2017

DESIGN FOR DISASSEMBLY - A CIRCULAR APPROACH

Wajiha Pervez
Virginia Commonwealth University

DESIGN FOR DISASSEMBLY – A CIRCULAR APPROACH

WAJIHA PERVEZ

DESIGN FOR DISASSEMBLY – A CIRCULAR APPROACH

WAJIHA PERVEZ

Approval certificate for Wajiha Pervez for the thesis project entitled Design for Disassembly – A Circular Approach. Submitted to the faculty of the Master of Fine Arts in Design of Virginia Commonwealth University in Qatar in partial fulfillment for the degree, Master of Fine Arts in Design.

Wajiha Pervez, BFA – Textile Design, College of Art and Design, University of the Punjab, Lahore, Pakistan, May 2010.

MFA in Design Studies, Virginia Commonwealth University in Qatar, Doha Qatar, May 2017.

Denielle Emans
Primary Advisor, Assistant Professor
Department of Graphic Design
Virginia Commonwealth University in Qatar

Diane Derr
Secondary Advisor, Associate Professor
Graduate Studies
Virginia Commonwealth University in Qatar

Richard Blackwell
Secondary Advisor, Assistant Professor
Art Foundation
Virginia Commonwealth University in Qatar

Michael Wirtz
Reader, Assistant Professor
Head Research and Library Technology
Virginia Commonwealth University in Qatar

Rab McClure
Interim Director, Associate Professor
Graduate Studies
Virginia Commonwealth University in Qatar

Dr. Akel I. Kahera
Dean
Virginia Commonwealth University in Qatar

Dr. F. Douglas Boudinot
Dean
School of Graduate Studies
Virginia Commonwealth University

To *Maa*, *Abbo* and *Sahar*

ACKNOWLEDGEMENTS

I am extremely thankful to Allah Almighty for blessing me with health, opportunity and dedication to complete this thesis to the best of my abilities. However, I would like to thank a number of people without whom, this thesis would not have been possible

My Mother, for always believing in me, for knowing the value of my dreams, for her prayers and for her endless support that kept me going every day.

My Father, for making me resilient and strong and for giving me the confidence to follow my heart.

Sahar, for pampering me, for giving me the best semester break experiences and for being the best sister in the world.

My sincere gratitude and thanks to Denielle Emans, my main thesis advisor for her valuable guidance, constructive criticism, eye for perfection and for her immense support from the inception to the completion of this thesis.

I would also like to thank Diane Derr, Richard Blackwell and Micheal Wirtz, my secondary advisors and reader for their input and encouragement in finalizing my project and final thesis document.

A very special thanks Richard Lombard for being an external thesis committee member and for giving me his valuable feedback despite being in a different time zone, half a world away.

Furthermore, I would like to thank Fleming Jeffries for introducing me to Denim paper and for providing me valuable references, equipment, fibers, and books to help in making all the material for my thesis production.

Last but not the least, Hazem, Abdul, Jawad, Sidra, all my friends, colleagues and MFA faculty who have all taught me a lot in their own ways and who helped to enhance my learning many folds throughout my time at VCUQatar.

TABLE OF CONTENTS

Abstract

Introduction

ABSTRACT

As the world becomes increasingly aware of the need to better care for the environment, innovative business models are helping to counter the damage of the fast fashion system - a phenomenon in the fashion industry whereby production processes are expedited in order to get new trends to the market as quickly and cheaply as possible.

Designing products with a focus on their renewability can shift the product-consumer relationship. The closed loop concept of a “circular economy” is emerging as a viable and promising solution to the current linear business model.

This study explores the possibilities of a more mindful approach to systems of production and consumption through material explorations using plastic from water bottles, paper from old newspaper and magazines, and fabric leftovers from pattern making within a circular economy. It considers the generative and renewable approaches in redefining how fashion engages with the components and raw materials of the industry.

The research demonstrates a circular approach to the production of hospitality accessories in an effort to develop new intersections between products, materials, and consumers. The accessories are designed using discarded, reformulated denim–an abundant and underutilized byproduct of the fashion industry–to reduce waste that currently occurs every time hotel chains and airlines produce disposable giveaway products from new materials.

INTRODUCTION

This research is my journey from enthusiastic designer to eco-enthusiastic designer. It is a glimpse into my endeavors to unlearn linear design behaviors and discover circular practices through interdisciplinary research. It provides insight into my quest to approach textile design, production and consumption systems while keeping in mind the end-of-life and after-life of the product.

I am a textile designer who would spend hours browsing through shops looking for the perfect attire for a dinner. Yet, every attempt to pick something from my closet for a later occasion, was a disappointment. For many years I repeated this practice because I bought low priced clothes to use for a specific occasion, a season, or due to pure impulse. One day, I came across a documentary that changed the way I thought about clothes forever.

Being trained as a textile designer in Pakistan, I was told that waste streams are a constant byproduct of garment production and there is no way to improve them. I saw tons of fabric find their way into storage rooms that served as pre-or post-consumer factory discard. Consumers were never aware of the landfills created as the result of pre-garment manufacture waste; materials like leftovers from patterns, mismatched dyed fabrics, test print fabrics and minor defect inventories. At that time, I assumed there was little that could be done to change the environmental impacts of the fashion industry. The question about future utilization of all the fabric waste kept lingering in my mind and I was determined to find the answers. George Bernard Shaw said "Progress is impossible without change, and those who cannot change their minds cannot change anything."[1]

"The True Cost", a documentary by Andrew Morgan, made me review my role as a textile designer.[2] Released in 2015, "The True Cost" is a "groundbreaking documentary film that pulls back the curtain on the untold story of the fashion industry and asks us to consider, who really pays the price for our clothing? Filmed in countries all over the world, from the brightest runways to the darkest slums, and featuring interviews with the world's leading influencers including Stella McCartney, Livia Firth and Vandana Shiva, "The True Cost" is an unprecedented project that invites the viewer on an eye opening journey around the world and into the lives of the many people and places behind our clothes."[3] "The powerful film exposes the true human and ecological cost of fashion – factors like human suffering and environmental damage that are not reflected in a garment's price tag."[4] In the words of Andrew Morgan, "More than just underscoring the problem, this is an effort to highlight real solutions that every day people can take part in. Our goal is to impact consumer behavior that in turn impacts corporate and government policy decisions. The road we are on simply is not sustainable, but there is an opportunity here; a defining moment in history for us to set a new precedent for the future we will create."[5]

My international exposure and research also revealed that there are countries where there are few limitations or strict laws to govern ethical garment manufacturing practices and even design education is affected by misinformation. As a designer, it made me review my own practice. I have started thinking about ways in which I can be more vigilant while designing a product. While I certainly cannot solve all the environmental challenges of the fashion industry on my own, this study explores the possibilities of a more mindful approach to systems of production and consumption in order to engage with a circular economy.

2. Literature Review

In the present day postindustrial society, buying has become more driven by impulse than need. Our fast paced lifestyle, from fast food to fast fashion, is a vicious cycle of consumption. The "disposable" nature of commodities has altered the value embedded in apparel and accessories. A significant amount of residue of almost all the garment productions, purchases, and consumptions fills massive landfills and damages the atmosphere. Textile consultant Kate Fletcher said "Fast isn't free – someone somewhere is paying."[6]

According to the Ethical Fashion Forum, "The increase in number of clothes people consume also has consequences for the environment. More clothing is shipped and flown from the Far East to Europe than ever before and the life cycle of these garments is decreasing. Statistics show that on average, UK consumers send 30kg of clothing and textiles per capita to landfill each year and that 1.2 million tons of clothing went to landfill in 2005 in the UK alone. Moreover, different textile materials have different decomposition challenges in landfills. Synthetic (man-made) fibers such as Spandex, Fleece, Nylon and Polyester that have plastic content may take between 20 to 200 years to break down depending upon their composition. Woolen garments do decompose but they produce methane gas that contributes to global warming."[7] Eric Abrhamson, a professor of business at Columbia University says in his research that: "High street Fashion, more than any other industry in the world, embraces obsolescence as a primary goal; fast fashion simply raises the stakes."[8]

In his book Liquid Life, Zygman Bauman explains that young consumers' desire for fast fashion is coupled with significant disposable income (or, alternatively, the availability of credit). Fast fashion exploits this situation, offering of-the-moment design and the immediate gratification of continually acquiring latest fashion.[9]

Fast fashion has also been referred to as "McFashion," because of the speed with which gratification is provided. George Ritzer – An American sociologist, introduced the concept of McDonaldization with his 1993 book, The McDonaldization of Society. It refers to "The particular kind of rationalization of production, work, and consumption that rose to prominence in the late twentieth century. The basic idea is that these elements have been adapted based on the characteristics of a fast-food restaurant – efficiency, calculability, predictability and standardization, and control – and that this adaptation has ripple effects throughout all aspects of society."[10]

In the times of hand production, the concept of discarded or unwanted items was almost non-existent: It took time and patience to produce things. Goods were manufactured from purer raw materials and involved less chemical processes. Mechanization of society through steam engines, transportation and electronics also saw rapid wear and tear. During World War II, the automotive industry resorted to disassembly of parts from old vehicles and remanufacturing using these parts because of the scarcity of resources.[11] Dating back to the 1940's, this approach experienced growth and became popular in numerous recycling approaches such as paper, napkins and shopping bags, but with a few rare exceptions, the quality of the product obtained through recycling is inferior to the original product.

Tracing the roots of mass production to the Industrial Revolution, the development of factory models and optimizing industrial methods to enable fast paced and low cost production came into practice to replace the inefficiency of the cottage industry.[12] The explicit intention of made-to-expire products was the key to keep the factories running and revenue flowing.[13] This approach expanded with globalization and shifts in economies. The demand for goods increased worldwide and so did the need to expand the industry to meet those demands.

According to CNBC, the current model of fast fashion operates on the principle of "planned obsolescence" in most cases.[14] It means using cheap materials to manufacture goods that deteriorate quickly and subsequently need to be replaced. This system is using earth's limited resources and energy to make products that quickly approach their end of life. The system also thrives on the impulsive human desire to acquire the latest fashion. According to the Ethical Fashion Forum, any thriving fast fashion brand can offer up to 18 collections in a year.[15] It tempts the buyer to buy goods that they rarely wear because of the attractive price points. Most of these purchases end up being thrown away because of the rapidly changing fashion and low monetary value associated with them.

This process is reaching an alarming limit and has become a major point of concern across the globe. The landfills caused by this system

are not only emitting poisonous greenhouse gases but are also highly unlikely to decompose because of the numerous synthetic chemicals used in production.[16]

As described by Kate Fletcher, fast fashion is, by its very nature, "a fast-response system that encourages disposability."[17] In an interview with NPR, Simon Collins, Dean of Fashion, Parsons The New School for Design, says that with fast fashion brands "producing hundreds of millions of garments per year, there is a growing public consensus that the mass production of so much cheap clothing is a waste of resources such as fuel and water."[18] An article by Vogue discussing the impacts of fast fashion mentions that as an industry, "Fast fashion depletes the Earth's resources and uses slave labor all over the world."[19]

Maxine Bédat, co-founder of Zady, a fashion brand and lifestyle destination trying to create a transparent and sustainable future for the apparel industry, comments in an article for CNBC that in addition to a lack of regulation in terms of working and safety conditions and wages, environmental and related regulations concerning the use of chemicals and pollutants are lax in low cost centers of manufacturing. As such, "textile companies just keep engines roaring, running largely on coal, while they systematically dump their chemicals untreated back into their local water. This has all added up to the apparel industry being the second most polluting industry in the world, behind only the oil sector."[20] And the side effects do not end there. The increase in production of garments and accessories has led to an increase in waste: "Inevitably, much of this excess finds its way into landfills. In the US alone more than 10.5 million tons of clothes end up in landfills each year, and even natural fibers may not break down."[21]

2.1. Fast Fashion

The term "fast fashion" refers to a phenomenon in the fashion industry whereby production processes are expedited in order to get new trends to the market as quickly and cheaply as possible.[22] It was initially advocated as an opportunity for developing and low-income economies by promising jobs and a better livelihood for skilled people. Contrary to nurturing its concept of global welfare, fast fashion systems often exploit cheap labor and non-existent labor laws in developing countries. The unethical working conditions, which include the use of toxic chemicals, child labor, low wages, questionable sanitation conditions and physical abuse, make this business model, in most cases, totally unsustainable.[23]

The fast fashion system gained momentum in the late 80's and early 90's. It is a linear model involving production, consumption, and disposal. Many companies follow the principle of "planned obsolescence."[24] This means manufacturing goods that deteriorate in quality quickly and, subsequently, need to be replaced. According to the Ethical Fashion Forum, any thriving fashion brand can offer up to 18 collections in a year.[25]

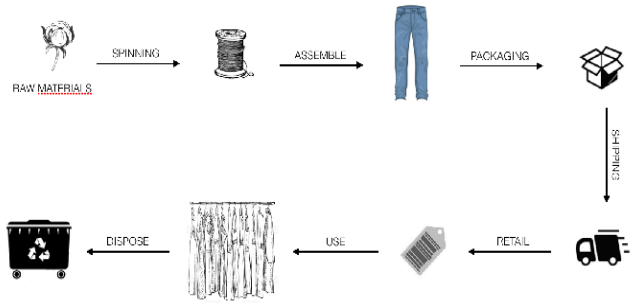


Fig 01. System diagram of Linear Economy Business Model

2.2. Consumer Behavior

There is also the consumer side of the story. Outlined below are points taken from the results of research conducted by Tina Yinyin Wing at the University of Boras, Sweden, about the behavior of fast fashion consumers. It shows that there are several factors that influence the decision making process including alternative evaluation, decision making, value, product and care information, social and personal significance, individual differences, consumer resources, knowledge, attitude, self-perception and lifestyle.[26]

2.2.1. Alternative Evaluation

"Low-priced, quickly produced, and designed for obsolescence, fast fashion encourages consumer detachment from issues of sustainability and fair labor."[27] According to a 2014 report in the UK Financial Times, "apparel is growing rapidly in UK food retail."[28] The space allocated to non-food items in a shop may be smaller, but the profit margins on them are way bigger. In Australia, Collette Dinnigan, once known for her luxurious lace ladies' wear, did a kids' collection for the discount supermarket chain Aldi. One can buy fashion as part of the weekly food shopping, with as little thought as they might give to buying bread. In 1990, the British chain Asda became the first grocery store to introduce a fast-fashion line.

The alternative evaluation between products and price points of fast fashion brands and luxury brands is a huge determining factor for consumers. Consumers do not like to pay for an out-of-season dress if they can find the latest fashion at the same price.

Aesthetic appeal holds a great significance to the fashion world. People use it to construct their sense of self. "Because identity in a postmodern society is a work in constant progress, adopting new fashions can help define an ever-evolving self-image, thereby providing a sense of personal direction for the future."[29] Fast fashion allows for an on-going personal transformation at a mass-market level, due to its affordability. Consumers evaluate alternatives during both the pre-purchase stage and purchase stage. Impulse purchasing occurs more frequently in fast fashion consumer behavior than in other industries. After the pre-purchase alternative evaluation, it is often possible for consumers to articulate their purchase intentions, and these fall into three outcomes:

i. Fully planned purchase – both product and brand are chosen in advance.
ii. Partially planned purchase – there is an intention to buy a given product but the final choice is deferred until shopping is completed.
iii. Unplanned purchase – both the product and brand are chosen at point of sale.

The most influential factor that makes consumers choose fast fashion brands instead of luxury brands is the low price point. It is a very significant feature that drives the consumers to choose to go into a fast fashion store or decide to shop. Consumers compare the price of fast fashion brands and high-end fashion brands in the pre-purchase stage.

Findings of a Harvard Business Review case study revealed that brands, like H&M, Forever 21 and Zara, adapt the latest fashion trend information from many sources, such as TV, Internet, film content, trend spotters and young, fashion-conscious staff.[30] Therefore, fast fashion brands have items that can be found that are very similar to other luxury fashion brands. For example, two very similar trousers (see picture below) that have similar colors, pattern and style. The Forever 21 version costs 22- 25 USD, while the similar one at Stella McCartney costs 925 USD. Examples like this can be found in numerus stores and across a range of products from clothing to footwear and accessories.

Fig 02. Forever 21 (22-25 USD) vs Stella Mc Cartney (925 USD)
Luxury Look-Alikes for Less: Diane Kruger's Floral Print Stella ..."
Accessed February 24, 2017.
https://styledarlingdaily.com/2013/02/04/luxury-look-alikes-for-less-diane-krugers-floral-print-stella-mccartney-pants-vs-under-25-forever-21-picks/

So, in situation like this, fast fashion has a big advantage when consumers evaluate price as an important criterion. In response, several luxury houses have increased the number of their collections as well as the speed with which they take those collections from the catwalk to the shop floor.

