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Linear Economy versus Circular Economy: New raw material

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Abstract

The fashion industry plays a key role in the road to sustainability and around financial system. Indeed, the fashion industry is a sector with a strong impact on the environment; it requires a very long and complicated supply chain linked to the high use of water and resources, the use of chemical substances, the contamination of water and air, the production of waste and, finally, the generation of microplastics. Textile and textile waste has become a huge international concern. Against this context, the objective of this paper is to evaluate existing measures of the European Union (EU) that have an impact on the development of sustainable practices and the transition to a round financial system in the style industry, with a specific emphasis on the need for clothing in the EU (for paintings and pleasure). However, what we put on places a huge strain on the atmosphere. In the past 15 years, growing prosperity and the churn of rapid manner have contributed to the doubling of the development of world clothing. It is grown at a faster fee than Gross Domestic Product (GDP), and on the identical time, use of clothes is diminishing, with lots much less than one percent of the fifty-three million tons of fibers produced every 12 months, 1/2 of one million tones turning into recycled returned into production. Most style finally ends up in a landfill and maximum of it, an extraordinary waste of money, within 12 months of being made. Therefore, the Ellen MacArthur Foundation (EMAF) is organizing an international alliance to show the linear discard put on style financial system right into a round one. Big manufacturers such Burberry, Gap, H&M, and Nike, have come on board to paintings to expand a round financial system that levels out dangerous substances and maintains garments in use. Revised waste legislative framework followed inside the 2015 Circular Economy Action Plan.

Keywords
Fashion industry, Circular economy, linear economy, Gross Domestic Product (GDP).

1. INTRODUCTION

Evoked by the economic revolution and, therefore, the starting of mass production, the businesses and therefore the client have stuck to a linear business model useful creation, with associate degree ending lifecycle that expires with disposal of the product. Relating to the style industry, the roots lie within the quick manikin (Takalo et al., Khaksar et al., 2010; Abdul-Halim et al., 2021; Taherinia et al., 2021; Vesal et al., 2013; Hakkak et al., 2016 McKinsey, 2016). Shorter lead times for production allow corporations to introduce a lot of assortments per year, so the trends are simply short-lived. Quick fashion retailers refresh their assortment weakly to encourage their clients to shop for perpetually new garments (McKinsey, 2016). Apparel corporations have sharply cut prices and efficient them provide chains so as to satisfy the expectations of the low price, the exigent consumer. According to a McKinsey report in 2016, a hundred billion clothes are made each year (McKinsey, 2016). Nowadays buyers buy five times as many clothes as they did in 1980, or 68 items each year, and the typical garment is worn seven times (The Wallstreet Journal, 2019). The fashion business is becoming the second largest polluting industry, answerable for 10% of world carbon emissions, behind the fossil oil trade

(New royal family Times, 2019; Forbes, 2016). Only in 2015, the fashion garment sector utilized 79 billion blockish water meters, a figure that is predicted to rise by 50% by 2030. (Rifinery29, 2019). Not surprisingly, the business generated 2. 5 billion in international yearly sales until the Corona Epidemic hit in 2020. (McKinsey, 2020). Among alternative things, % of garbage, usually recycled and even harmful, is explained by the up-to-date consumption trend (Kos, 2016). More than sixteen million loads of textile waste were generated in 2014, in keeping with the Environmental Agency (EPA). Of these, solely 2. 62 million tons are recycled, 3. 14 million tons were combusted for energy recovery, and 10. 46 million tons were sent to lowland sites (the balance smb, 2019).

The highest level has gained additional management than ever in recent years, impelled by conscious supporters together with such David Attenborough and Greta Thunberg. They boost awareness concerning the present conditions facing the planet to improve the perspective of consumers who use their wallets to drive society to a greener future (Gheitarani et al., 2022a; Sepahvand et al., 2022; Vafaei-Zadeh et al., 2022; CSO, 2020; Sadeghi et al., 2013; Nawaser, 2015; Hakkak et al., 2014 Jahanashahi et al., 2020; Shamsaddini et al., 2015). In addition, sales for the world fashion, fashion, and luxury business can decrease by twenty-seven to thirty % in 2020 compared to the previous year keep with the McKinsey report Corona update 2020. Lost profits and lockdown stores were evoked either by Corona Pandemic, a tributary to overfilled warehouses loaded with unsold seasonal stock. Corporations that withstand this crisis can have undertaken swift and daring action to strengthen their core business, finding new markets and competitive opportunities in a dramatically reworked world industry (McKinsey, 2020). The tragic events could have caused the business to reach the 'tip of the iceberg', focusing on additional property and developing technology to realize a greener future. As a result, a shift from a linear to a circular economy is required to maintain goods durable and within a reprocessing cycle, as well as to combat the growing trash heap. Within the framework of the fashion business, we will address the transition to a circular economy. We'll start with an overview of the linear and circular economies, after which we'll go further into the waste problem caused by the current linear system, as well as how garbage will be used in the circular economy and how information is becoming more important in the circular system. Finally, we look at several brands who are currently using roundness in their operations and may be considered forward thinkers in the industry.

Figure 1. A General Process of Recycling.

