas can be drawn from them or, correspondingly, it can be noticed which ideas do not necessarily work or are current at least right now. The companies discussed in this report would be able to offer solutions in the textile sector to both individuals and companies as they move towards a more sustainable textile and fashion sector.

The exceptional conditions experienced during the pandemic made trading move quickly online. This was also noticeable in the operations of startup companies, many of the companies were founded during the pandemic and many of their operations were focused on the online (Startup list 2023). In a report by the consulting company McKinsey, it is reported that the pandemic may also lead to the enhancement of value chains in the clothing and textile industry by narrowing product selections while reducing the need for storage and moving to production that meets consumer demand more than before (Finnwatch 2022).

The startups' activities strongly included technology and its utilization. It will presumably be one of the most important aids in the future, the development of technology shows the direction of the future in the textile industry. In the future, for example, technology will be used more and more in the recycling and identification of textiles. (Startup list 2023.)

When looking at the future of the circular economy of textiles, it was noticed from several different sources that bio-based textiles play a big role in it. It was surprising to notice that they were almost completely absent from startup companies, except for a few companies. Only a few companies focused on bio-based materials in their operations. In addition, it was noticed that there were many similar companies among the companies, and it would have been great if there were many more that stood out. (Startup list 2023.) But it can be stated that all ideas and development are important and move the circular economy of textiles forward.

4 SUMMARY

Based on this report, three issues can be highlighted in the future of the circular economy of textiles: technology, the sharing economy and transparency. Technology facilitates the sharing economy and increases transparency. Technology will also increase in the future when looking at the entire life cycle of textiles holistically. All three of these are intertwined, the development of technology improves and facilitates the sharing economy, and at the same time technology increases transparency and brings a clear structure to the entire value chain of textiles. An interesting observation was also that among the startups there were hardly any companies focused on the manufacture or production of clothes, but rather services that extend the use and maintenance of clothes. In the future, consumers will be encouraged to reuse and recycle, and to increase the length of the life cycle of clothes with maintenance and repairs.

Sharing the responsibility also with the brands increases the pressure on the textile industry to focus on transparency and its own operations, where it could be improved and if sustainability could possibly be the company's trump card compared to competing companies. In the future, brands could also be encouraged to find out about the entire manufacturing process of their own products and invest in the transparency of the entire value chain.

Consumer attitudes are also an important part of the future of the textile circular economy, each consumer can guide the future in a certain direction with their choices. These attitudes must be modified, and the problems of the textile industry brought to the fore more, especially among young people. The consumer can make a lot of changes with their own choices, because the demand has a direct consequence in which direction the brands in the textile industry take their products or what kind of concept they create.

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