Using modern production techniques and better-managed supply chains, they now deliver at least two ready-to-wear and two couture collections for women each year, as well as pre-fall, resort, menswear and accessory lines. They have also increased the variety of products available in their online and physical stores. This shift comes with a cost. High profile designers have been leaving prestigious positions, insisting that the pressure of doing several shows a year doesn't foster an atmosphere that allows creativity to flourish.

Raf Simons, who declined to renew his contract at Dior, told journalist Kathy Horyn: "When you do six shows a year, there's not enough time for the whole process. You have no incubation time, and incubation time is very important. When you try an idea, you look at it and think, hmm, let's put it away for a week and think about it later. But that's never possible when you have only one team working on all the collections."[31] Earlier in spring/ summer 2014 issue of Dazed, Simons said that "I've come to really question the system, as much as I am part of it, I have to question it for the simple reason that I wonder how far it can go. How far can it go until the moment that it might not work anymore?"[32]

Alber Elbaz cited similar reasons for leaving Lanvin. In March 2013, in the first ever interview after being fired from Dior over mental health issues, John Galliano said: "I was going to end up in a mental asylum or six feet under."[33] Later speaking to American TV host Charlie Rose, he explained what drove him to the edge: "I was afraid to say no. I thought it showed weakness. And with more and more success, I would just say yes. And keep on taking more work on, which took its toll." All in all, he was overseeing an astounding 32 collections a year (an average of more than 2.5 a month) between Dior and his own label, directing everything from handbags and jewellery to perfumes and kidswear.[34] When creative directors suffer, creative design suffers. And because the very foundations of luxury fashion are built on unique, ingeniously crafted pieces, if these fail to meet standards, consumers are disappointed.

One leading example of conscious luxury fashion consumer is the Duchess of Cambridge, Kate Middleton. She is known for repeating dresses and looks over years despite being a public figure.

Fig 03. Left: Emilia Wickstead coat dress debut: At the Order of the Thistle ceremony in Edinburgh in 2012 , Right: Latest outing: On her royal tour of India and Bhutan. The £1200 design was made bespoke for Kate in 2012.

Leaper, Caroline. "Kate Middleton, Wardrobe Recycler. Here's All the Times the Duchess Wore the Same Dress Twice." Marie Claire, April 15, 2016. http:// www.marieclaire.co.uk/news/fashion-news/kate-middleton-wardrobe-recycler-here-s-all-the-times-the-duchess-wore-the-same-dress-twice-10931.

2.2.2. Decision Making

Fig 04. Left: Design debut, In Wellington, New Zealand, on her 2014 royal tour. Right: Latest outing, Tory Burch op-art shift by the label on a visit to Harrow College in October 2015.

Leaper, Caroline. "Kate Middleton, Wardrobe Recycler. Here's All the Times the Duchess Wore the Same Dress Twice." Marie Claire, April 15, 2016. http://www.marieclaire.co.uk/news/fashion-news/kate-middleton-wardrobe-recycler-here-s-all-the-times-the-duchess-wore-the-same-dress-twice-10931.

Fast fashion items are so attractively priced that the consumers are easily inclined towards buying them to update their wardrobe at a fraction of the cost. In addition to the pre-purchase alternative evaluation, the three important patterns are:

i. Purchasing in accordance with certain expectations.
ii. Purchasing an unexpected item while shopping with certain expectations.
iii. Going shopping without any expectations.

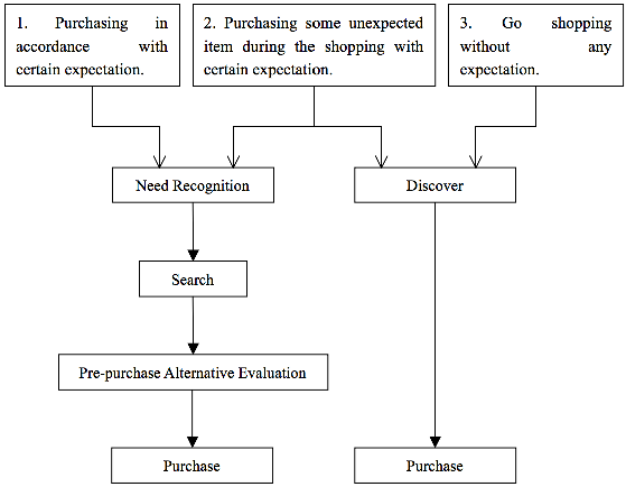


Fig 05 . Compositions of the Three Fast Fashion Consumer Decision Process Patterns Yinyin, Wang. "Consumer Behavior Characteristics in Fast Fashion," 2011. http://bada.hb.se/handle/2320/7723.

There is one more habit that can be a part of the unexpected shopping experience for some people. It is known as "impulse buying" or a spur of the moment, unplanned decision, made just before a purchase.[35] These are a few characteristics that Dennis W. Rook and Stephen J. Hoch described of impulse purchasing:

- A sudden and spontaneous desire to act accompanied by urgency.
- A state of psychological disequilibrium in which a person can feel temporarily out of control. The onset of conflict and struggle that is resolved by an immediate action.
- Minimal objective evaluation – emotional considerations are dominant.
- A lack of regard for consequences.[36]

Fast fashion collections are quickly updated, new products come into stores and are replaced by the next collection quickly. Consumers are attracted by new clothes every time they visit the store. Sometimes they do not get the chance to see the product twice. As a result, they do not have time to make clearly thought out decisions about a product. This may result in two effects on consumers:

1. Subconscious awareness that the clothes will probably not be in the store next time, so to avoid any regret they may need to buy it immediately.
2. New fashion can stimulate consumers so impulsive buying becomes an emotional reaction.[37]

2.2.3. Value

Value is the regard that something is held to deserve; the importance, worth, or usefulness of something.[38] Value can reflect the motivation in the personal relevance of a product in a particular context. Usually when a consumer considers a purchase, value has large personal significance. It can vary depending upon personal association, information about the product, cultural and emotional experience.

2.2.3.1. Personal and Social Significance

Luxury goods used to be valued because of their classic and timeless craftsmanship. Intrinsic value still continues to play an important role but there is always a group of consumers, that prefer shopping for rapidly changing trends over timeless and classic craftsmanship. A report by CNBC revealed a long list of luxury designers ignoring the tradition of showing their collections five months before shoppers can have them in their closet. Many luxury brands and designers have been questioning the role of pre-season fashion shows in a world of Instagram and fast fashion.[39] Burberry, a brand that is traditionally known for being been timeless and bespoke, announced that starting in September 2016, it will cut the number of shows from four to two, and design "seasonless" collections that are immediately available for purchase.[40] That same day, Tom Ford canceled his New York Fashion Week plans, saying he would instead debut his fall collection in September.[41]

Emerging contemporary designer Misha Nonoo collaborated with the high street label Aldo to design and to show her Spring 2015 collection on Instagram and her team decided to make the items available immediately for pre-order.[42] She said her clients surprised her, instead of buying the pre-order collection, they were drawn to pieces that were similar and available immediately. "Consumers are shopping differently today; they want to buy now and wear now," said Nonoo.[43] She also canceled her fall '17 presentation at New York Fashion Week. Instead, she is planning an in-season event for September. Chere Di Boscio, Editor in Chief of Eluxe Magazine said that "I've been surprised to see that more of my friends are shopping on the high street, when I ask them why?, they always say the same thing: they could get the original design from a luxury brand, but why bother paying the extra money when the two items are so similar, and will be out of fashion in a short time anyway?"[44] Vincent Quan, an associate professor at the Fashion Institute of Technology said that "I don't think it's really possible to compete with the fast-fashion retailers because of their business model, If you're a medium to luxury fashion designer, the intricacies of your product are inherently much more complex."[45] One designer who has managed to keep the pace slow is Azzedine Alaia, who creates one collection per season. He doesn't shoot ad campaigns. He rarely sends clothing samples out for magazines to feature, and he doesn't produce massive runway shows for assorted bloggers, celebrities, and press. Instead, he creates for confident customers who know their style and body type and buy well rather than often.

It can be said that the fast fashion system works for consumers because consumers think they have knowledge about product before shopping. Social media, friends, magazines, newspapers and window shopping are a few handy means to acquire information about which color, style and product is in fashion. There is no high risk for consumers to make the purchasing decision because low priced clothing is not a huge economic burden to the individual. Fast fashion garments follow popular trends, which means they will never depart far from common taste. So, the consumers do not have to worry that the clothes from H&M or Zara may not be in fashion. Also, most of the fast fashion stores have good return policies. They accept refunds and exchanges within one or two weeks. In this case, the consumers are aware that the immediate purchase can still be reconsidered later, so the risk of a purchasing decision is further reduced.

2.2.3.2. Ownership

We live a world where we judge what is 'used' as not good. The need for personal ownership is deeply ingrained in most of us. Changing this kind of mindset and culture is difficult and a process that might take decades. Clothing and accessories often have high value but low usage. Arun Sundararajan, a professor at NYU's Stern School of Business said "It's quite common to have clothing that costs three figures or four figures", many of which are bought and worn only occasionally. According to a report by online thrift store Thred up, over $8 billion worth of clothing sits in closets, unworn in the US alone."[46] "Rentable fashion" is becoming increasingly popular for consumers who want instant access to luxury, without the high price tag. Filipa Neto has founded the company Chic by Choice, a service offering rentals of designer womenswear across Europe. The plan is to make garments from some of the world's best brands available on a short-term basis and at a fraction of the cost of buying. Users select the dress they want, book it for four or eight days, and couriers deliver and collect the garment. One doesn't even need to worry about dry cleaning, making it as hassle-free as possible.

For owners, this sharing economy transforms possessions into revenue streams, by enabling items to be useful all of the time. Consumers can pay for something to use for a short period of time, at a fraction of the purchase price, and with greater choice. As a result, dozens of fashion companies have entered the sharing economy fray in the last few years, adopting a number of different business models to tap into this opportunity. Marshal Cohen, chief industry analyst of the market research company The NPD Group said: "Luxury is changing for the more value-centric consumers who are much greater in number than pure luxury products."[47] Style expert Jacqui Stafford said: "Something that used to be attainable purely for the elite is now becoming more accessible to those who are willing to splurge. It's still a splurge, there's no question about it. You're still going to be spending at least $500 [to rent] a gown that you might have to pay $5,000 to buy."[48] With more spending power and choice, but less commitment, consumers can use rental sites to constantly update their wardrobes, enabling them to keep up with fashion's fast-turning trend cycles. However, convincing people to share clothes with other people requires a much bigger behavioral shift than convincing them to share vehicles or accommodation — both of which have been available to rent for years."[49]

2.2.3.3. Product and Care Information

Decisions about washing, removing stains, ironing, and drying have a profound impact on how well and how long an item lasts. In addition to clothing being explicitly made not to last, the problem multiplies when people do not know how to care properly for their clothes. Items fade, shrink, and get misshapen when treated poorly, and then are destined for the trash can.

Today, 90% of all clothing is discarded far earlier than necessary, with as much as 70% due to preventable damage like fading, shrinkage or misshaping. The solution? Better clothing care. In a survey conducted by AEG in 2016, more than half of consumers stated that they rely on care labels in order to feel confident when doing their laundry. However, care labels are only suggestions by the respective clothing brands. One third of consumers stated that they find care labels confusing.[50] Meanwhile, a lot of designers and brands lack both time and infrastructure to do proper laundry testing. So, they add inaccurate instructions to their garments in order to avoid being responsible for any damage created during the washing process. The result is an overuse of "Dry Clean Only."

Since a high percentage of clothing's carbon footprint comes from the way it's cared for, this information plays a significant role in educating consumers. While there are different laws for the labelling of garments for different countries, some of the key information requirements are the same throughout the world. Labels containing fiber content, country of origin, the identification of the manufacturer, importer, or other dealer, and care instructions must be present at the time the end user takes possession of the good. Labels containing care instructions must be attached permanently to the item.

While it is important to have this information, labels containing information about the effects of washing the garment on the atmosphere or decomposition time in landfills can prevent people from throwing away perfectly good clothing and caring more for them.

Stella McCartney partnered in 2014 with H&M to launch "Clevercare" garment labels. Developed in collaboration with Swiss wash care label company Ginetex, the Clevercare labels provide explicit care instructions designed to help customers get the most out of their clothing through proper care. It leads to water and energy savings through less frequent machine-washing and drying, as well as guidance on ironing and professional laundering techniques.[51]

In 2016, home appliance maker AEG introduced the Care Label Project and partnered with The Woolmark Company, Fashion Revolution, and Not Just A Label to raise awareness for the environmental impact of garment care. They selected a number of designers to launch an exclusive collection of designer garments for the 2017 campaign, with lab tested care advice and a modern fabric guide. The resulting fashion collection – the Care Label Collection – is a long-term collaboration aiming to deliver smarter washing technologies and fabrics that can create sensitivity towards fabric care to encourage people to change their washing and care habits.

Berlin-based designer Tim Labenda said "A garment should live for a lifetime." he added "that's only possible if you care for it in the right way."[52]

Fig 06. Care Label Project
"Care Label Project." AEG. Accessed April 3, 2017.
http://www.aeg.co.uk/care/inspiration/care-label-project/.

2.2.3.4. Individual Differences

Income is included in nearly every marketing research survey as one of the key variables in explaining consumer behavior. Although there are many common features in the fast fashion consumer behavior, there are still a lot of differences varying from individual to individual. According to general consumer behavior theory, individuals differ in five fundamental ways: consumer resources, knowledge, attitudes, self-concept, and lifestyle.[53]

2.2.3.4.1. Consumer Resources

The market for different income-level consumers can be divided into two types: low-end market and high-end market. Fast fashion belongs to the low-end market. Fast fashion brands like H&M, Forever 21 and Zara have a very clear marketing strategy to focus on the low-end market. But the stores that appeal to the low-end fashion market also have to be attractive and stylish. Another advantage for this visual merchandising and sales efficiency is that treating the low-end market with respect and good service also attracts some of the high-end market.[54] According to Mark Tungate, "The secret to Zara's appeal is that, although shopping there is cheap, it doesn't feel cheap. The stores are large and centrally located. The clothes are given room to breathe."[55]

Fig 07. Zara's flagship store at Oxford Street, London.
Ryan, John. "Store Gallery: Zara Opens an Industrial Flagship on Oxford Street." Retail Week. Accessed February 24, 2017. https://www.retail-week.com/topics/stores/store-gallery-zara-opens-an-industrial-flagship-on-oxford-street/5074575.article.

2.2.3.4.2. Knowledge

Knowledge consists of the information stored within memory. The subset of total information relevant to consumers functioning in the marketplace is called consumer knowledge.[56] It greatly affects an individual's purchasing pattern. One of the key points of knowledge is product knowledge. It is a combination of many different types of information, including consumers' awareness of the product category and brands within the product category, beliefs about the product category in general and specific brands, and product attributes or features.[57] The consumers know the price points and they are clear that from H&M or Zara, they can get clothes for the whole family in all sizes.

There is a theory in conventional consumer behavior that consumers who know that a product is traditionally placed on sale during certain times of the year may delay purchasing until such times.[58] The fast fashion industry has a different scenario. Most of the fast fashion consumers do not wait for a sale to buy a garment. The when-to-buy? knowledge does not play an important role in fast fashion purchasing. Due to the constant updating of products with seasons and collections, it does not appear as a smart option for consumers to make a delayed purchase choice.

2.2.3.4.3. Attitudes and Self- Perception

Attitude and self-perception refers to the beliefs a person holds about his or her attributes and how he or she evaluates these qualities. Products such as clothes, cars, furniture and jewelry help determine the perceived self, and in some way "we are what we have."[59] Cultural symbols like fashion can express one's self-perception. That is why clothing is a very important method of announcement of one's identity.[60]

It is very important for fashion brands to understand the target consumers' self-perception. When purchasing clothing, a consumer will consider whether it suits their self-perception. Consumers whose styles are "casual" and "trendy", shop fast fashion items more frequently and those whose fashion style is more "sport" or "elegant", shop fast fashion less than the others.[61]

2.2.3.4.4. Lifestyle

Lifestyle is a set of attitudes, habits, or possessions associated with a particular person or group.[62]

Marketers use lifestyle analysis to build their product-consumer relationship. Consumers often choose products, services, and activities over others because they are associated with a certain lifestyle. For example, wearing yoga pants and sneakers anywhere outside of the gym was once considered inappropriate but today's street-style icons and professionals alike flaunt their healthy lifestyle by wearing limited-edition trainers matched with high-performance sportswear and smart-tech gear. This growing lifestyle trend called Athleisure refers to "casual clothing — like yoga pants, sweat pants, and hoodies — that are designed to be worn both for exercising and for doing (almost) everything else."[63] Athleisure apparel is sold by brands such as Adidas, Lululemon, Bandier and Nike. These brands evoke an image of health consciousness and wellness, and consumers are attracted towards it.