2. LITERATURE REVIEW

2.1 Linear Economy and circular economy in comparison

The first, indirect frugality, has been used since industrialization, while the ultimate is more recent, although the original proposition on it dates to the 1960s. Due to this scheme, which is analogous to a flat line, the direct frugality can be planted under the name 'open cycle.' The main problem that arises with this product approach is the illogical operation of the available offers. During the process of the product, coffers are generally not enforced in the final product. Besides the severe damage to the biosphere, the downfall of the direct frugality is mortal exploitation as well. This system emphasizes the products themselves, and the outgrowth of such an equation is mass product and consumption. Circular Economy Indirect frugality comes as volition to the system of direct frugality. The indirect frugality is concentrated on the operation of products as coffers. The system used for the indirect frugality is the 3R principle of reducing, exercising, and reclaiming. An indirect frugality can be also planted under the name of 'unrestricted system of the product. The business model of the direct frugality is also concentrated on products, whilst the business model of the indirect frugality concentrates on service (Pearce et al., 1990).

2.1.1 Linear Economy

The billions of tons of garbage that annually end up in the environment lead to obvious, but insufficiently understood, consequences. The main reason for what is happening is a linear economy: mining, production, distribution, consumption, waste. Despite the benefits of a circular economy, the linear economic model still dominates. CEPS (Centre for European Policy Studies) explain this fact by the complexity of the concept of “circular economy” and the lack of description of the importance of circular economy for different industries. For example, how can it be used in the fashion industry? All stakeholders, including business representatives and politicians, need a better understanding of how this approach is applicable to different players and industry sectors. As a result, manufacturers were encouraged to follow business models that focused on extensive material use and economized on human labor.

While the linear economy has been exceptionally successful in creating material wealth in industrial nations up to the 20th century, vulnerabilities have been seen in the new millennium, and the eventual collapse is predicted in the coming years. The Ellen MacArthur Foundations (2013) reports, based on data by performance profile, that commodity prices reached a tipping point in 1999, and unpredictable upward strength was generated from previously decreasing manufacturing costs. Incremental prices and high volatility can be attributed to the increased demand that pushed output to a point in the cost curve where the production cost rises dramatically and to the depletion of easy-to-access extraction sites, which puts mining at risk of taking technical risks bringing new sites online. This pattern has been combined with growing competition, which has stopped businesses from ultimately exerting a profit squeeze on arms and pushing the value from passing the price rises on to their consumers. Finally, finally making a profit and streamlining their guns and adding value bypassing the price increases on their consumers. This mentality is primarily based on the extraction of resources, the manufacturing of products and offerings, and the disposal of post-patron waste.

However, this method is coming below the growing strain due to its environmental and financial disadvantages (Gheitarani et al., 2022b; Gogheri et al., 2013; Gharleghi et al., 2018; Hashemzadeh et al., 2011). These days, environmental issues have emerged as a worldwide issue. For example, withinside the remaining decades, the hassle of ingesting water scarcity is relevant. There are nonetheless issues of pollutants in the atmosphere, soil, and water via

diverse commercial wastes and emissions. And there are nonetheless a number of the style industries that contribute to the destruction of vegetation and fauna. A boom withinside the quantity of labor and the quantity of merchandise produced ends in the immoderate intake of natural resources, in addition to a boom in dangerous emissions into the environment. Great environmental harm is a result of deforestation and the processing of uncooked wood materials. As a result of this, now no longer handiest a huge quantity of waste is generated; however, a huge quantity of vegetation is destroyed. In turn, this leads to a lower in oxygen manufacturing and a boom in the quantity of carbon dioxide withinside the atmosphere. Many species of animals and birds that lived withinside the forest additionally died.

The absence of timber contributes to weather extrude, temperature adjustments emerge as sharp, humidity adjustments, and soils extrude. All this ends in the truth that the territory turns into flawed for human life, and they emerge as environmental refugees. At present, the environmental issues of the enterprise have reached a worldwide nature. The improvement of diverse sectors of the economic system ends in environmental pollutants and the depletion of natural resources. If the scenario now no longer extrudes within the foreseeable future, all this will cause a worldwide catastrophe. As it became stated earlier, we cannot forget it Sharm on account of atmosphere offerings. This financial version additionally jeopardizes the delivery of materials. This uncertainty is a result of fluctuating uncooked fabric prices, scarce materials, geopolitical dependence on different materials, and growing demand.

These issues are solved in a circular economic system. The dangers are defined below. Natural resources are squeezed between, on the one hand, rising and less stable prices in the resource markets and then on the other, increasing demand for materials and high competition in developing economies. This has a knock-on impact on the cost and availability of the goods needed by the installer. In addition, these elements, including indium and ch44romium, are only accessible to a very small degree. For their production methods, various industries use needed nutrients heavily. These raw materials are used by the metal industry, the computer, and electronics industry, the electronic equipment industry, as well as the auto and automotive industries. These sectors make up a significant proportion of the economy in the Netherlands (CBS, 2019). Goods have become increasingly powerful. Water shortage, but an oil trading oil surplus to buy grain. As a result, these raw materials are, as they were, linked to each other. In addition, the production process of many goods depends on water and fuels. As a result of this interdependence, the scarcity of one raw material will have a widespread effect on the prices and availability of many more goods during the 20th century, worldwide material consumption increased eight times. By 2050, global resource use is expected to have tripled. As a result, the world faces an unprecedented number of environmental challenges. In addition, there is a growing challenge that many resources are or will become scarce. Product lifespan is still decreasing because there is a process of positive feedback: consumers want new products faster and therefore use their “old” products shorter. This, in turn, means that less quality is needed in a product’s lifecycle, which in turn leads to consumers wanting new products even faster (Circle Economy, 2018). In the 1950s, there was a marked shift away from the “waste not, want not” approach to life, replaced instead by a feverish post-war consumption boom where status came to be defined by the number of products consumed instead of the quality of products produced. Today is the perfect opportunity to reflect on this shift since recycling is a key enabler of the circular economy. Prices have risen or have become more volatile in the last decade. Therefore, more and more companies.