Flexible dress codes and an increased emphasis on staying in shape have contributed greatly to the wide adoption of athleisure. Remo Ruffini, chairman of Moncler said, "It's not just a trend. It's a lifestyle."[64] Lisa Aiken, Net-a-Porter's fashion director said, "It's a shift that we are seeing within our daily lives. Very often, we are not training alone. There's a social element in taking fitness classes together. It's another dressing occasion that we need to find a solution for our customers."[65]

2.3. From Fast Fashion to a Circular Approach

To sum it all up, it can be said that fast fashion consumers' purchasing decisions are affected by various factors such as income, style statement, personal association to the product, knowledge about the product and lifestyle. It has been declared by environmentalists that fast fashion is an industry that has negative effects on the environment on multiple levels. For the consumers and the producers, there needs to be a change in the behaviors to counter or prevent unsustainable consumption.
We live in a time where lifestyle changes happen on a daily basis because of the way designers make things and offer services. From smart phones to cloud sharing to 3D printing, everything that we once imagined is now an everyday reality.

3. Being Circular

Designing products, keeping in mind the end of life or another life, can mark a shift in the product-consumer relationship. This closed loop concept is called "Circular Economy". It is globally emerging as a viable and promising solution to the current linear business model.

A circular economy product cycle is designed to be regenerative and renewable. Products are designed to consider a "lifecycle", in terms of their components and the materials are used to their optimum value. It divides products between their technical and biological contents to be renewed.

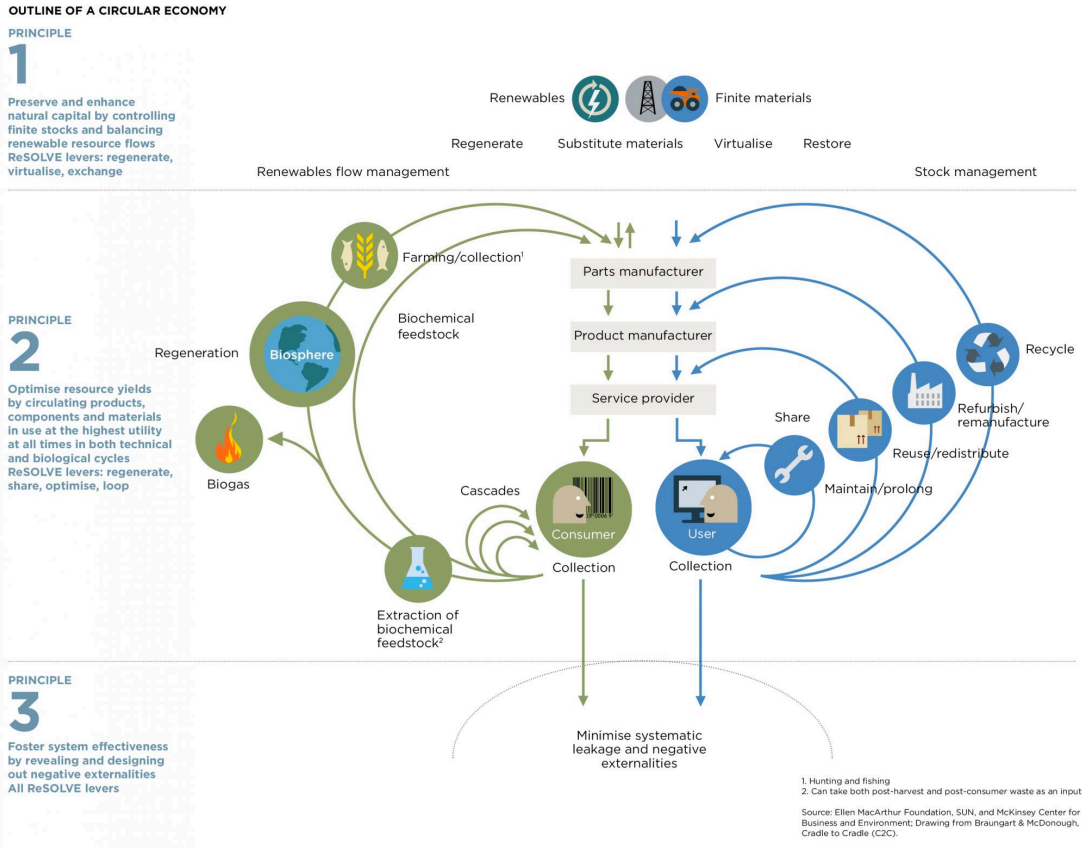


Fig 08. Circular Economy System Diagram "Circular Economy System Diagram - Ellen MacArthur Foundation." Accessed October 24, 2016. https://www.ellenmacarthurfoundation.org/circular-economy/interactive-diagram.

The design documentary, "Objectified" emphasizes the value of good design in order to determine a product's life, post consumption. In the documentary, acclaimed artist Karim Rashid talks about the adverse effects of planned obsolescence and the need to change the ways of making. He suggests that if goods such as electronics are designed to be obsolete within a year, then they should not incorporate metallic bodies and heavy-duty metals to manufacture the hardware. It should be durable but eco-friendly enough to feed back as a raw material.[66]

In the journal article "Resource Recovery from Post-Consumer Waste", authors Jagdeep Singh and Isabel Ordonez studied over 50 attempts towards circular economy and deduced that an ideal circular economy scenario does not involve waste because the products are designed to adapt to a biological or technical waste renewal cycle. Biomaterials can be compostable and other parts such as metals, alloys or other man-made substances can be upcycled or renewed to a high quality.[67]

In the book "Cradle to Cradle", William McDonough and Michael Braungart talk about the transformative power of design in establishing systems that use design as a tool for positive impact.[68] The book says that it "Calls for the transformation of human industry through ecologically intelligent design."[69] McDonough and Braungart outline their vision for the 'Next Industrial Revolution' through case studies of their work and design paradigms. The Cradle to Cradle design perceives the safe and productive processes of nature's 'biological metabolism' as a model for developing a 'technical metabolism' for industrial materials. All products can be designed for continuous recovery and reutilization as biological or technical nutrients within these metabolisms.
"Cradle to Cradle" design is based on safe cycling of goods and services in either the technosphere (technical cycle) or biosphere (biological cycle) as valuable nutrients. In addition to the safe cycling of goods, Cradle to Cradle design integrates clean water, clean energy and social fairness considerations.

One example of a Cradle to Cradle project is "Ege", a carpet manufacturing company. According to Cradle to Cradle Certification website, "One of the overall goals for Ege is to design a sustainable carpet that is 100% recyclable, in terms of reusing every component of the carpet (when it has served its time) in new carpet products." With collaborations from Cradle to Cradle Denmark, they launched a take back program "Recover by Ege." The program uses a system to take back used carpet tiles and sort between reusable and non-reusable tiles. The reusable tiles are sold as vintage tiles. The company is collaborating with individuals to increase from 30% to 100%. Until then, the company delivers its non-resalable carpets to the cement industry, which uses it as a fuel alternative to fossil fuel.[70]

Another commendable effort is the Bio mimicry based company "Ecovative" that draws inspiration from Mycelium which are mushroom roots that grow on woodchips and bind them together in the process. This observation led to the inception of fully compostable packaging material by Evocative that can be grown in any shape and size. It is made through a system of growing mycelium around locally grown and obtained agricultural byproducts.[71]

The digital enterprise office solution, "REEP," is re-inventing paper for circular economy. The Reep system uses a two-step process in an effort to counter the average official paper waste. It consists of a special paper that is compatible with any regular laser printer, but instead of filing and shredding the paper to maintain confidentiality, it uses a specially designed laser based scanning device that removes the ink and digitizes the information.

The paper is automatically scanned, converted into a searchable document, securely archived into the cloud, and then it gets completely erased in a closed loop cycle right in the office. Their system removes the toner from all existing laser copiers and printers as well as hand written marks or signatures. The paper is fresh and ready to re-use again.[72] Using the REEP system can result in faster internal and external customer response time, increase productivity, save time and increase document security because the information stays inside the office building. The company believes that the REEP solution can reduce the environmental footprint of the office paper lifecycle by up to 90%.[73]

While efforts are being made on various levels, making a transition into the circular economy is complex and challenging because it requires a system redesign, creative skills, innovation, collaboration and strategy to gradually shift the current methods and perspectives. According to William McDonough and Michael Braungart, ideal circular economy based design solutions should include:

- "Designing products made with materials that come from and can safely return to nature or industry in biological and/or technical cycles operating in a circular economy.
- Intentionally designing products in which manufacturing is powered by 100% clean and renewable energy.
- Managing clean water as a precious resource and an essential human right.
- Designing goods, services and systems affected by the creation, use, disposal or reuse of a product."[74]

This situation opens up opportunities and a need for designers, thinkers and makers to accept the challenge and device solutions for every field and to develop a range of products based on the principles of circular economy.

3.1. Precedent Studies

In an attempt to encourage circular systems for producing, consuming and regenerating goods, designers, companies, organizations (and in some cases governments) have developed green strategies. The following precedents show diverse marketing strategies and product ideation of five design based circular economy setups.

All of these projects use innovative approaches within the circular economy. For example, service instead of product, recycled, reused and upcycled materials vs new materials to innovate the ways in which we extend the life of cellulose and nylon based materials to make new products and propose new solutions. Both of these materials use earth's valuable resources - water and energy in the manufacturing process. Waste generated by abundant disposal of underutilized products made from both these materials is one of the major concerns for the environment.

The projects highlighted below vary from businesses to startups and student projects. The diverse nature and scale of each of these setups is indicative of realization of the need of shifting towards a circular approach amongst innovators on both big and small scales.

3.1.1. Rethinking Ownership - from Owner to User

3.1.1.1. MUD Jeans

Netherland based "MUD Jeans" has a unique business model where the most effective way of getting the product back is to avoid selling it.[75] In order to retain control of the materials, MUD jeans leases jeans, with a number of options available. Although customers can purchase the jeans outright, they can also opt to lease Mud Jeans for €7.50 / month.

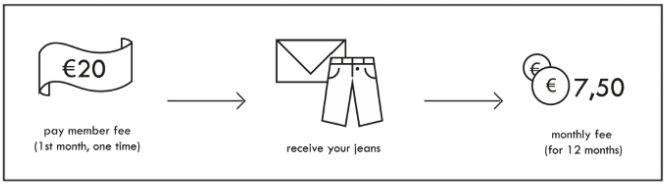


Fig 09. Lease A Jeans Model
"Lease A Jeans | MUD Jeans | Lease Your MUD Jeans Online!" MUD JEANS. Accessed January 1, 2017. http://www.mudjeans.eu/lease-a-jeans/.

After one year, the user has three options. They can exchange their jeans for a new pair and continue leasing the new one for another year or end the relationship by returning the jeans to Mud. Free repairs are included in the contract. Those who decide to keep the jeans are offered financial incentives like take back discounts to return the items in order to encourage recovery and prevent raw material leakages in the system.[76]

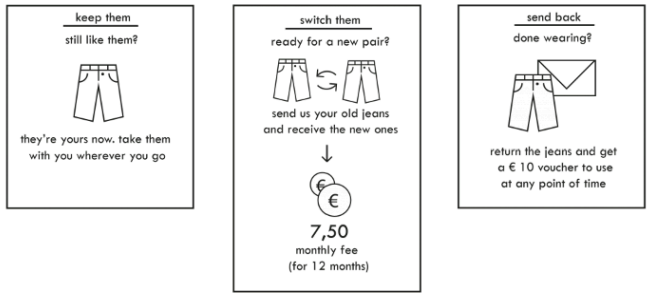


Fig 10. Lease A Jeans Model
"Lease A Jeans | MUD Jeans | Lease Your MUD Jeans Online!" MUD JEANS. Accessed January 1, 2017. http://www.mudjeans.eu/lease-a-jeans/.

Fig 11. REMO tags for MUD jeans
"Blog | MUD Jeans | Remo For Transparency | Sustainable Jeans." MUD JEANS, December 5, 2016. http://www.mudjeans.eu/blog-remo-for-transparency/.

Once the jeans have been recovered, they are assessed and the materials continue to flow through one of two loops. In the first loop, if the product is undamaged, it is cleaned and re-sold. In the second loop, if the product is beyond repair, then the materials are returned to the denim manufacturer to be recycled. They also use QR code embedded tags to inform the consumer about the life cycle and environmental footprint of the product.[77]

3.1.1.2. Rent the Runway

Rent the Runway is an eCommerce business with a mission to democratize luxury in the U.S. They believe that everybody deserves a Cinderella experience. They provide women the ability to rent designer dresses, accessories, and other essentials for a fraction of the retail price, allowing them to look and feel beautiful for all of their special occasions. A goal of the company is to make rental a significant part of the retail industry. Their belief is that retail does not just have to be in the business of selling products but rather using products to deliver aspirational experiences.

Launched in November 2009, Rent the Runway has grown to become the leader in the global fashion rental space and is known as the "Netflix for Fashion." They are backed by some of the top venture capitalists in the world including Kleiner Perkins, Highland Capital and Bain Capital Ventures. They've been recognized by The Today Show, Fortune, Fast Company, The New York Times, and Tech Crunch as one of the most innovative businesses in the U.S.[78]

3.1.2. Reuse Material: Renew instead of New

3.1.2.1. ECONYL®

Another example of circular system of production is ECONYL®. The company gathers nylon based materials from all over the world to regenerate high quality nylon yarn from it.[79]

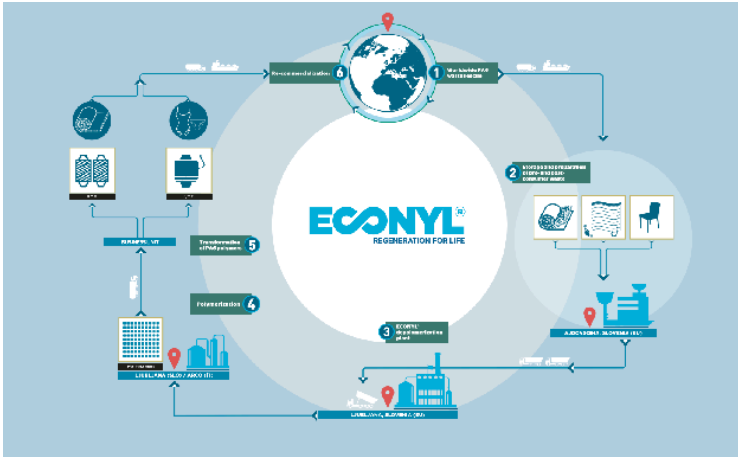


Fig 12. "ECONYL® - Regeneration System."
Accessed February 7, 2017. http://www.econyl.com/regeneration-system/.

3.1.2.1.1. Worldwide Polyamide Waste Rescue

The pre-consumer waste ECONYL collects includes production discards, industrial plastic components and oligomers. They also collect products at the end of their life cycle: fishing nets, fabrics. and fluff from carpet flooring. Currently, they reclaim waste throughout Canada (British Columbia), USA, Greece, Egypt, Pakistan, Turkey, Thailand, and Norway; and are constantly exploring new opportunities.[80]

Fig 13. ECONYL Worldwide Waste Rescue
"ECONYL - REGENERATION SYSTEM." Accessed February 25, 2017. https://www.econyl.com/regeneration-system/.

3.1.2.1.2. Storage and Preparation of Waste

According to ECONYL, "The collected waste begins its journey back to its origins in Ajdovščina (Slovenia) near Ljubljana. In this waste treatment center, the different types of waste are cleaned and prepared for depolymerization. As part of the cleaning process, foreign materials other than nylon 6 - organic, plastic or metallic materials - are removed and sent to other supply chains."[81] The cleaned nylon waste is shredded, compacted, bagged and transported to the ECONYL regeneration plant in Ljubljana. Slovenia.

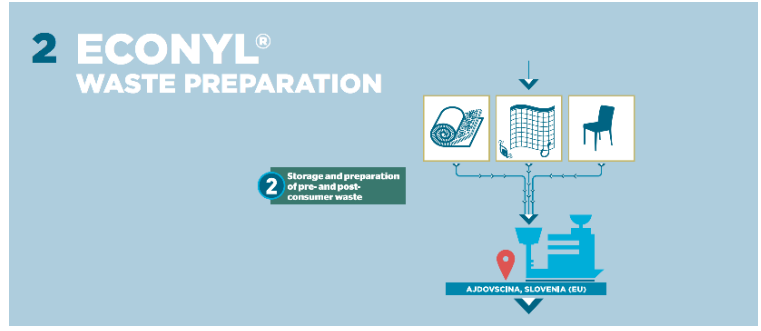


Fig 14. ECONYL Waste Preparation
"ECONYL® - REGENERATION SYSTEM." Accessed February 25, 2017. https://www.econyl.com/regeneration-system/.

3.1.2.1.3. The ECONYL Depolymerization Plant

At the core of the ECONYL Regeneration System stands the innovative ECONYL depolymerization process. According to ECONYL, what makes this step innovative and superior is a "miracle" in their system, because depolymerization at a scale that is commercially viable has been deemed impossible in the synthetic fibers sector due to extremely high costs of production and small amount of nylon output. They have invented a new purification process that is less complex than others applied in the industry. As a result, less energy and water is utilized, there is less residual waste, and more first-grade nylon is produced.

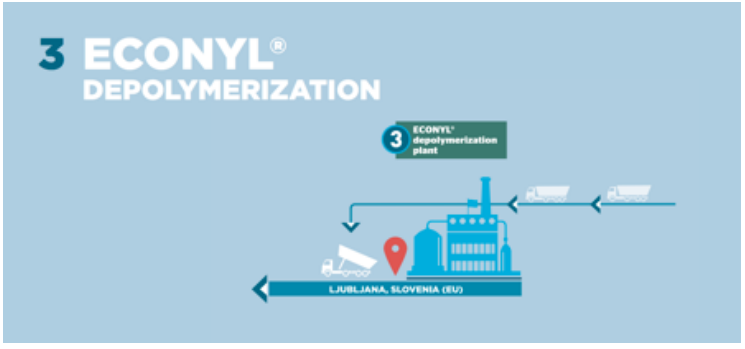


Fig 15. ECONYL Depolymerization
"ECONY Brochure." Accessed February 25, 2017.
http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.

3.1.2.1.4. The ECONYL Polymerization Plant

ECONYL has two polymerization plants that are located in Ljubljana (Slovenia) and Arco (Italy). The ECONYL caprolactam they produce has the same chemical and performance characteristics as caprolactam from raw fossil material. Hence, the process and chemical methods of transforming the ECONYL caprolactam into nylon 6 polymers – what is known as polymerization – are identical to polymerization of virgin caprolactam.[82]

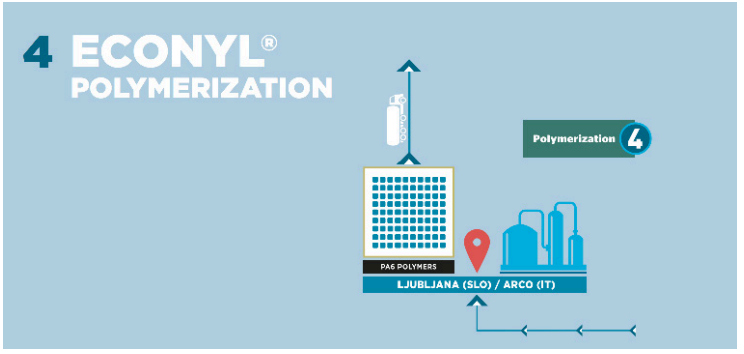


Fig 16. ECONYL polymerization
"ECONY Brochure." Accessed February 25, 2017.
http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.

3.1.2.1.5. Transformation and commercialization of PA6 Polymers

The PA6 polymers produced from ECONYL caprolactam are distributed to other production facilities where they are processed into BCF yarn (carpet flooring yarn) and NTF yarn (textile yarn).[83] Their goal is to manufacture products that are not only entirely made of regenerated material, but are fully and endlessly renewable.[84]

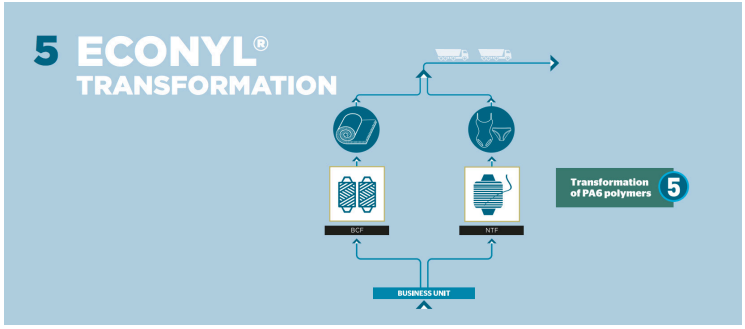


Fig 17. ECONYL Transformation
"ECONY Brochure." Accessed February 26, 2017.
http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.

Fig 18: ECONYL Re-comercialization
"ECONY Brochure." Accessed February 26, 2017.
http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.

3.1.2.2. Nike Remix and Recut collection

The Nike Remix and Recut collection by Nancy Wu was a collaboration between Nike and the designer.[85] It was a student project designed by sourcing and deconstructing old Nike shoes. The reusable components were recovered from pre-owned shoes and fashioned into a new wearable casual collection by the designer. Each pair produced, as a result of this process, was unique because there was unpredictability in obtaining the components that could fit together to take new forms. This method can open up possibilities of deconstruction services and take–back models in which slightly used shoes can be given a new look and new life to prevent the product from ending up in landfills.

Fig 20 & 21. "Nike Re-Mixed & Re-Cut by Nancy Wu." Hypebeast. Accessed October 31, 2016. https://hypebeast.com/2008/12/nike-re-mixed-re-cut-by-nancy-wu.

Fig 19. "Nike Remixed & Recut - Today and Tomorrow." Accessed October 31, 2016. http://www.todayandtomorrow.net/2008/12/12/nike-remixed-recut/.

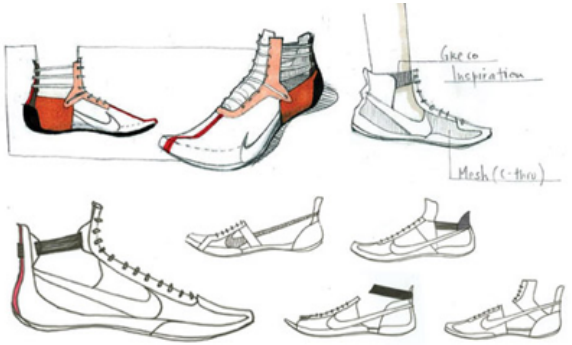


Fig 22. "Nike Re-Mixed & Re-Cut by Nancy Wu." Hypebeast. Accessed October 31, 2016. https://hypebeast.com/2008/12/nike-re-mixed-re-cut-by-nancy-wu.

Fig 23. "Nike Re-Mixed & Re-Cut by Nancy Wu." Hypebeast. Accessed October 31, 2016. https://hypebeast.com/2008/12/nike-re-mixed-re-cut-by-nancy-wu.

3.1.3. Upcycle

3.1.3.1. Rype Office

The aim of Rype Office is to change how companies buy and use their office furniture. There are three options available to the customers: they can buy new furniture and return it in a buy-back plan, purchase remade furniture manufactured from the inventory of buy-back program, or get previously purchased furniture renewed and restored to a like-new condition.[86] These three approaches allow Rype to cater to different types of clients, reach a broader audience and keep up with the full life cycle of the product. This range of services also enables customers to decide the amount of financial savings that can be made depending on their level of acceptance of the new business model. This approach has won Rype several business and innovation awards.

Rype Office has observed that while there are several success stories, there are still limitations which include lack of knowledge about the product, system and manufacturing methods within circular business models. The most important of these is perception. "By definition, remanufactured or upcycled products should retain a 'better than new' quality" but customers usually confuse remanufactured products with second hand products.[87] The second barrier is that pay-per-use is a fairly new concept and it is often perceived as being more expensive or inconvenient. In reality it may be the opposite, because circular leasing models guarantee better maintenance and support by the manufacturer throughout the life of the product.

INVESTIGATIONS

4. Afterlife and Designing for Disassembly

Fast fashion labels have been compressing production cycles and turning out up-to-the-minute designs and these businesses have enabled shoppers not only to expand their wardrobes but also to refresh them quickly. Consumers have responded to lower prices and greater variety by buying more items of clothing. The number of garments produced annually has doubled since 2000 and exceeded 100 billion pieces for the first time in 2014 which is nearly 14 items of clothing for every person on earth. Across nearly every apparel category from formal to casual and fitness, consumers keep clothing items about half as long as they did a decade ago.[88] Various research reports have suggested that consumers treat the lowest-priced garments as nearly disposable, discarding them before utilizing them to their full potential.

Innovation in the way clothes are made has not sustainably kept pace with how they are designed and marketed. Fast fashion is now a large business supported by a relatively low-tech production system: a system that has colossal environmental effects. Design for disassembly is a design strategy that considers the future need to disassemble a product for repair, refurbishing or recycling in order to prevent useful materials from ending up in landfills before being utilized to their full potential. Design for disassembly methods increase the effectiveness of a product by asking the following questions before, during, and after the life of a product:

1. Will a product need to be repaired?
2. Which parts will need replacement?
3. Who will repair it?
4. How can the experience be simple and intuitive?
5. Can the product be reclaimed, refurbished, and resold?
6. If it must be discarded, how can we facilitate its disassembly into easily recyclable components?[89]

Designing for disassembly involves a straightforward design methodology. For example:

- The fewer parts used in manufacturing, the fewer parts there are to take apart.
- As with parts, the fewer fasteners used, the better.
- Common and similar fasteners that require only a few standard tools will help to simplify and speed disassembly.
- Screws are faster to unfasten than nuts and bolts.
- Glues should be avoided.
- Building disassembly instructions into the product would help users understand how to take it apart.[90]

5. Rethinking Cellulose and Nylon Waste for and from Garments: Experiments in Interdisciplinary Design

The following series of experiments is an effort to sustainably regenerate and give a new meaning to discarded nylon and cellulose based items from sources around me, such as cotton leftovers from garment pattern making, plastic from water bottles, and paper from packaging, newspaper, and magazines. The experiments explore generative and renewable approaches that engage with components and raw materials in an effort to design solutions for disposable and wasteful fashion streams within a circular economy. The work developed in these series of experiments leads to the development of a system of circular production of hospitality accessories in an effort to develop new intersections between products, materials, and consumers. The accessories are designed using discarded, reformulated denim – an abundant and underutilized by product of the fashion industry – to reduce waste that currently occurs every time hotel chains and airlines produce disposable giveaway products from new materials.

5.1. Nylon

Nylon is synthetic, man-made, polyamide fiber derived from petrochemicals that is used extensively throughout the fashion industry. This plastic is put through an intensive chemical process, resulting in the strong, stretchy fibers that make it so useful as a fabric. It is extremely versatile, and is used for everything from stockings and parachutes, to carpets and packaging. Production of nylon is three times more energy intensive process than cotton. The production of nylon results in the release of nitrous oxide, a greenhouse gas that has a significant contribution to global warming. Nylon can be found in hosiery, the bristles of our toothbrushes, umbrellas, knits, swimwear and activewear. Nylon is used as replacement for naturally occurring polyamides that include wool and silk. It is hard-wearing, and was introduced to fashion in the 1930s as a long–lasting alternative to silk stockings. It replaced silk in military parachutes during the Second World War. Nylon is also not compatible with natural dyes and low impact chemical dyes: this means that the process of dyeing the fiber also creates significant water pollution. Nylon is less water intensive to produce than natural fibers, but with more nylon being producd in countries with weaker environmental protections in place, it makes nylon a significant contributor to water pollution, and thus water insecurity in the developing world.

Different kinds of nylon have different properties, but the common properties are strength, durability and the ability to be molded into shape. The flip side is that no form of nylon is biodegradable; so once you no longer have a need for your torn stockings or old toothbrush, it sits in a landfill for at least 20-200 years.

The good side is that nylon is a plastic, and a plastic that can be recycled. Recycled textiles allow designers to access the functionality of nylon, and, contribute to a good environmental outcome. However, the recycling process is still energy intensive, releases greenhouse gases and uses more harmful chemical dyes.

In order to find innovative and sustainable ways of utilizing nylon waste around me, I carried out the following experiments:

5.1.1 Re-Purpose

Since nylon is a plastic and producing further yarns from the plastic takes extra energy, I decided to utilize the properties and strength of this material in low- tech ways through the most abundant form of wasted plastic around me - plastic bottles.

Aim/ Intent

The aim of this experiment was to explore if plastic bottles can be used as a textile surface without using any heat for crushing and melting them down, since it would have required energy and would have produced visually invisible harmful gases.

Actions/ Process

In this experiment, I worked with smooth and straight parts of plastic bottles in an attempt to use them as small pieces of textile surfaces in themselves rather than considering plastic as a yarn or component that makes another surface.

Fig 24. A Peg Board and Pegs
"5-Peg-Boards-and-Pegs-[2]-46563-P.jpg (2048×1482)." Accessed February 7, 2017. http://www.cheapdisabilityaids.co.uk/ekmps/shops/podcmedia/images/5-peg-boards-and-pegs-[2]-46563-p.jpg.

Execution

The inspiration of this experiment was peg board and peg pins which are usually made out of plastic and are easy to assemble and disassemble providing innumerable options to play with different layouts and styles. They can last as long as the life of the plastic involved in their manufacturing and can continue providing design possibilities. Following the construction of the peg board, I made similar holes on the straightened plastic surface taken out from the center smooth part of a plastic bottle, where the label sits usually, and worked with thread to embroider patterns on it.

Conclusion/ Outcome

The limitation of the blown and rigid plastic bottle parts allowed only the central part of the bottle to be used in this case: it is soft, smooth flexible and big enough to be considered as a surface that could be embroidered, and also follow around a form to use in garments. The center part of the plastic bottle, however, was approximately 20% of the entire bottle. Not only was it a very small surface to work with, but a major part of the non-flexible part of the bottle remained underutilized which defied the purpose of a truly circular approach. It however, showed, that there is a potential for more ways of deconstruction and reconstruction if slicing is done to the entire form of the bottle, translating its form to a flexible, thread - like material as a whole rather than separating parts and fragments, which will not be a wholesome circular outcome.

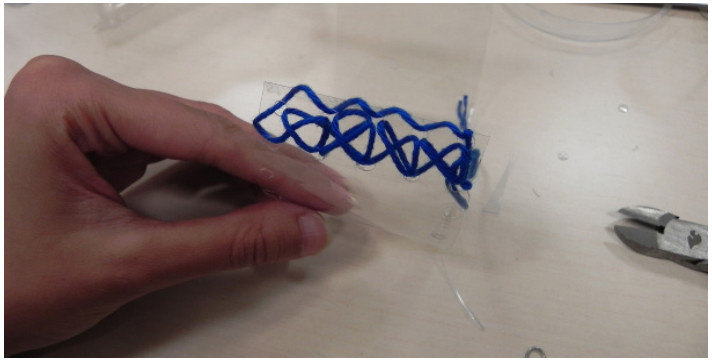


Fig 25. Interwoven thread with PET bottle section

5.1.2 Grids

Aim/ Intent

The aim of this experiment was to explore the possibilities of changing multiple looks with the help of different materials within a single piece.

Actions/ Process

For this experiment, I began with removing the cap, top and bottom of a plastic bottle and slicing the remaining plastic bottle into one thin continuous strand. In addition to that, I also gathered odd fabric and leather cuttings and sliced then into strips of equal size.

Execution

Continuing with the inspiration of a peg board, I 3d printed grids with ABS plastic and weaved strips of sliced plastic bottles and scraps of fabric and leather to complete the surface. This approach allowed me to disassemble any parts I didn't like and replace them with fresh ones for a new look everytime.

Conclusion/ Outcome

The outcome showed that there is a possibility to use this kind of disassembly approach on a small scale because the process to weave the strips again and again could be time consuming and tedious. Also, although it is long lasting and adaptable, printing more plastic to utilize similar amount of plastic didn't seemed a very effective solution because it is not sustainable so I moved on to more explorations that can yield a better solution.

Fig 26. PET bottle strand

Fig 27. Weaved grid

5.2. Cotton

Cotton is a natural cellulosic fiber, and is extensively used in clothing. It is the most pesticide intensive crop in the world.[91] These chemicals sometimes remain in the fabric even after finishing, and are released during the lifetime of the garments. Processing cotton from fiber to cloth – bleaching, dyeing, and finishing – uses energy and water, and causes pollution.