2.1.2. Circular Economy

The circular economy is an alternative economic system in which the linear flow of materials and other resources (Make use dispose of) is replaced with a circular system. The circular economy aims to minimize waste through the product's entire life cycle by designing durable and recyclable products, applying more sustainable and resource-efficient production practices, lengthening the life of products by repair, reuse, and recycling, and thus minimizing the use of virgin materials. The system is found in restorative and regenerative production and consumption. The circular economy aims to keep materials and resources in the system for as long as possible without disposing of them. (EMF, 2020). The circular economy is a comprehensive way of organizing the business and takes into consideration the whole life cycle of a product and all actors included in it, designers, manufacturers, suppliers, executives, retailers, and even consumers. (Niinimäki, 2018; Moezzi et al., 2012; Khaksar et al., 2011; Hakkak et al., 2013; Eizi etal., 2013; Jahanashahi et al., 2011). In the Figure below, the main flows of materials in the circular economy in the fashion industry case are visualized.

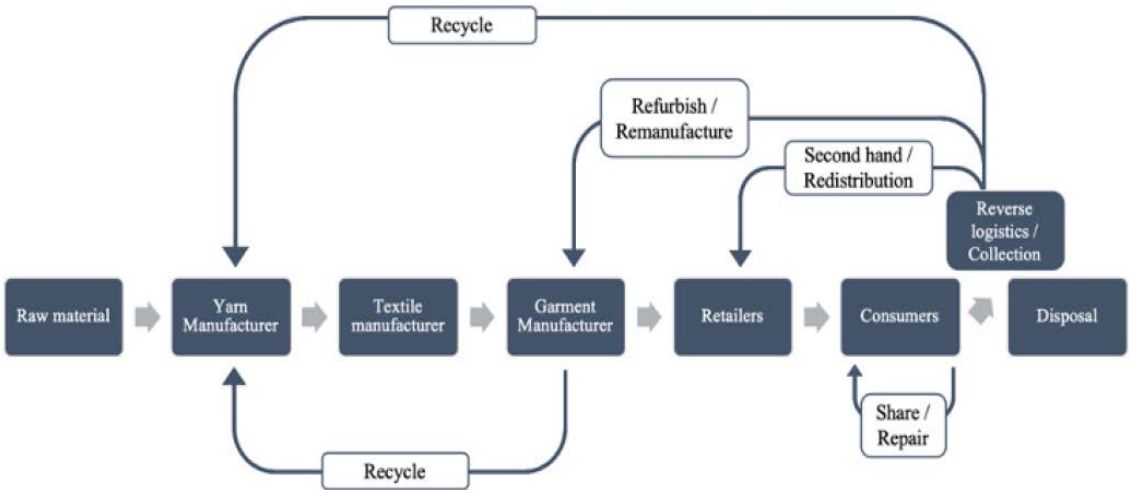

Figure 2. The Circular Economy Processes.

The linear supply chain, which starts from raw materials and ends in disposal, is designed in a new way, where products are collected after they would normally become waste and "reversed" back on the supply chain and used again either by recycling, remanufacturing, or redistributing. Beginning from the design, products should be designed for longevity and circularity. This means that designers should favor environment-friendly, renewable, and recycled materials and sustainable manufacturing practices. Most importantly, the use after the garment is not consumable anymore should be taken into consideration already in the design. Can the material be recycled into a new garment or used in another way, or will it be inevitable to dispose of? A circular economy calls for a cross-industrial collaboration as materials can easily find a new purpose in another industry. As an example, t-shirts can be made out of water bottles.

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long as possible without disposing of them. (EMF, 2020). The circular economy is a comprehensive way of organizing the business and takes into consideration the whole life cycle of a product and all actors included in it; designers. Besides the materials circling in the supply chain by reusing waste and products, the circular economy can also be applied to our consumption. Collaborative consumption, meaning the shared use of a good or a service, could work as a great way toward a more sustainable fashion industry. What makes collaborative consumption environmentally friendly, is that it enables to lengthen the consumable lifetime of a product which can slow down the production flow (Zamani et al., 2017). The clothing can be used for its whole value by renting or sharing clothing as it rarely sits in the closet unused. According to EMF (2017) increasing the average number of times clothes are worn is the most direct method to capture value and design out of waste and pollution in the fashion industry, which is exactly what collaborative consumption does. A great side effect of rental services is that they also encourage brands to design for durability, as they will make more profit the more times the garment can be rented (EMF, 2017).