- Dyeing can account for most of the water used in producing a garment; unfixed dye then often washes out of garments, and can end up coloring the rivers, as treatment plants fail to remove them from the water. Dye fixatives – often heavy metals – also end up in sewers and then rivers.

- Cotton is often bleached using dioxin-producing chlorine compounds.

- Approximately all polycotton (especially bedlinen), plus all 'easy care', 'crease resistant', 'permanent press' cotton, are treated with toxic formaldehyde (also used for flameproofing nylon).

Cotton is a renewable resource, but is often disposed of without being fully utilized. It will be ideal if all cotton clothes could simply be recycled into new garments when their time was up. It would keep millions of tons of waste out of landfills, and allow the fashion industry to use far less virgin material, in turn cutting use of water, pesticides, and chemicals for dyeing. Unfortunately, recycling cotton clothes isn't simple. To create a new piece of clothing from old clothes, the old clothes first have to be chopped up and turned back into raw material. But that chopping-up process tends to lower the cotton's quality because it shortens the staple length of the fibers. Staple length plays an important role in determining the strength and softness of cotton threads. The longer the staple, the softer and finer the fabric. This is the reason cotton varieties with extra-long staple lengths, such as supima, are highly valued and why fashion brands find it difficult to use any large amount of recycled cotton in their products.

In order to find innovative ways of processing cotton waste within a circular economy, I carried out the following series of experiments including Warp and Weft, Weaving it together, Deconstruction and Re–thinking denim.

5.2.1. Warp and Weft

Warp and weft are the two essential components of a basic fabric weave. Warp is the thread that runs vertically while the weft is the thread that runs horizontally on a simple fabric loom. The combination of both these opposite directional threads, when weaved together, form a fabric. Warp is always a single strong, flexible and continuous thread of uniform width that is wrapped to the length and width of the desired fabric on a warping board before being adjusted to the loom. Weft is then added to it layer by layer to weave fabric. The simpler the weave, the easier it is to deconstruct it later. Hence, I decided use to everyday discards around me to develop my own fabric blend that could be taken apart easily after reaching its end of use to be further remade, renewed, or recycled.

Aim/ Intent

The aim of this project was to weave everyday discards such as paper, left over fabric from clothing patterns, aluminum cans, and thread manipulated in similar way as the plastic bottle slices to develop a fabric blend that can be used in similar ways as decorative fabrics. Deciding on a simple weave structure provided the ability to deconstruct the fabric at the end of its life for further renewal and reuse.

Actions/ Process

Plastic bottle slices along with continuous slices and strips from a combination of everyday discards like newspaper, magazine, fabric

Fig 28 & 29. Weaving process on the loom

trimmings, and soda cans were developed and weaved together on a basic handloom to from a running fabric blend.

Conclusion/ Outcome

This fabric can be used as an everyday fashion accessory or to decorate interior spaces. It can also be weaved to different lengths. This outcome also opens possibilities of using hand-weaving techniques like knitting and crochet that are easily deconstructable to further explore the potential of discarded materials.

Fig 30: Final Woven Piece

5.2.2 Weaving it Together

Fig 31. "Charpoy Charpai Manjaa Manji." Pinterest. Accessed February 7, 2017. https://www.pinterest.com/lrr4ever/charpoy-charpai-manjaa-manji/.

Fig 32. Denim charpoy weave with cardboard frames

Aim/ Intent

The aim of the project was to utilize denim leftovers from jean patterns. Denim is a cotton–based product and uses extensive energy, chemicals, and dyes to produce. I intended to take advantage of the rugged nature and complex weave of denim to make a stronger, weaved surface for interiors and furniture.

Actions/ Process

I started the process by mimicking a traditional, sub-continental, off–loom charpoy bed weaving pattern–where warp and weft weave structures support each other by going over and under to reinforce the strength of twine or fabric, to make the bed strong enough to support human weight. Using pre–consumer pattern–waste denim, strips of fabric were interweaved between sheets of heavy-duty cardboard to ensure flexibility and strength. The strips were fastened with the help of Velcro to make it easier to adjust and later disassemble the weave.

Conclusion/ Outcome

The experiment did not yield the required result because the cardboard was not strong enough to support and hold the weave in place for a long time. Also, denim was not an appropriate material for such structure since it lacked the elasticity that the traditional charpoy twine has. The resulting piece was too rigid, uncomfortable, and weak to sit on and weak to sit on.

5.2.3 Deconstruction

Aim/ Intent

Realizing halfway through the last experiment that denim itself is a complex weave, the next set of experiments was to find out what possibilities can open up if denim is un-weaved.

Actions/ Process

Small experiments were carried out to un-weave the fabric from warp and weft sides both with and without cutting the fabric.

Conclusion/ Outcome

The deconstruction revealed a third color tone of thread that is invisible to the user in regular denim. Contrary to its established rugged look, the fabric became flexible and sheer.

Fig 33, 34 & 35. Deconstruction of twill denim weaves from different directions

5.2.4 Rethinking Denim

The experiments in denim changed from minor deconstruction to complete transformations after coming across insulation generated through upcycling discarded denim by the "Blue jeans go green" project.[92] The project used the small length of the staple yarn to the material's advantage to make insulation that was very well binded together. Not only did it add to the diverse nature of the material, but it also became a decisive element in sticking with denim for the remainder of my research. The material kept yielding different interesting results every time it was deconstructed because of the reaction and response of cellulose content present in denim to the process, materials and steps involved in the process. This quality of denim to bond with various fibers made me push further and explore the possibilities that are generated after the manipulation and treatment of this material in itself or in combination with similar cellulose based materials for the remaining part of the research.

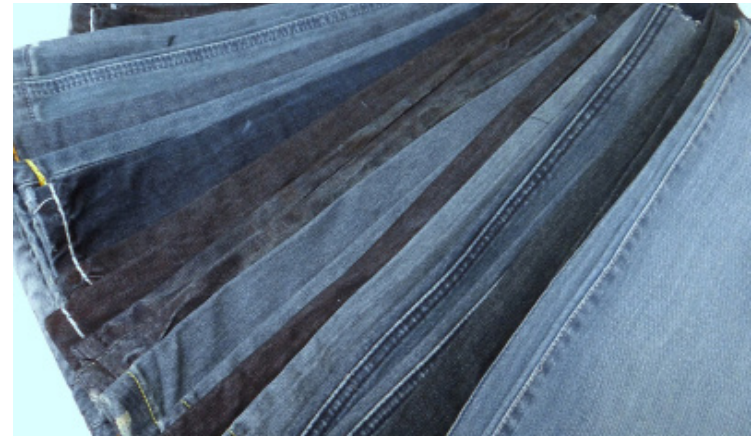


Fig 36. Discarded Denims from Colleagues

Aim/ Intent

This project was an attempt to find out if denim can be used in fusion with similar cellulose based materials to form hybrids with interesting properties.

Fig 37 & 38. Beating and couching process

Actions/ Process

Post-consumer discarded denim was collected from the surroundings. It was cleaned, shredded and mixed with Abaca paper pulp in a Hollander beater to obtain a fine pulp. The pulp was then formed into sheets with varying densities and dried under different conditions to observe effect on the behavior of the material.

Fig 39 & 40. Couching and pressing pulp layers

Conclusion/ Outcome

The material obtained as a result of these experiments was a hybrid between paper and fabric. It was soft, strong, lightweight, sturdy and flexible. It had recyclable properties due to similar manufacturing procedure as paper. It had varied levels of flexibility depending upon the number of layers involved and the drying methodology involved. Thick un-pressed material was more cushiony and flexible as compared to pressed material and thinner layers retained better durability when pressed.

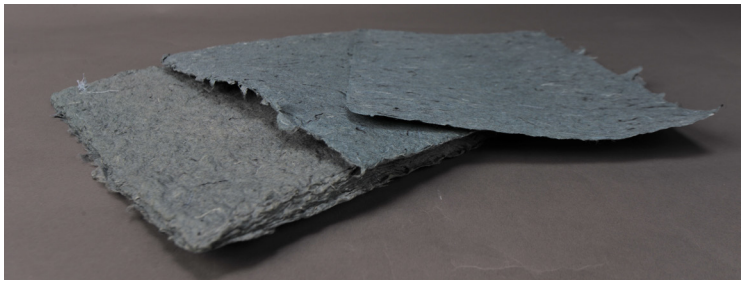


Fig 41 & 42. Dried material in different thicknesses

5.2.5. Rethinking Possibilities

The un-pressed sheets obtained after drying straight against wooden boards in the sun were so soft and cushiony that they made me want to walk on them. The idea was immediately acted upon in the following series of experiments.

Aim/ Intent

The soft and malleable nature of the material made it easier to form shapes when wet and retain form when dried while still being soft and cushiony. This property gave me the idea to experiment with making customized footbeds for my feet and experience how well it fits after drying. Since I have a high arch, most of the high street, fast fashion footwear never fits me and I have always wanted to make a sole that will actually fit me.

Actions/ Process

Explorations were done at the wet stage of the material since it is malleable to hold any shape if supported well around a smooth surface until it is dried. Good support at this wet stage is essential to obtain good results after drying because the material becomes wavy and uneven if water evaporates without a support.

The pulp was molded around the contours of the foot to try to obtain a soft, lightweight, and customized foot bed for each foot when dried. It was later dried flat, supported by wooden boards and glass windows to allow smooth evaporation of water and avoid deformation.

Fig 43. Foot impressions in wet pulp

Conclusion/ Outcome

The dried footbeds came out to be very close to my expectations. They were smooth, soft lightweight and fit very well. However, there were a couple of notable results. First, drying one of them in bright sunlight made it stiffer than the ones that dried in shade. So, the flexibility differed between both the footbeds. Second, these footbeds had a short life span because of the small length of fibres in the composition, and no coatings to prevent from weather damage.

Fig 44 & 45. Dried denim pulp beds adjusted to foot contours

5.2.6. Rethinking Application

Aim/ Intent

This experiment was an attempt to use the comfort, temporality, and recyclable nature of the footbeds and apply it to a footwear product that can take advantage of these characteristics. This resulted in a consideration of forms of footwear with short life spans. In order to determine that, I observed my own shoe collection for footwear items that I dispose of most often and discovered numerous pairs of hospitality slippers that I have gathered from my travels through many years. Most of them were picked up because they felt cozy and comfortable, while others because I had opened them and used them for a little bit and felt that the hotel will throw them away even if I don't take them.

Often marketed as disposable, hospitality slippers follow regular shoe making procedures and materials but has a temporality in usage because of the hygene standards of the hospitality industry. Since denim paper footbeds had a short life span because of short fibers, I decided to use this temporality as an advantage to develop hospitality slippers.

Fig 46. Personal collection of Hotel slippers

Fig 47. Dethreading the denim

Actions/ Process

The experiments continued with making more material in varying densities and attempting to make the entire slipper using the paper press. For the top pieces, denim pieces were partially de-threaded to allow the pulp to penetrate, fuse and bond through the base layers of pulp during pressing stage. The de-threaded denim was then sandwiched between 7 layers of pulp in a paper press. Thin sheets of the material were sliced, sewed and braided together to develop trimmings for the slippers.

Conclusion/Outcome

Trimming the excessive bed and assembling the parts together resulted in this hospitality slipper prototype seen in fig 52,53, and 54. It is soft, lightweight, and flexible. The leftover cuttings can be reused to make more material. Similarly, the entire slipper can also be potentially cleaned and recycled to develop similar products.

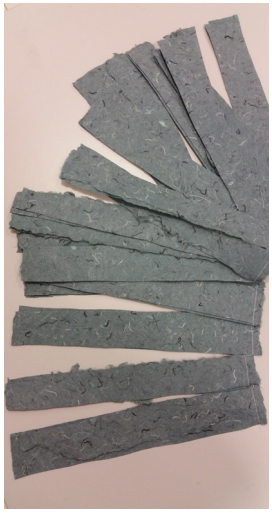


Fig 48. Pressed slipper sheet

Fig 49 & 50. Slicing, sewing and braiding the sheets together

Fig 51 & 52 . Completed slipper

Fig 53. Completed slipper

Fig 54 & 55. Footwear variations from the material

5.2.7. Variations

Aim/ Intent

To utilize leftover material from previous experiment to make more diverse forms of footwear.

Actions/ Process

Initially developed footbeds and leftover braids from preliminary experiments were further used to develop these lightweight sandal variations. Variations of these sandals can be a part of resort collections and spa merchandise.

Conclusion/ Outcome

The hotel industry is a highly competitive industry. Thus, the hotel amenities and supplies that they provide are part of the competition that include factors like how many hotel amenities are being offered including their types, quality, and design of the products. In this regard, the hospitality industry is similar to the fast fashion brands competition.

Guests' expectations of such hotel amenities are affected by the type of hotel and its sophistication level. Slippers, robes, absorbent towels, exquisite bed linens, wooden luggage racks, etc. are basic hotel amenities for hotels with 4 stars and up. The main aim for providing such extra luxury items is to increase the occupancy rates of the hotel rooms. As the level of the hotel goes up, so does the quality and number of hotel amenities and supplies.

Hotels and resorts with 5-star or above provide an even higher level of guest services and hotel amenities to attract and sustain high-end guests. For instance, shaving kits, medical kits, microfiber bathrobes and towels, shaving mirrors with a fog-free feature, in-room lockers, refrigerators and a mini bar are just some examples of high quality hotel amenities of luxury hotels and resorts. Not only do such additional hotel amenities attract new guests but they also increase the occupancy rates. The value and importance of hotel amenities cannot be overlooked as they have direct affect on the occupancy rates.

Disposable slippers are the most common amenity and must-have product category in most hotels. There are many kinds of disposable slippers, but the most common ones are made out of non-woven cloth, towel, or paper. Soles are made of plastic, with a thin layer of foam in the middle. Additionally, conventional terry towel slippers have two problems. First, the disposal of used hotel slippers becomes a problem for not being fully recyclable and, second, hotel slippers need to be changed regularly. Some hotels even change them on daily bases, making the product end up in trash before being used to its full potential.

ANALYSIS

6. Significance of Hospitality Slippers

The hotel industry is expanding with every passing day due to the boom in leisure and corporate tourism. Hoteliers know that if they want their customers to choose them over the competitors they have to provide something extra to the guests. An important one is offering quality and desirable hotel amenities to the guests at suitable rates. Things like hotel slippers, shampoos, conditioner etc. are some items that can be customized by the hotels to serve their guests. Hotel slippers mark the exclusiveness and brand of a hotel/resort. Some hotels also customize things like slippers, luggage racks, bedspreads, pillows, furniture, paper coasters, and other supplies. Providing products such as slippers to the customers creates positive impressions about the hotel and gives guests the comfort they want. Disposable slippers are present in almost all the 3+ star hotels because they charge for a certain level of hospitality. The disposable nature of these slippers is also important to health concerns because hotel guests do not expect to wear the slippers previously used by other guests. When a customer decides which hotel would be best choice to stay in, they review a number of different factors like room tariff, location, food, facilities, and also amenities. Amenities like comfortable hotel slippers speaks a lot about how comfortable, cozy, and well catered a guest's stay would be in a hotel. Large hotel franchises also invest in the design, material and presentation of the slippers to cater to their target market.

For example, Disney Parks and Resorts in Hong Kong offer take away slippers for the entire family.

Fig 56. Hotel slippers at Disney Hong Kong Hotel
Guan, Ellena. "[Day 1] Weekend Getaway To Hong Kong Disneyland." Accessed April 30, 2017. http://www.ellenaguan.com/2013/10/day-1-weekend-getaway-to-hong-kong.html.