When it comes to the circular economy, it is important to consider that waste and materials are not the only points of focus. Though easily associated with reusing waste, the circular economy is more about reducing waste. Reusing waste is surely a step towards a circular economy but in the ideal scenario, all products would be designed and optimized for disassembly and reuse and there would be no waste to be recycled. In the ideal circular economy scenario, the supply chain would be fully a closed loop, and everything; raw materials, products, and even the manufacturing equipment would circulate constantly and be never disposed of. (WEF, 2020). Now, complete circulation on a large scale is only a theoretical possibility, but a partial adaptation of the circular economy is used in many fields and is becoming a long-term strategy of many companies (Ungerman & Dedkova, 2020).

The circular economy is currently gaining momentum and being talked about a lot; however, it is not a new invention. According to EMF (2020), the circular economy started gaining attention in the 1970s within a small group of academics and businesses. In a circular economy, a lot can be learned from nature. As we know, there is no waste in nature and all materials flow through endless closed loops which is exactly what a circular economy aims for. Biomimicry/Mimicking nature can greatly help us in the change towards a more circular economy. Seth Galewyrick in his TED talk (Link: https://www. youtube. com/watch?v=Fidi8Js0Qjs) from last April, explains how following the example of nature is so valuable in the future, for suppliers, executives, retailers, and even consumers. (Niinimäki, 2018). In the Figure below, the main flows of materials in the circular economy in the fashion industry case are visualized.

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2.2 What Makes A Circular Economy More Sustainable Than A Linear Economy?

As said before, the financial system can allow to slow down the extraction of uncooked substances and manufacturing because the already existing substances are reused, which means there's no want for brand spanking new virgin substances. To be capable of now no longer want to extract such a lot of uncooked substances is honestly sustainable. The round financial system also ambitions to apply renewable power and other sustainable manufacturing practices, making it an extra sustainable approach than a linear financial system. The discount of waste, which is feasible around the financial system, can combat the contemporary waste hassle created through the happening linear system, presently inflicting plenty of bad environmental impacts. From around the financial system to paintings on a big scale, the delivery chain might want to be very obvious to manipulate the cloth flows efficiently. This should also assist with the happening social sustainability troubles of the style industry, which means the negative running situations in garb production, as presently, they may be honestly hard to clear up due to the complexity of the chain and the opaqueness. Last, however, now no longer least, a Circular financial system performed properly can be economically more sustainable than a linear financial system. Currently, we aren't the usage of our sources for his or her complete cost, nor are we the usage of the overall cost of the garb we use. According to Fletcher (2008), on the common simplest 30% of our cloth dresser is in lively use, which means we're retaining a big unused resource disused. In addition, 15- 30 percent of the textiles produced are wasted already withinside the production element as a manufacturing waste (Niinimäki et al. 2020). A great part of those unused sources come to be in landfills, whilst the valuable substances should nevertheless be used and financially benefited from, and the garments are probably shared or recycled in place of disposed of in landfills. What comes to the bad facets of the round financial system is that it would create extra want for transportation because the garments and substances are moved around and recycled, which would possibly triumph over the nice impact it has on the environment if the transportation is performed in unsustainable manners.

2.3. Waste And Data As New Raw Material

As mentioned before, the current fashion system operates in an almost completely linear way, which means that large quantities of non-renewable resources are used, causing a massive waste problem, especially since the 2000er when the Fast Fashion Industry expanded tremendously, led by brands like Zara and H&M (Greenpeace, 2017). Since then, clothing sales have almost doubled between 2002 and 2015, from 1 trillion us dollars to 1. 8 trillion us dollars (McKinsey, 2014). Before the Corona Pandemics in 2020, industry experts expected a further increase of the industry to 2. 1 trillion us dollars by 2025. Clothing production doubled in the years from 2000 to 2014 and in 2014, over 100 billion new items of clothing were produced. Today's textile trends became the garbage of tomorrow, as 85 percent of all textiles go to the dump each year (Business Insider, 2019). Fast fashion brands are producing new trends in ever shorter intervals, and the average frequency of wearing a garment has decreased by 36 percent compared to 15 years ago (Euromonitor, 2016).

There is hardly any real recycling. It is not about recovering fibers to make new clothes. The materials are mostly shredded and processed into cleaning rags or insulation and fillers, which means just a temporary extension of life, as in the end, these rags become garbage. So-called fiber-to-fiber recycling, the conversion of old materials into usable yarns or fabrics for new clothing, hardly ever takes place (Ellen McArthur Foundation, 2017). A major problem is identifying the fibers, and even when fabrics are recognized, the many fiber mixes, the composition of different fabrics, buttons, zippers, and so on prevent an economically profitable separation (Gothenburg University, 2015). The mechanical separation of fibers, especially cotton

and wool, is a technically established process but at the expense of quality. Larger amounts of new fibers have to be mixed in for usable yarns. The recycling of synthetic fibers is much more limited, and only a few companies offer chemical recycling of synthetic materials. However, none of the methods now developed is economically viable (The Guardian, 2015).

In contrast to new technologies, the biggest issue is the high cost of recycled fibers. In addition, the apparel industry weighted down deadstock fabrics and unsold inventory, which accounts for 10 percent of global carbon emissions. Because of society's greater consciousness, brands are under greater pressure to reduce their environmental effects and understand the need to pursue more sustainable alternatives in the supply chain. It is not only cloth waste that is manufactured but also vast volumes of other resources that have a detrimental effect on humans and the environment. The textile industry relies largely on non-renewable energy. A total of 98 million tons per year, including oil for the manufacture of synthetic fabrics, cotton fertilizers, and chemicals for the processing, dyeing, and finishing of fibers and textiles, requires approximately 93 billion cubic meters of water to be used annually (Ellen McArthur Foundation, 2017).

2.4. Waste As Raw Material

Waste can be eliminated within a circular fashion economy (Ellen McArthur Foundation, 2017), and it aims to minimize waste to a minimum by retaining the products as long as humanly possible in the use and output cycle. During the supply chain, materials are collected and reused whenever possible and converted into new fabrics and garments with the aid of various recycling technologies. The beneficial effect on the atmosphere is relatively high with the use of recycled fabrics, which was shown by a pilot project with a denim maker that saved 53 percent of energy due to the use of recycled fibers, while water savings amounted to 99 percent and chemical savings were 88 percent (CBI, 2020). And not only will the money be spared, but economic benefits are often left untapped by the linear system. Clothing underuse is a huge chance to capture profit, as buyers waste billions of dollars in value by disposing of wearable clothing (Ellen McArthur Foundation, 2019)

While textile recycling focuses on the recovery of Up-cycling of waste materials for reuse, remanufacturing or reprocessing is a method of recycling in which the waste material is turned into a higher-value, improved quality commodity. From an ecological, social, and economic perspective, both textile recycling and up-cycling are potentially advantageous alternatives. They reduce landfill space requirements, the use of new fibers, energy, and water consumption, help prevent pollution and reduce the demand for dyes (CBI, 2020). The prevention of waste starts already within the design process, and it is a collaborative effort across the value chain. An innovative business model must be matched with a forward-thinking designer and professionals with the tools to design for circularity. By considering the whole usage and lifecycle of a product, clothes can be designed according to unlock the full value of clothing, rather than seeing it as garbage. Thoughtful design matched with innovative business models could change the whole value chain and the possibilities of reusing the materials again and again.

2.4.1. Data As Raw Material

But waste is not just an essential resource for the circular economy, but also data used during additive manufacturing (AM) and should be implemented into the circular economy with the aid of machine learning (AI) and could help the industry adapt to sustainable processes. By adding upon layer content, AM describes the technology behind creating 3D objects. AM covers a range of developments, including 3D printing, Rapid Prototyping (RP), Direct Digital

Manufacturing (DDM), layered development, and additive manufacturing (Additive Manufacturing, 2020).

2.4.1.1. Artificial Intelligence

Artificial Intelligence is a software model of the processes of human intelligence which works with computer models and frameworks. Consequently, this does not mean granting computers knowledge or consciousness in the same way as a human is intellectual and aware, but what distinguishes them from software conventions is that they can benefit from the experience and not only programming. In terms of the Fashion industry, can help solve problems by executing duties based on information from videos, images, audio, numeric, text, and many more that involve pattern recognition, prediction, optimization, and suggestion generation. (Ellen McArthur Foundation, 2017).

AI will improve and allow a creative circular economy across the fashion industry. It will help promote the generation of different technologies and materials that are ideal for a circular economy, allowing prototyping and research to be quicker and better. Products will also be more user-centered (Medium, 2019). AI will use real-time and historical data from goods and customers in the operating circular business model, thereby improving product distribution and asset usage through price and market prediction, maintenance, and smart inventory management (Medium, 2019).

Traditionally, retailers depend on data from the previous year that was unsafe to adapt to evolving Patterns to focus their estimation of current year revenue. Predictive mistakes should be minimized by 50 percent (Forbes, 2019) to avoid overproduction and large volumes of leftovers.

Figure 3. The Simulation of Human Intelligence Processes By Machines.

Finally, enhancing the systems for sorting and disassembling items, remanufactured parts, and recycled materials, would optimize facilities (Medium, 2019). According to Forbes, in any aspect of the fashion world, AI technologies have brought quality, from either the design phase and manufacturing processes to the sales and marketing of finished products.

2.4.1.2 3D printing

Further, 3D printing technology is also getting to be used with the assistance of AI (Medium, 2018). 3D printing and AM, are becoming a lot and more necessary and are commonly

mentioned within the context of digitalization or trade 4. 0. ab initio employed in the development of prototypes; AM contains a heap of potential, particularly within the areas of textile products similarly as textile production processes. This could have an impact on the efficiency of production and helps with the discrimination and functionalization of products (Südwesttextil, 2016). products are often individually custom-made or technical applications can be created and therefore satisfy modern or technical specifications.

Figure 4. 3D Printing Technology.