Former creative director of Jimmy Choo, Beatrix Ong, introduced limited edition luxury slippers created exclusively for the guests and residents of the Shangri-La Hotel, at the Shard, London. The slippers had the design and comfort that both brands are renowned for, and were only available in London from 1st October 2015.[93]

The hotel's 202 luxuriously appointed rooms and suites were all individually designed with Asian influences complementing the stunning skyline. Alongside luxurious amenities such as Acqua Di Parma bathroom products, Chinese Tea Sets, and a pillow menu, this exclusive range of slippers were available as a complimentary luxury amenity within the hotel's three signature suites: The Shangri-La Suite, The London Suite, and The Westminster Suite, and were be available in all rooms and suites for purchase at £88 per pair. Made with luxurious silk velvet and non-slip suede soles, and in two sizes, the backs could be folded down transforming them into a slip on style if desired.[94]

Fig 57. Slippers at Hotel Shangri – LA at the Shard London by Designer Beatrix Ong
"More Projects." BEATRIX ONG. Accessed April 4, 2017.
http://www.beatrixong.com/moreprojects/

Shoe maestro Manolo Blahnik designed special edition hospitality slippers for the guests of Four seasons in Milano on the occasion of the worldwide launch of the touring exhibition "Manolo Blahnik. The Art of Shoe." A pair of these unique Manolo Blahnik slippers are included in the exclusive package for guests booking the Hotel's "Manolo Blahnik Package". This limited edition collector's item is made in Milan. It is a deep blue velvet and satin slipper with golden embroidered motifs.[95]

As part of this exclusive collaboration, guests at the Four Seasons Hotel Milano will also benefit from access to the Manolo Blahnik exhibition taking place at Palazzo Morando until April 9, 2017. On the occasion of the launch of this collaboration, Manolo Blahnik said: "Four Seasons in Milan is like a home from home to me. I have been coming here since the beginning and I can't wait to visit and wear the slippers myself!"[96]

Fig 58. Manolo Blahnik slippers for Four Seasons Milano
VOGUE. "Schöner Reisen Mit Manolo Blahnik Hotel-Slippern." VOGUE. Accessed April 11, 2017. http://www.vogue.de/beauty/beauty-tipps/manolo-blahnik-hotel-slipper.

However, hotels are not the only ones offering disposable luxury amenities to guests. First and business class services in some of the world's leading airlines offer complete grooming kits along with designer sleeping suits and slippers for long flights. For example, Swiss Air gives its first class passengers an on board kit complete with slippers, pajamas and La Prairie beauty products.

Fig 59. Swiss Air first class on board kit
MailOnline, By Chris Kitching for. "Inside the High-End Amenity Kits given to First Class Passengers." Mail Online, January 29, 2016. http://www.dailymail.co.uk/travel/travel_news/article-3422396/Airline-class-amenity-kits-include-designer-lotions-slippers.html.

Similarly, Qatar airways offers one of the most luxurious first class on board kit complete with pajamas and slippers from Italian fashion house Missoni.[97]

Fig 60. Qatar Airways first class on board flight kit from Missoni
MailOnline, By Chris Kitching for. "Inside the High-End Amenity Kits given to First Class Passengers." Mail Online, January 29, 2016. http://www.dailymail.co.uk/travel/travel_news/article-3422396/Airline-class-amenity-kits-include-designer-lotions-slippers.html.

Most of the hotel chains and airlines allow the guests to take the slippers and certain amenities with them. While these slippers do not wear well and general sizes do not fit every guest, hotel chains and airlines take slippers seriously. Most of the 3 star and above hotels, business class and first class sections of major world airlines offer exclusively designed slippers with logos embroidered or printed on them.

Recognizing the guests' appreciation for products found in hotels, hotels are creating a separate business out of their in-room product collection. The W hotels, ITC and Ritz Carlton for instance, have stores on all their properties and websites where guests can buy memorabilia, including products found in rooms, and souvenirs like T-shirts with the hotel's name.[98]

Fig 61. Slippers for sale online at Ritz Carlton shop
"Ritz-Carlton Hotel Shop - Waffle Slippers - Luxury Hotel Bedding, Linens and Home Decor." Ritz-Carlton Hotel Shop – Luxury Hotel Bedding, Linens and Home Decor. Accessed January 6, 2017. http://www.ritzcarltonshops.com/product.aspx?waffle-slippers.

It is evident from the precedents above that hospitality slippers are an important part of the overall travel experience from flight to the stay and some of the major hospitality players from airlines to hotels, take slipper offerings quite seriously. Some of us may even have a small collection of the take away slippers from all their globe-trotting experiences. While some of us might completely ignore they exist because however exclusive the design may be, the slipper is made in generic sizes that are too small for them. The take away model of all the amenities including slippers suits the hotels and carriers because once used, the product is not launder-able or reusable due to hygiene reasons.

OUTCOMES

7. Materials, Methods and Design – A Circular Approach to Hospitality Slippers

In order to identify broad sustainable circular economy design solutions for hospitality slippers using preliminary denim paper investigations, further research revealed that there can be several factors that affect the sustainability, design, assembly, look and price points of hospitality slippers. A few of these factors are user experience, logistics, followed by the lifestyle of the targeted guest, tariff and nature of the stay (i.e executive suits vs regular rooms in a hotel or business class vs first class on flights).

Slippers are an item that is needed in large volumes by hotels and airlines because of the regular flow of their guests. Ordinary hospitality slippers are pre made, wrapped in plastic and shipped to the desired destination. This system often results in shipment of more volume instead of actual product. Moreover, most of these slippers are made to fit average male and female foot sizes and therefore do not fit people with bigger foot sizes.

To address the three immediate design problems that can help change the overall hospitality slipper experience for industry and users, I came up with four solutions that address the problems of :

i. Large shipping volumes
ii. Bigger or smaller foot sizes
iii. High end user experience and customer satisfaction

FLAT PACKED 1

Intent

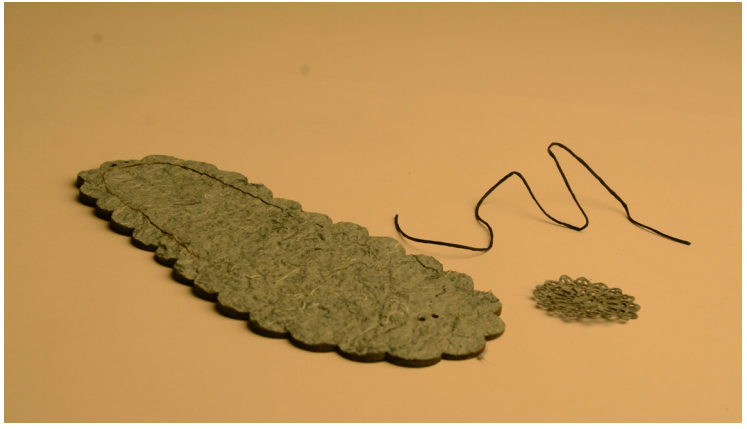
Flat packing minimizes the shipping volume of product so that they become easier for service providers to get more product at reduced priced points. Additionally, it adds to the user experience of making the product in easy steps.

Process

The denim paper was formed in a combination of 70% denim and 30% abaca to obtain a strong yet flexible material. Six layers were couched and pressed to form a smooth sheet in order to achieve the right thickness for the sole and upper support of an open toe slipper since the entire slipper was taken out of this sheet. The challenge was to design a slipper with easy assembly steps that can self-guide the user to put it together.

Outcome

The outcome is a simple design cut in the shape of a shoe insole that can be transformed into an open toe slipper with one easy step. It uses one A3 size denim paper sheet for a standard U.S 8.5 foot and can be shipped in larger quantities than the pre–assembled slippers. It is easy to assemble, lightweight, and durable enough to support the feet. The material has been made water tight by adding micro glaze which is an environment friendly paper sealant that helps withstand water damage to paper.



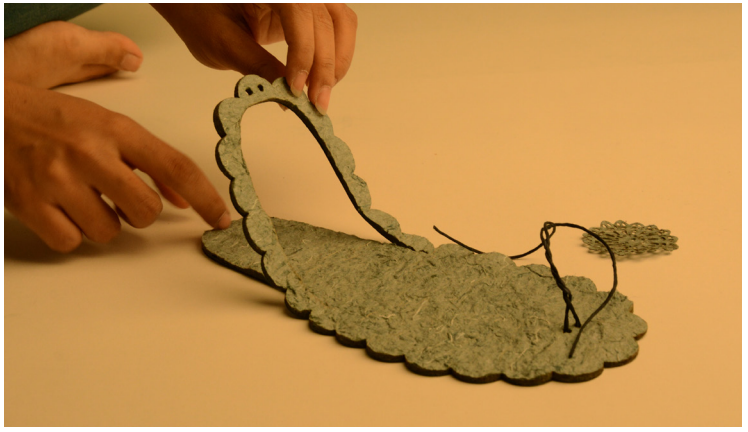
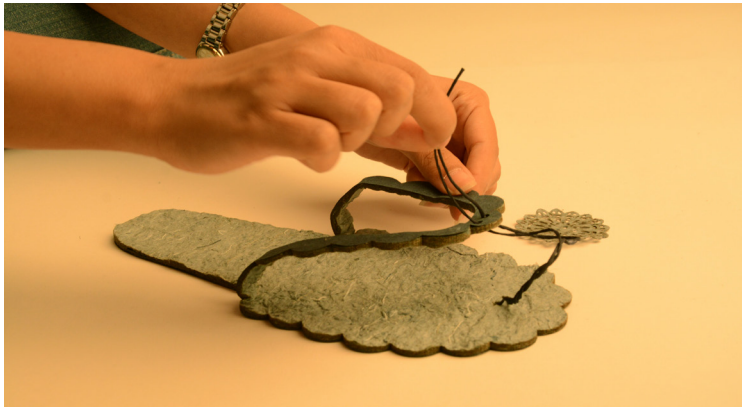


Fig 62 & 63. Open-toe flat-packed slipper



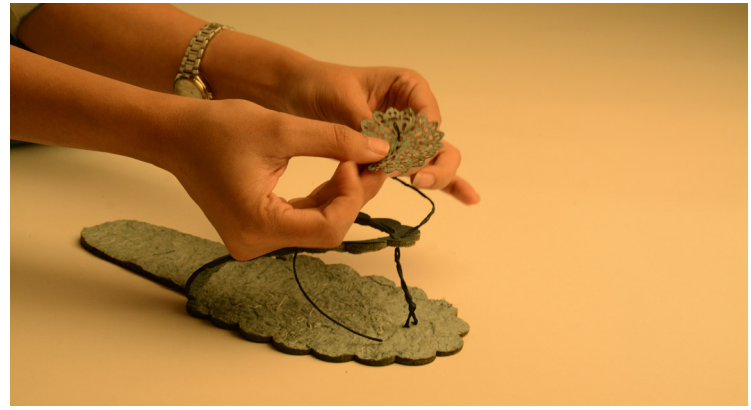


Fig 64 & 65. Putting the slipper together

Fig 66 & 67. Completed slipper

FLAT PACKED 2

Intent

This slipper was also developed with the intent of minimizing shipping volumes and creating a simple closed-toe flat packed solution using denim paper.

Process

Denim paper was formed in the combination of 50% denim and 50% abaca to obtain both a soft and strong foundation, but maintain a sturdy material. 4 layers of the material were couched on top of each other in sets of 2 sheets of denim and 2 sheets of abaca in order to obtain a color variation. The sheet was pressed to form a sheet that was easily foldable and could retain its shape.

Outcome

The outcome is a simple 2-step solution that can be folded at the sides of the slipper and fixed from the front, forming a closed toe slipper. Different layers of material (in sets of 2) not only make the product visually interesting, but also provide softness on the inside and stiffness on the outside as needed.

Fig 68 & 69. Closed-toe flat-packed slipper

Fig 70 & 71. Putting the slipper together

Fig 72 & 73. Completed slipper

ONE SIZE DOES NOT FIT ALL

Intent

The intent of the design of this slipper is to cater to the audience that does not fit into the generic shoe sizes between 24.5 cm to 26.5 cm at the sole. The goal is to find a balance between customization and accessibility in order to provide guests, within the hospitality industry, a product that feels unique and valuable.

Process

Denim paper combination of 65% denim and 35% abaca was used to form 4 layered pressed sheets. After testing several paper prototypes, this pattern was picked because of ease of assembly and then arranged in sizes from U. S size 7 to 9, one inside the other.

Outcome

The 'One size does not fit all' slipper was developed to contain all the concentric sizes in one easy-to-assemble vector file. In other words, the slipper is laser cut with form markings to allow the user to easily separate the size that suits them the best and assemble the slipper around their feet. This approach covers a broad group of users. The sizes for this pattern can run from the smallest to the largest possible size and still be arranged inside one another. The markings are enough to separate the right size, but strong enough to hold the rest of the shape in place. This approach also enables the hospitality provider to offer a more customized service and add to the overall user experience.

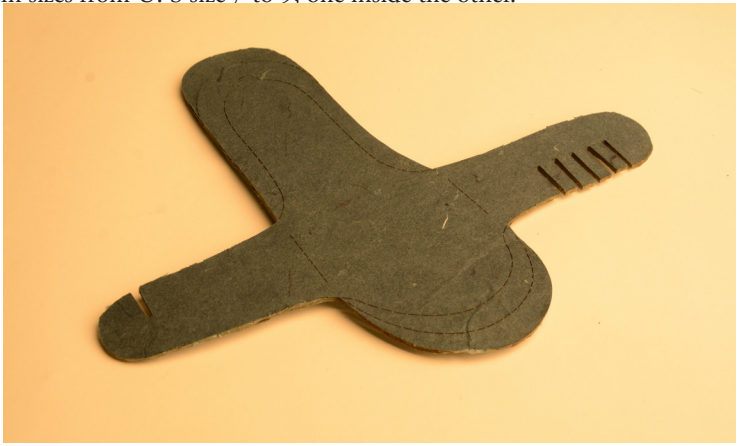


Fig 74 & 75. Flat form of 'One Size Does Not Fit All'

Fig 76 & 77. Putting the slipper together

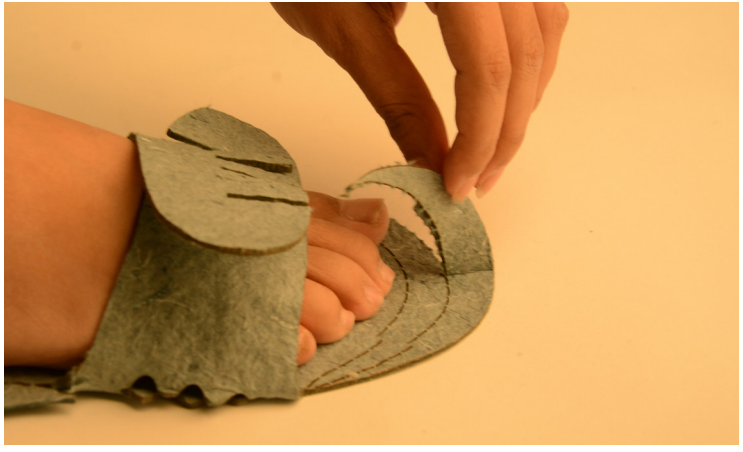


Fig 78 & 79. Completed slipper

HAND CRAFTED

Intent

The intent of the 'Hand crafted' slipper is to provide exclusive guests of the hotel industry a handcrafted pair of slippers that incorporate basic shoe making techniques. This value-added pair of slippers aims to encourage high-end hotels to engage with a more circular approach to their business models.

Process

The denim paper was formed into sheets of 70% denim and 30% paper consistency. These sheets were then hand cut, folded, weaved, and braided together to form soles and uppers for the slippers.

Outcome

The resulting handcrafted slipper is an exclusive product for hotel guests, from the preparation of the material to the final product. It can be presented to esteemed business and first class guests with a story that tells the journey of this product, reinforcing the value of the time spent on creating each unique pair of slippers.

Fig 80 & 81. Quilted and braided slipper

Fig 82 & 83. Braided and weaved slipper

Fig 84 & 85. Braided and weaved slipper

Fig 86 & 87. Braided slipper

Fig 88 & 89. Braided slipper

Fig 90 & 91. Waeved &braided slipper

EXHIBITION

Fig 92. Thesis work exhibited at VCUQatar gallery from 29th April to 20th May 2017

CONCLUSION

Denim is a universally mass produced fabric. Research conducted by Statistic Brain in August 2016 revealed that over 1,240,000,000 denims are sold every year.[99] It takes 1800 gallons of water to grow the cotton required to make a single pair of adult size denim trousers. In addition, most denim manufacturers use synthetic dyes that are released in rivers and pollute the environment. The rivers in the denim manufacturing capital of the world Xintang, in China, have turned blue and the city is no longer suitable for living. The global waste generated from the pre-consumer cuttings and discarded denim is more than 23.8 billion pounds per year.[100] Contrary to popular perception that denim is bio degradable, the synthetic dyes used in the manufacturing of denim make it extremely difficult for it to biodegrade.

This research examined how these large quantities of wasted denim can be seen as a raw material to produce the widely used product "hospitality slippers" within a circular economy approach. The denim-abaca hybrid material obtained as a result of this research is soft, lightweight, flexible, and has temporary durability that works to the advantage of making hospitality footwear. The research investigated how a circular approach to production might help address large shipping volumes, foot size variation, high-end user experience, and customer satisfaction within the hospitality industry. The factors of sustainability, design, and assembly guided the design of a circular approach to the production of four slipper variations: flat packed 1& 2,one size does not fit all, and hand crafted.