Currently, additionally, several items of analysis on how fabric-like structures are often 3D printed exist however, the assembly of textile surfaces is still terribly limited. Also attention-grabbing during this context is the printing of accessories reminiscent of buttons and zippers, which could significantly shorten delivery times. Men can demand-driven production and "short time to market" for textile innovations. Successfully implemented, some textile-manufacturing process steps, such as cutting, could be saved. And, the quality of the products could be better controlled, and manufacturers could, case, immediately intervene. A tailor-made product generation can also avoid a significant amount of material residues and waste (Südwesttextil, 2016) but also lower CO2 emissions. 3D printing could be a method for reusing plastic material and giving it back to the economy in a new form (Print, 2019). In the last 8 years Nature Works, a material manufacturer jointly owned by Cargill and PTT international Chemical has been collaborating with the Ellen full general Foundation, supporting to fostering of the vision of property, and the circular economy for plastics (Bioplastics News, 2020). Nature Work developed the fabric referred to as Ingo PLA, created by the chemical process of plant sugars that may be either reused or may be composted. This can be a sustainable chemical compound meaning in step with Nature Work that it's made up of renewable plant matter instead of unrenewable rock oil (Bioplastics News, 2020). This production methodology may result in a smaller carbon footprint and require less non-renewable energy to manufacture than petroleum-based plastics (NatureWorks, 2020).

2.4.1.3. Virtual World

As social media is playing an important role nowadays, self-identification also gains more value in the virtual world. The user has the urge for newness, accompanied by the guilty feeling of the negative environmental footprint of purchasing physical garments (Spott, 2019). Thus, companies like the Norwegian Carlings invent digital fashion lines to offer their clients stylish photos for their social media accounts. That gives new potential not just to consumers, but also to the industry. The new fusion within the gaming market makes it possible to see avatars being dressed fashionably. Just recently introduced by the berlin-based fashion organization

Reference Festival, the Nintendo Game Animal Crossing takes its fashion potential one a step further with a virtual fashion show of Animal Crossing Avatars dressed up in current season looks inspired by Loewe, Prada, and GmbH. Such digital innovations show a smart way of saving an incredible amount of money and resources by not purchasing new clothes and still looking sharp in the digital world (Vogue, 2020).

Figure 5. Virtual Worlds

Furthermore, corporations are getting down to work on and with technologies, making Avatars in 3D to style prototypes for the assembly to save massive production steps and cut back on waste and emissions (lecture 2020). In conclusion, to implement waste and information as new raw material, the industry, and also the policy ought to encourage cooperative consumption and longer use by supporting leasing or sharing platforms, however, conjointly to take-back and resale, second-hand stores and by revaluing repair and maintenance. Also, the availability chain inside an organization desire to be utterly revised and customers ought to be educated. There are plenty of potentials, particularly within usage technologies, that desire to be researched and developed to develop innovative ideas.

2.5. Forward-Thinking Brands And Manufacturers Within The Industry

The transition towards a circular economy in the fashion industry is indispensable, as previously argued, and the burden on the fashion industry is growing. With about 60 to 75 million people working in the apparel, clothing, and footwear sector worldwide in 2014, the fashion industry has several obligations (ILO, 2015), and cotton processing alone accounts for almost 7 percent of all jobs in some low-income countries. (EllenMcArthur Foundation, 2017).

As there are not only environmental and social but also economic advantages, the problem is already faced by many enterprises (Bazgosha et al., 2013; Hakkak et al., 2022; Afshar Jahan Shahi et al., 2018; Asadollahi et al., 2011; Bazgosha et al., 2012). The move to a circular structure would unlock economic prospects worth about $560 billion. (Ellen McArthur Foundation, 2017). Furthermore, there's AN increasing focus from governments and the garment industry to use roundness in the textile industry in Europe. The ECU Commission has introduced a Circular Economic Package to a transition to higher usage of resources for European businesses (European Commission, 2017) so conjointly the countries are currently.

starting to implement rules and restrictions to accelerate the processes. Different strategies are often utilized by the business to implement a circular economy, like reuse, resell, remanufacture, and recycle (Kumar & Malegeant, 2006), however in step with analysis the

larger environmental profit exists through utilize of a product instead of recycling it (Sciencedirect, 2018). so, corporations ought to address the "end-of-life" of clothes inside their business models, which is a necessary phase for utilizing waste (Mistrafuturefashion, 2017).

While speaking concerning the circular economy and the different models, it's necessary to differentiate between "short-life fashion" and "long-life fashion". Reusing, reselling, upcycling, and remanufacturing makes sense on clothes with durability, quality production, and long usages. Instead, merchandise that are made with quality through quick production systems typically don't have enough price to be repaired or resold, thus this merchandise ought to be taken back to recycle (Mistrafuturefashion, 2017). As mentioned in our former chapter "waste as new raw material", the methods, innovations, and technology are thus far still limited, and utilize on its own isn't sufficient to scale back simply textile waste and doesn't address the difficulty of resource scarceness for giant fashion companies. Textile-to-textile usage is a thanks to address each problem with resource scarceness and textile waste in landfills. Major fashion companies, like Adidas, Levies, Patagonia, H&M and PVH are already dedicated to rising their processes and material selections towards a greener future. so, they're cooperating during a kind of alternative ways with forward-thinking and innovative makers or start-ups however conjointly invest by themself in new innovations and ideas to become a lot of property and satisfy the new shopper requirements. As analysis shows, eighty-eight of customers wish fashion brands to assist them to be a lot environmentally friendly (Forbes, 2020).

Figure 6. The Biological Cycle For Formulas And Bottles.