While there remains room for additional explorations, the slippers produced as a part of this thesis also open up the possibility of using denim material to produce amenities that are truly circular in nature. For instance, the leftover cutting from any patterns can be fed back into the paper vat and used to form more amenities like rugs, placemats, hangers and notebooks etc.

Similarly, the used slippers can be recycled like any other paper or can be collected back. The top and bottom layers of the slippers containing wax and impurities can be removed since the sheets are formed in layers that are easily peelable.

The successful identification of a source to collect raw material and a system to make, take back, and recycle these slippers can potentially reduce a significant quantity of hospitality slipper waste from hotel chains and airline companies. Using a combination of various cellulose–based paper alternatives, along with denim, can help in developing further interesting materials with simple papermaking techniques. Also, since the strength of material comes from the length of denim fibers and the fusing strength of abaca, the ratio between both of them or a different choice of additive material can yield a range of different results from varying levels of absorbency, flexibility, strength and sustainability.

FUTURE DIRECTIONS

Making clothes generally requires a lot of water and chemicals from the fiber to the garment stage, accompanied by the emission of significant amounts of greenhouse gases. Reports also continue to emerge about clothing-factory workers being underpaid and exposed to unsafe - even deadly - workplace conditions, particularly when handling materials like cotton, nylon, and leather that require extensive processing. Without improvements in the system for how clothing is made, used and reused, these issues will grow proportionally as more clothes are produced.

The Circular Economy takes its values from various schools of thought like Cradle to Cradle, Bio mimicry , Regenerative design, Upcyling and Industrial Ecology.[101] It encourages innovators and creative thinkers to propose adaptive, modular and versatile systems to reimagine products that have a truly sustainable nature. An online publication by the Ellen MacArthur Foundation states that “circular product (and process) design requires advanced skills, information sets, and working methods. Areas important for economically successful circular design include: material selection, standardized components, designed-to-last products, design for easy end-of-life sorting, separation or reuse of products & materials, and design-for-manufacturing criteria that take into account possible useful applications of by-products and wastes”.

Designers, companies, organizations (and in some cases governments) have a responsibility to develop green strategies and encourage circular systems for producing, consuming and regenerating goods. While making a transition into the circular economy is a complex and challenging process, designers can play an important role in redesigning these systems using their creativity, innovation, and collaborative skills to gradually shift the current methods and perspectives. This research will, therefore, continue to keep exploring new opportunities for designers and makers to accept these challenges and to develop a range of products based on the principles of circular economy.

REFERENCES

1. *"George Bernard Shaw Quotes," BrainyQuote, accessed April 29, 2017, https://www.brainyquote.com/quotes/quotes/g/georgebern386923.html.*
2. *Andrew Morgan, "The True Cost" - Official Trailer, 2015, https://www.youtube.com/watch?v=OaGp5_Sfbss.*
3. *"About | True Cost | A Fashion Film," The True Cost, accessed April 15, 2017, http://truecostmovie.com/about/.*
4. *"People Tree - True Cost Film," accessed April 15, 2017, http://www.peopletree.co.uk/true-cost-film.*
5. *Ibid.*
6. *Cat, "'Fast Isn't Free – Someone Somewhere Is Paying.,'" accessed April 2, 2017, http://catherine--frances.blogspot.com/2013/02/fast-isnt-free-someone-somewhere-is.html.*
7. *"Fast Fashion, 'value' fashion | Ethical Fashion Forum," accessed October 23, 2016, https://www.ethicalfashionforum.com/the-issues/fast-fashion-cheap-fashion.*
8. *Eric Abrahamson, "The Iron Cage: Ugly, Uncool and Unfashionable.pdf," accessed March 31, 2017, https://www0.gsb.columbia.edu/mygsb/faculty/research/pubfiles/4694/Abrahamson%202010.pdf.*
9. *Zygmunt Bauman, Liquid Life, 1 edition (Cambridge, UK ; Malden, MA: Polity, 2005).*
10. *Ashley Crossman, "McDonaldization and Why Sociologists Are Not Lovin' It," ThoughtCo, accessed April 15, 2017, https://www.thoughtco.com/mcdonaldization-of-society-3026751.*
11. *Jagdeep Singh and Isabel Ordoñez, "Resource Recovery from Post-Consumer Waste: Important Lessons for the Upcoming Circular Economy," Journal of Cleaner Production, Special Volume: Transitions to Sustainable Consumption and Production in Cities, 134, Part A (October 15, 2016): 342–53, doi:10.1016/j.jclepro.2015.12.020.*
12. *Gary Hustwit, Objectified, Documentary, (2009).*
13. *Singh and Ordoñez, "Resource Recovery from Post-Consumer Waste."*
14. *Maxine Bédat Zady co-founder of, "Fast Fashion Has a Dirty Little Secret," CNBC, July 3, 2015, http://www.cnbc.com/2015/07/03/fast-fashions-dirty-secret-and-a-solution-made-in-america-commentary.html.*
15. *"Fast Fashion, 'value' fashion | Ethical Fashion Forum," accessed October 22, 2016, https://www.ethicalfashionforum.com/the-issues/fast-fashion-cheap-fashion.*
16. *EcoWatch, "Fast Fashion: Cheap Clothes = Huge Environmental Cost," EcoWatch, September 8, 2016, http://www.ecowatch.com/fast-*

fashion-1994121280.html.

17. *Jagdeep Singh and Isabel Ordoñez, "Resource Recovery from Post-Consumer Waste: Important Lessons for the Upcoming Circular Economy," Journal of Cleaner Production, Special Volume: Transitions to Sustainable Consumption and Production in Cities, 134, Part A (October 15, 2016): 342–53, doi:10.1016/j.jclepro.2015.12.020.*
18. *Jagdeep Singh and Isabel Ordoñez, "Resource Recovery from Post-Consumer Waste: Important Lessons for the Upcoming Circular Economy," Journal of Cleaner Production, Special Volume: Transitions to Sustainable Consumption and Production in Cities, 134, Part A (October 15, 2016): 342–53, doi:10.1016/j.jclepro.2015.12.020.*
19. *"The True Cost' Explores the Global Impact of Fast Fashion," Vogue, accessed April 1, 2017, http://www.vogue.com/article/the-true-cost-documentary.*
20. *Zady, "Fast Fashion Has a Dirty Little Secret."*
21. *Marc Bain, "H&M's 'sustainability' Report Hides the Unsustainable Reality of Fast Fashion," Quartz, accessed April 1, 2017, https://qz.com/380055/hms-sustainability-report-hides-the-unsustainable-reality-of-fast-fashion/.*
22. *Jason Fernando, "Fast Fashion," Investopedia, August 17, 2015, http://www.investopedia.com/terms/f/fast-fashion.asp.*
23. *"Unethical Production - Fast Fashion," accessed October 22, 2016, http://fastfashion.weebly.com/unethical-production.html.*
24. *"What is Planned Obsolescence?" accessed October 21, 2016, http://www.technologystudent.com/prddes1/plannedob1.html.*
25. *"Fast Fashion, 'value' fashion | Ethical Fashion Forum."*
26. *Wang Yinyin, "Consumer Behavior Characteristics in Fast Fashion," 2011, http://bada.hb.se/handle/2320/7723.*
27. *"Fast Fashion, Luxury Brands, and Sustainability | The World Financial Review | Empowering Communication Globally," accessed April 1, 2017, http://www.worldfinancialreview.com/?p=738.*
28. *Apr 23 2016 at 12:15 AM and Updated Apr 23 2016 at 12:15 AM, "Wardrobe Crisis – Too Much, Too Cheap, Too Fast," Financial Review, April 22, 2016, http://www.afr.com/lifestyle/fashion/why-the-fashion-industry-is-out-of-control-20160419-goa5ic.*
29. *Alladi Venkatesh et al., "The Aesthetics of Luxury Fashion, Body and Identify Formation," Journal of Consumer Psychology, Aesthetics, 20, no. 4 (October 2010): 459–70, doi:10.1016/j.jcps.2010.06.011.*
30. *Pankaj Ghemawat and Jose Luis Nueno, "ZARA: Fast Fashion," accessed February 27, 2017, https://hbr.org/product/zara-fast-fashion/703497-Pdf-Eng.*

31. *"Luxury VS Fast Fashion: Live Battle Or Blurred Lines?," Luxury Society, accessed April 1, 2017, http://luxurysociety.com/en/articles/2015/12/luxury-vs-fast-fashion-live-battle-or-blurred-lines/.*

32. *Dazed, "Mental Health in Fashion: It's Time to Talk," Dazed, February 12, 2015, http://www.dazeddigital.com/fashion/article/23582/1/mental-health-in-fashion-it-s-time-to-talk.*

33. *Paul Harris, "John Galliano Describes Rampant Drug Abuse in First Interview since Dior Firing," The Guardian, June 4, 2013, sec. Fashion, https://www.theguardian.com/fashion/2013/jun/04/john-galliano-first-interview-dior.*

34. *Dazed, "Mental Health in Fashion."*

35. *"What Is Impulse Buying? Definition and Meaning," BusinessDictionary.com, accessed February 26, 2017, http://www.businessdictionary.com/definition/impulse-buying.html.*

36. *Dennis W. Rook and Stephen J. Hoch, "Consuming Impulses," NA - Advances in Consumer Research Volume 12, 1985, http://acrwebsite.org/volumes/6351/volumes/v12/NA-12.*

37. *Yinyin, "Consumer Behavior Characteristics in Fast Fashion."*

38. *"Value - Definition of Value in English | Oxford Dictionaries," Oxford Dictionaries | English, accessed February 27, 2017, https://en.oxforddictionaries.com/definition/value.*

39. *Krystina Gustafson, "The Problem Luxury Brands Aren't Talking about," CNBC, February 10, 2016, http://www.cnbc.com/2016/02/10/the-real-problem-luxury-brands-arent-talking-about.html.*

40. *Scarlett Conlon, "Burberry Changes Fashion-Show Model," British Vogue, accessed April 1, 2017, http://www.vogue.co.uk/article/burberry-to-concentrate-on-two-annual-consumer-shows.*

41. *Scarlett Conlon, "Tom Ford Cancels Show," British Vogue, accessed April 1, 2017, http://www.vogue.co.uk/article/tom-ford-cancels-new-york-fashion-week-show.*

42. *Margaret Sutherlin and Margaret Sutherlin, "Fashion Week At A Crossroads: Why Designers Are Changing Up The Traditional Runway Show," Footwear News, February 5, 2016, http://footwearnews.com/2016/fashion/designers/new-york-fashion-week-designers-changing-up-traditional-runway-show-188563/.*

43. *Ibid.*

44. *"Luxury VS Fast Fashion."*

45. *Gustafson, "The Problem Luxury Brands Aren't Talking about."*

46. *"Check out the Latest Annual Fashion Resale Report on thredUP.com!," thredUP, accessed April 8, 2017, https://www.thredup.com/resale.*

47. *"High-End Shopping In The Sharing Economy: Now We Can All Have Couture," Fast Company, September 15, 2016, https://www.fastcompany.com/3063255/high-end-shopping-in-the-sharing-economy-now-we-can-all-have-couture.*

48. *Ibid.*

49. *Helena Pike, "Will the 'Sharing Economy' Work For Fashion?," The Business of Fashion, May 8, 2016, https://www.businessoffashion.com/articles/fashion-tech/will-the-sharing-economy-work-for-fashion-rent-the-runway-rental.*

50. *"Care Label Project," AEG, accessed April 3, 2017, http://www.aeg.co.uk/care/inspiration/care-label-project/.*

51. *"H&M's Clevercare Labels Helping Customers Extend Clothing Life While Saving Energy, Water | Sustainable Brands," Sustainablebrands.com, accessed April 3, 2017, http://www.sustainablebrands.com/news_and_views/behavior_change/jennifer_elks/hms_clevercare_labels_helping_customers_extend_clothing.*

52. *"The Care Label Project Wants to Save the Planet by Improving the Fashion Industry," Highsnobiety, April 29, 2017, http://www.highsnobiety.com/2017/03/28/aeg-care-label-project/.*

53. *J. F. ; Blackwell Engel R. D. ; Miniard, P. W., Consumer Behaviour, International 8 Revised Ed edition (Fort Worth, Tex. etc.: Harcourt Education, 1995).*

54. *Ibid.*

55. *Mark Tungate, Fashion Brands: Branding Style from Armani to Zara (Kogan Page Publishers, 2008).*

56. *Engel, Consumer Behaviour.*

57. *Ibid.*

58. *John R. Hauser and Frank S. Koppelman, "Effective Marketing Research.pdf," accessed February 27, 2017, http://www.mit.edu/~hauser/Papers/effective%20marketing%20research.pdf.*

59. *Russell W. Belk, "An Exploratory Assessment of Situational Effects in Buyer Behavior," Journal of Marketing Research 11, no. 2 (1974): 156–63, doi:10.2307/3150553.*

60. *Michael R. Solomon and Nancy Rabolt, Consumer Behavior in Fashion, 2 edition (Upper Saddle River, N.J: Prentice Hall, 2008).*

61. *"Lifestyle," BusinessDictionary.com, accessed February 27, 2017, http://www.businessdictionary.com/definition/lifestyle.html.*

62. *Ibid.*

63. *"The 'Athleisure' Trend," accessed April 16, 2017, https://www.merriam-webster.com/words-at-play/athleisure-words-were-watching.*

64. *"Luxury Fashion Brands Are Embracing Athleisure," South China Morning Post, accessed April 16, 2017, http://www.scmp.com/magazines/style/fashion-beauty/article/1983046/brand-new-lifestyle-luxury-fashion-brands-are.*

65. *Ibid*

66. *Hustwit, Objectified.*

67. *Singh and Ordoñez, "Resource Recovery from Post-Consumer Waste."*

68. *William. McDonough, Cradle to Cradle: Remaking the Way We Make Things, 1st ed.. (New York: North Point Press, 2002).*

69. *Ibid.*

70 *"Ege - Innovation Stories - Cradle to Cradle Products Innovation Institute," accessed October 24, 2016, http://www.c2ccertified.org/innovation-stories/ege.*

71. *"Case Studies," accessed October 24, 2016, https://www.ellenmacarthurfoundation.org/case-studies/growing-alternativesto-petroleum-based-packaging.*

72. *"Reep - The Digital Enterprise Paper Solution," accessed February 25, 2017, http://reepcorp.com/.*

73. *Ibid.*

74. *"How to get your product cradle to cradle certified TM," MBDC, accessed April 16, 2017, https://mbdc.com/how-to-get-your-product-cradle-to-cradle-certified/.*

75. *"MUD Jeans - Circular Denim," MUD Jeans, accessed October 31, 2016, http://www.mudjeans.eu/.*

76. *"Lease A Jeans | MUD Jeans | Lease Your MUD Jeans Online!" MUD JEANS, accessed February 7, 2017, http://www.mudjeans.eu/lease-a-jeans/.*

77. *"Blog | MUD Jeans | Remo For Transparency | Sustainable Jeans," MUD JEANS, December 5, 2016, http://www.mudjeans.eu/blog-remo-for-transparency/.*

78. *"Rent the Runway | Crunchbase," accessed May 1, 2017, https://www.crunchbase.com/organization/rent-the-runway*

79. *"ECONYL® - Regeneration System," accessed February 7, 2017, http://www.econyl.com/regeneration-system/.*

80. *Ibid.*

81. *Ibid.*

82. *"ECONY Brochure," accessed February 27, 2017, http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.*

83. *Ibid.*

84. *"BLUE JEANS GO GREEN • Receive Insulation," accessed February 10, 2017, http://bluejeansgogreen.org/Receive-Insulation/.*

85. *"Nike Re-Mixed & Re-Cut by Nancy Wu," Hypebeast, accessed November 21, 2016, https://hypebeast.com/2008/12/nike-re-mixed-re-cut-by-nancy-wu.*

86. *"Office Furniture and Free Office Design from Rype Office," Rype Office, accessed November 21, 2016, http://www.rypeoffice.com/.*

87. *"Circular Economy Options in Office Furnishing," accessed April 16, 2017, https://www.ellenmacarthurfoundation.org/case-studies/circular-economy-options-in-office-furnishing.*

88. *Nathalie Remy, Eveline Speelman, and Steven Swartz, "Style That's Sustainable: A New Fast-Fashion Formula | McKinsey & Company," accessed April 5, 2017, http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/style-thats-sustainable-a-new-fast-fashion-formula.*

89. *"Afterlife: An Essential Guide To Design For Disassembly, by Alex Diener," Core77, accessed April 29, 2017, http://www.core77.com//posts/15799/Afterlife-An-Essential-Guide-To-Design-For-Disassembly-by-Alex-Diener.*

90. *"Design for Disassembly." Accessed February 28, 2017. https://sustainabilityworkshop.autodesk.com/sites/default/files/core-page-files/autodesk-sustworkshp_designfordisassemblyandrecycling.pdf*

91. *"Resource Library | Pesticide Action Network," accessed April 6, 2017, http://www.panna.org/resource-library.*

92. *"BLUE JEANS GO GREEN • About Us." Accessed February 28, 2017. http://bluejeansgogreen.org/About-Us/.*

93. *"Shangri-La Hotel, At The Shard, London Collaborates With Designer, Beatrix Ong, MBE, On Exclusive Limited Edition Luxury Slippers | Shangri-La Hotel London," accessed January 10, 2017, http://www.shangri-la.com/london/shangrila/press-room/press-releases/shangri-la-hotel-at-the-shard-london-collaborates-with-designer-beatrix-ong-mbe/.*

94. *Ibid.*

95. *"Manolo Blahnik's Limited Edition Shoes Are Worth a Flight," Vogue Arabia, February 8, 2017, http://en.vogue.me/culture/manolo-blahnik-four-seasons-hotel-milano/.*

96. *"Manolo Blahnik Designs Custom Slippers for Guests of Four Seasons Hotel Milano," Four Seasons Press Room, accessed April 29, 2017, http://press.fourseasons.com/milan/hotel-news/2017/manolo-blahnik-package/.*

97. *By Chris Kitching for MailOnline, "Inside the High-End Amenity Kits given to First Class Passengers," Mail Online, January 29, 2016, http://www.dailymail.co.uk/travel/travel_news/article-3422396/Airline-class-amenity-kits-include-designer-lotions-slippers.html.*

98. *Ibid.*

99. *"Denim Jeans Industry Statistics – Statistic Brain," accessed April 16, 2017, http://www.statisticbrain.com/denim-jeans- industry-statistics/.*

100. *Macaroon Kids, "The Denim Facts," Macaroon Kids, June 26, 2013, https://macaroonkids.wordpress.com/2013/06/27/thedenim-facts/.*

101. *"Cradle to Cradle in a Circular Economy - Products and Systems," accessed October 24, 2016, https://www. ellenmacarthurfoundation.org/circular-economy/schools-of-thought/industrial-ecology*

BIBLIOGRAPHY

"Cradle to Cradle in a Circular Economy - Products and Systems."