Also, new certificates are created or gaining a lot of importance, not only for the consumer but also for the companies. many alternative certificates are globally used, that can facilitate fashion firms to manage and examine processes at intervals their price chain and are auxiliary for a circular business model and a good industry. The Cradle to Cradle Certified™, introduced in 2010, may be a globally recognized live of safer, a lot of property merchandise created for the circular economy. it absolutely was established by William McDonough and Dr. archangel Braungart and helps brands rework their price chain and create merchandise with a positive impact on individuals and the environment. merchandise is evaluated for environmental and social performance supported 5 important property categories: material health, material reuse, renewable energy and carbon management, water stewardship, and social fairness (C2C Certified, 2020).

QUALITY CATEGORY	BASIC	BRONZE	SILVER	GOLD	PLATINUM
MATERIAL HEALTH				✓	
MATERIAL REUTILIZATION			✓		
RENEWABLE ENERGY & CARBON MANAGEMENT		✓			
WATER STEWARDSHIP			✓		
SOCIAL FAIRNESS				✓	
OVERALL CERTIFICATION LEVEL		✓			

Figure 7. Cradle To Cradle Certified Product Scorecard.

The honest wear Foundation focuses on sensible changes for garment workers, supports the U. N. Declaration on Human Rights. Oeko-Tex gives info concerning ototoxic chemicals, and Bluesign normally indicates that a textile has the tiniest ecological footprint doable (Eluxe, 2019). Brands try to improve processes or entire price chains to create a lot of sustainability. For example, Levi's tries to use ninety-six % less water in its production due to denim being ill-famed for requiring giant amounts of water to create jeans. As such, it is committed to property throughout the planning and producing process, as well as performing on one hundred pc property cotton and utilization previous jeans for house-insulation (Forbes, 2020).

Another exemplar is that the complete Patagonia who tries, next to its honest trade practices and closely monitored supply chain, to provide durable clothes, with the likelihood to repair them. They also advise customers to shop for used products rather than new ones (Forbes, 2020). PVH invests in technologies to optimize their price chain, making less waste (e. g. Avatars for Prototypes) and to supply their customers transparency inside their products within the future (QR code tags) (Lecture, 2020). And additionally, Adidas develops items, like shoes and hoodies, out of 100% reclaimable material, which is currently tested on elite customers (Adidas, 2019).

Figure 8. 100% Recyclable Material Shoes.

Adidas' goal is to exchange virgin polyester with recycled polyester by 2024 and is already exploitation forty recycled polyester in their current collections (Adidas, 2019). because the field gains additional importance, several start-ups, and material suppliers are performing on new technologies to make use easier and worthy. after are some innovative firms named, who developed new use techniques and fabrics: Evrnu, a textile innovations company based in 2014,

is making a regenerative system by exploitation NuCycl™ technologies to increase the life cycle of today's single-use textiles (Evrnu, 2020). it's changing pre- and post-consumer materials pleased from landfills and incinerators into new fibers and creates a regenerative provider of high-quality, bio-based fibers (Ellen McArthur Foundation, 2013). The technology permits the complete business use of cotton clothes nevertheless (Textile Exchange, 2020) and is going to use identical technology for polyester fibers in the predicted future (Apparel News, 2019). Evrnu is currently operating with companies resembling Levi's, Adidas, and Target who are licensing their technology and is in varied stages of early analysis and development with many alternative technologies designed to interrupt down garment waste (Ellen McArthur Foundation, 2013).

The British company Worn Again, based in 2016, invented a technology that's the primitive person that allows the roundness of PET and plastic raw materials and replaces the employment of virgin resources (Kering, 2016). For this they separate, cleanse and extract polyester and cellulose (from cotton) from non-reusable textiles and polyester bottles and packaging to provide twin PET and polysaccharide outputs, to introduce long-run sustainable resources back to production provide chains (Worn Again, 2019). Currently, the corporate is functioning closely with firms like H&M, Kering, and Puma. Sodra, a Swedish-based company is resolution one in all the foremost obstacles to textile recycling, by inventing a way that's able to separate poly-cotton blends. The pure cotton fibers are then additional to our wood-derived textile pulp, which might then be wont to build new textiles (Cision, 2019). the corporate was based in 2016 uses forest-related solutions and innovations to seek out textile alternatives and develop solutions for a good vary of areas as for example, additionally substitution oil-based chemicals with bio-based chemicals and identify new material ideas (Sodra, 2016). The long-run goal of Soda is to utilize each variety of textile product (Tieto evry, 2019). Algiknit, a US-based company, is manufacturing textile fibers extruded from kelp, a spread of seaweed. The extrusion method turns the biopolymer mixture into kelp-based thread that may be unwoven, or 3D written to attenuate waste. the ultimate wear is perishable and may be unreal with natural pigments in an exceedingly closed-loop cycle. There are even more companies developing and using new technologies, inventing apps or new innovative fabrics created out of Pineapple, Oranges or apples, ocean waste or reducing microplastic. As we said the demand for sustainable products is increasing, thus finally also the investments in technologies are increasing (Luxiders, 2019).

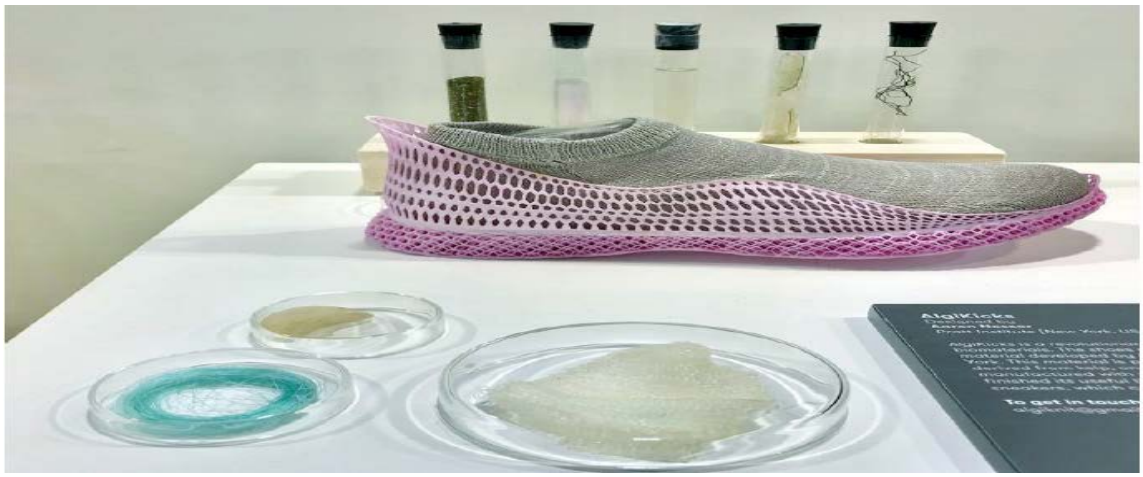

Figure 9. 100% Recyclable Material Shoes.

3. DISCUSSION AND CONCLUSION

Circle and protruded approaches, containing the dependence of the frugality on material and energy inputs, adding the adaptability of the profitable system, the preservation of the terrain, supplying the growing demands of the ever more populated earth, and adding the operational capability and cost-effectiveness of the product. Moreover, the indirect frugality is compatible with the essential interests of the pots, as it's aligned with the competitive and the strategic fabrics and it's able to enrich the contract between the consumers and the directors. The extra desire and pleasant supplied through new income and carrier fashions in a brand-new textile economic system might beautify the advantage skilled customers. A new textile economic system might offer blessings to an extraordinary variety of customers. In a brand-new fabric economic system, secure and healthy clothing inputs into textile manufacturing might now no longer go away. People uncover materials dangerous to their fitness and might lessen fitness dangers for every person carrying garments. With its low rates of utilization and low levels of recycling, the currently wasteful, linear system has numerous negative environmental and societal impacts. These, and other commonly used materials, all have various negative impacts on people and the environment, leaving room for significant innovation in materials. The new textile economy is renewable and resilient and will phase out the use of non-renewable resources. Alternative Non-renewable resources using recycled raw materials. The reduction of system throughput by maximizing garment utilization contributed significantly to the reduction of resource consumption. increase. However, you will probably always use the new you need. Such inputs are required, there are recycled materials, and more and more should be obtained from them. Renewable resources are produced in a renewable way. They also switch to a more efficient and efficient production process.

Less waste and less resource usage (e.g., B). Reducing water usage due to fossil fuels, chemicals, and water scarcity. The region is energy efficient and uses renewable energy. Helps further reduce the demand for non-renewable energy. Resource consumption. In addition to being essential for long-term functional systems, achieving this goal will allow the industry to reduce the risks associated with resource price fluctuations and supply security, and add value through direct cost savings. You can attach it. Four major actions have been identified to support more effective use of resources and a shift to renewable inputs.

Find a source of renewable raw material that requires resource input. Remove the barriers to deploying more! How to make large-scale active textiles. An innovative process that consumes fewer resources. After evaluating both models, and according to the given fact that the fashion industry is the second biggest polluting industry globally, the need to shift to a full circular economy in fashion is long overdue. It is not just within the companies' responsibility but also a duty of the states and countries to provide support and determine regulations. The consumer has the responsibility to educate themself and demand more sustainable products and support the change towards a zero-waste model. The industry and the economic policy should encourage collaborative consumption and longer use by supporting leasing or sharing platforms and taking-back and resale, secondhand stores, and revaluing repair and maintenance. Also, the supply chain within a company needs to be completely revised. In 2018, the EU implemented a new strategy on plastic and introduced a new circular economy package that should ensure the separate collection of textiles in all Member States by latest 2025 and it is expected that there will be more stringent regulations over the years to limit the environmental footprint of fashion.

To implement waste and data as new raw material and exploit the full capacity of our resources, the textile industry and the states need to invest in innovative re- and up cycle

models and new technologies to make the processes even more efficient. Taking fashion into the virtual world will probably fill a (niche) market and will have a positive effect but cannot replace the production of physical garments. Thus, Artificial Intelligence and 3D technologies are already steps into the right direction and will accompany the industry by accomplishing their goals. Corona virus, besides the mental health issues Gong et al., 2021; Chen et al., 2021; Zhang et al., 2020) has forced companies even more to consider a change within their business model. Not just because the consumer is getting more informed and is expecting more transparency but also because of the huge amount of stock, leftovers, and overproduction due to the fast-changing trends and short product life cycles, companies are facing big issues by selling off their products. As mentioned before, there is a lot for us to learn by mimicking nature, as nature works as an ideal example of a circular economy. Besides offering business opportunities, circular economy is most of all a philosophy and a system that creates a healthy and functional relationship between nature and human society.

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