"Building Blocks Of A Circular Economy - Circular Economy Design & Circular Economy Business Models," accessed October 24, 2016, https://www.ellenmacarthurfoundation.org/circular-economy/building-blocks.

"About | True Cost | A Fashion Film." The True Cost. Accessed April 15, 2017. http://truecostmovie.com/about/.

Abrahamson, Eric. "The Iron Cage: Ugly, Uncool and Unfashionable.pdf." Accessed March 31, 2017. https://www0.gsb.columbia.edu/mygsb/faculty/research/pubfiles/4694/Abrahamson%202010.pdf.

"Afterlife: An Essential Guide To Design For Disassembly, by Alex Diener." Core77. Accessed April 29, 2017. http://www.core77.com//posts/15799/Afterlife-An-Essential-Guide-To-Design-For-Disassembly-by-Alex-Diener.

AM, Apr 23 2016 at 12:15, and Updated Apr 23 2016 at 12:15 AM. "Wardrobe Crisis – Too Much, Too Cheap, Too Fast." Financial Review, April 22, 2016. http://www.afr.com/lifestyle/fashion/why-the-fashion-industry-is-out-of-control-20160419-goa5ic.

Andrew Morgan. "The True Cost" - Official Trailer, 2015. https://www.youtube.com/watch?v=OaGp5_Sfbss.

Bain, Marc. "H&M's 'sustainability' Report Hides the Unsustainable Reality of Fast Fashion." Quartz. Accessed April 1, 2017. https://qz.com/380055/hms-sustainability-report-hides-the-unsustainable-reality-of-fast-fashion/.

Bauman, Zygmunt. Liquid Life. 1 edition. Cambridge, UK ; Malden, MA: Polity, 2005.

Belk, Russell W. "An Exploratory Assessment of Situational Effects in Buyer Behavior." Journal of Marketing Research 11, no. 2 (1974): 156–63. doi:10.2307/3150553.

"Blog | MUD Jeans | Remo For Transparency | Sustainable Jeans." MUD Jeans, December 5, 2016. http://www.mudjeans.eu/blog-remo-for-transparency/.

"BLUE JEANS GO GREEN • Receive Insulation." Accessed February 10, 2017. http://bluejeansgogreen.org/Receive-Insulation/.

"Building Blocks Of A Circular Economy - Circular Economy Design & Circular Economy Business Models." Accessed October 24, 2016. https://www.ellenmacarthurfoundation.org/circular-economy/building-blocks.

"Care Label Project." AEG. Accessed April 3, 2017. http://www.aeg.co.uk/care/inspiration/care-label-project/.

"Case Studies." Accessed October 24, 2016. https://www.ellenmacarthurfoundation.org/case-studies/growing-alternatives-to-petroleum-based-packaging.

Cat. "'Fast Isn't Free – Someone Somewhere Is Paying.'" Accessed April 2, 2017. http://catherine--frances.blogspot.com/2013/02/fast-isnt-free-someone-somewhere-is.html.

"Check out the Latest Annual Fashion Resale Report on thredUP.com!" thredUP. Accessed April 8, 2017. https://www.thredup.com/resale.

"Circular Economy Options in Office Furnishing." Accessed April 16, 2017. https://www.ellenmacarthurfoundation.org/case-studies/circular-economy-options-in-office-furnishing.

Collins, Simon, Dean of Fashion, and Parsons The New School for Design. "In Trendy World Of Fast Fashion, Styles Aren't Made To Last." NPR.org. Accessed April 1, 2017. http://www.npr.org/2013/03/11/174013774/in-trendy-world-of-fast-fashion-styles-arent-made-to-last.

Conlon, Scarlett. "Burberry Changes Fashion-Show Model." British Vogue. Accessed April 1, 2017. http://www.vogue.co.uk/article/burberry-to-concentrate-on-two-annual-consumer-shows.

"Tom Ford Cancels Show." British Vogue. Accessed April 1, 2017. http://www.vogue.co.uk/article/tom-ford-cancels-new-york-fashion-week-show.

"Cradle to Cradle in a Circular Economy - Products and Systems." Accessed October 24, 2016. https://www.ellenmacarthurfoundation.org/circular-economy/schools-of-thought/industrial-ecology.

"Cradle to Cradle in a Circular Economy - Products and Systems." Accessed February 10, 2017. https://www.ellenmacarthurfoundation.org/circular-economy/schools-of-thought/biomimicry.

"Cradle to Cradle in a Circular Economy - Products and Systems." Accessed February 10, 2017. https://www.ellenmacarthurfoundation.org/circular-economy/schools-of-thought/regenerative-design.

Crossman, Ashley. "McDonaldization and Why Sociologists Are Not Lovin' It." ThoughtCo. Accessed April 15, 2017. https://www.thoughtco.com/mcdonaldization-of-society-3026751.

Dazed. "Mental Health in Fashion: It's Time to Talk." Dazed, February 12, 2015. http://www.dazeddigital.com/fashion/article/23582/1/mental-health-in-fashion-it-s-time-to-talk.

"Denim Jeans Industry Statistics – Statistic Brain." Accessed April 16, 2017. http://www.statisticbrain.com/denim-jeans-industry-statistics/.

"ECONY Brochure." Accessed February 27, 2017. http://www.econyl.com/assets/uploads/ECONYL_brochure_150318_EN.pdf.

"ECONYL® - Regeneration system." Accessed February 7, 2017. http://www.econyl.com/regeneration-system/.

EcoWatch. "Fast Fashion: Cheap Clothes = Huge Environmental Cost." EcoWatch, September 8, 2016. http://www.ecowatch.com/fast-fashion-1994121280.html.

"Ege - Innovation Stories - Cradle to Cradle Products Innovation Institute." Accessed October 24, 2016. http://www.c2ccertified.org/innovation-stories/ege.

Engel, J. F. ; Blackwell, R. D. ; Miniard, P. W. Consumer Behaviour. International 8 Revised Ed edition. Fort Worth, Tex. etc.: Harcourt Education, 1995.

"Fast Fashion, Luxury Brands, and Sustainability | The World Financial Review | Empowering Communication Globally." Accessed April 1, 2017. http://www.worldfinancialreview.com/?p=738.

"Fast Fashion, 'value' fashion | Ethical Fashion Forum." Accessed October 23, 2016. https://www.ethicalfashionforum.com/the-issues/fast-fashion-cheap-fashion.

"Fast Fashion, 'value' fashion | Ethical Fashion Forum." Accessed October 22, 2016. https://www.ethicalfashionforum.com/the-issues/fast-fashion-cheap-fashion.

Fernando, Jason. "Fast Fashion." Investopedia, August 17, 2015. http://www.investopedia.com/terms/f/fast-fashion.asp.

Fletcher, Kate. Sustainable Fashion and Textiles: Design Journeys. London ; Sterling, VA: Routledge, 2008.

"George Bernard Shaw Quotes." BrainyQuote. Accessed April 29, 2017. https://www.brainyquote.com/quotes/quotes/g/georgebern386923.html.

Ghemawat, Pankaj, and Jose Luis Nueno. "ZARA: Fast Fashion." Accessed February 27, 2017. https://hbr.org/product/zara-fast-fashion/703497-PDF-ENG.

Gustafson, Krystina. “The Problem Luxury Brands Aren’t Talking about.” CNBC, February 10, 2016. http://www.cnbc.com/2016/02/10/the-real-problem-luxury-brands-arent-talking-about.html.

Harris, Paul. “John Galliano Describes Rampant Drug Abuse in First Interview since Dior Firing.” The Guardian, June 4, 2013, sec. Fashion. https://www.theguardian.com/fashion/2013/jun/04/john-galliano-first-interview-dior.

Hauser, John R., and Frank S. Koppelman. “Effective Marketing Research.pdf.” Accessed February 27, 2017. http://www.mit.edu/~hauser/Papers/effective%20marketing%20research.pdf.

“High-End Shopping In The Sharing Economy: Now We Can All Have Couture.” Fast Company, September 15, 2016. https://www.fastcompany.com/3063255/high-end-shopping-in-the-sharing-economy-now-we-can-all-have-couture.

“H&M’s Clevercare Labels Helping Customers Extend Clothing Life While Saving Energy, Water | Sustainable Brands.” Sustainablebrands.com. Accessed April 3, 2017. http://www.sustainablebrands.com/news_and_views/behavior_change/jennifer_elks/hms_clevercare_labels_helping_customers_extend_clothing.

“How to get your product cradle to cradle certified TM.” MBDC. Accessed April 16, 2017. https://mbdc.com/how-to-get-your-product-cradle-to-cradle-certified/.

Hustwit, Gary. Objectified. Documentary, 2009.

Kids, Macaroon. “The Denim Facts.” Macaroon Kids, June 26, 2013. https://macaroonkids.wordpress.com/2013/06/27/the-denim-facts/.

“Lease A Jeans | MUD Jeans | Lease Your MUD Jeans Online!” MUD JEANS. Accessed February 7, 2017. http://www.mudjeans.eu/lease-a-jeans/.

“Lifestyle.” BusinessDictionary.com. Accessed February 27, 2017. http://www.businessdictionary.com/definition/lifestyle.html.

“Luxury Fashion Brands Are Embracing Athleisure.” South China Morning Post. Accessed April 16, 2017. http://www.scmp.com/magazines/style/fashion-beauty/article/1983046/brand-new-lifestyle-luxury-fashion-brands-are.

“Luxury VS Fast Fashion: Live Battle Or Blurred Lines?” Luxury Society. Accessed April 1, 2017. http://luxurysociety.com/en/articles/2015/12/luxury-vs-fast-fashion-live-battle-or-blurred-lines/.

MailOnline, By Chris Kitching for. “Inside the High-End Amenity Kits given to First Class Passengers.” Mail Online, January 29, 2016. http://www.dailymail.co.uk/travel/travel_news/article-3422396/Airline-class-amenity-kits-include-designer-lotions-slippers.html.

"Manolo Blahnik Designs Custom Slippers for Guests of Four Seasons Hotel Milano." Four Seasons Press Room. Accessed April 29, 2017. http://press.fourseasons.com/milan/hotel-news/2017/manolo-blahnik-package/.

"Manolo Blahnik's Limited Edition Shoes Are Worth a Flight." Vogue Arabia, February 8, 2017. http://en.vogue.me/culture/manolo-blahnik-four-seasons-hotel-milano/.

"MUD Jeans - Circulair Denim." MUD JEANS. Accessed October 31, 2016. http://www.mudjeans.eu/.

"Nike Re-Mixed & Re-Cut by Nancy Wu." Hypebeast. Accessed November 21, 2016. https://hypebeast.com/2008/12/nike-re-mixed-re-cut-by-nancy-wu.

"Office Furniture and Free Office Design from Rype Office." Rype Office. Accessed November 21, 2016. http://www.rypeoffice.com/.

"People Tree - True Cost Film." Accessed April 15, 2017. http://www.peopletree.co.uk/true-cost-film.

Pike, Helena. "Will the 'Sharing Economy' Work For Fashion?" The Business of Fashion, May 8, 2016. https://www.businessoffashion.com/articles/fashion-tech/will-the-sharing-economy-work-for-fashion-rent-the-runway-rental.

"Reep - The Digital Enterprise Paper Solution." Accessed February 25, 2017. http://reepcorp.com/.

Remy, Nathalie, Eveline Speelman, and Steven Swartz. "Style That's Sustainable: A New Fast-Fashion Formula | McKinsey & Company." Accessed April 5, 2017. http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/style-thats-sustainable-a-new-fast-fashion-formula.

"Resource Library | Pesticide Action Network." Accessed April 6, 2017. http://www.panna.org/resource-library.

Rook, Dennis W., and Stephen J. Hoch. "Consuming Impulses." NA - Advances in Consumer Research Volume 12, 1985. http://acrwebsite.org/volumes/6351/volumes/v12/NA-12.

"Shangri-La Hotel, At The Shard, London Collaborates With Designer, Beatrix Ong, MBE, On Exclusive Limited Edition Luxury Slippers | Shangri-La Hotel London." Accessed January 10, 2017. http://www.shangri-la.com/london/shangrila/press-room/press-releases/shangri-la-hotel-at-the-shard-london-collaborates-with-designer-beatrix-ong-mbe/.

Singh, Jagdeep, and Isabel Ordoñez. "Resource Recovery from Post-Consumer Waste: Important Lessons for the Upcoming Circular Economy." Journal of Cleaner Production, Special Volume: Transitions to Sustainable Consumption and Production in Cities, 134, Part A (October 15, 2016): 342–53. doi:10.1016/j.jclepro.2015.12.020.

Solomon, Michael R., and Nancy Rabolt. Consumer Behavior in Fashion. 2 edition. Upper Saddle River, N.J: Prentice Hall, 2008.

Sutherlin, Margaret, and Margaret Sutherlin. "Fashion Week At A Crossroads: Why Designers Are Changing Up The Traditional Runway Show." Footwear News, February 5, 2016. http://footwearnews.com/2016/fashion/designers/new-york-fashion-week-designers-changing-up-traditional-runway-show-188563/.

"The 'Athleisure' Trend." Accessed April 16, 2017. https://www.merriam-webster.com/words-at-play/athleisure-words-were-watching.

"The Care Label Project Wants to Save the Planet by Improving the Fashion Industry." Highsnobiety, April 29, 2017. http://www.highsnobiety.com/2017/03/28/aeg-care-label-project/.

"'The True Cost' Explores the Global Impact of Fast Fashion." Vogue. Accessed April 1, 2017. http://www.vogue.com/article/the-true-cost-documentary.

Tungate, Mark. Fashion Brands: Branding Style from Armani to Zara. Kogan Page Publishers, 2008.

"Unethical Production - Fast Fashion." Accessed October 22, 2016. http://fastfashion.weebly.com/unethical-production.html.

"Upcycle - Definition of Upcycle in English from the Oxford Dictionary." Accessed April 10, 2016. http://www.oxforddictionaries.com/definition/english/upcycle.

"Value - Definition of Value in English | Oxford Dictionaries." Oxford Dictionaries | English. Accessed February 27, 2017. https://en.oxforddictionaries.com/definition/value.

Venkatesh, Alladi, Annamma Joy, John F. Sherry Jr., and Jonathan Deschenes. "The Aesthetics of Luxury Fashion, Body and Identify Formation." Journal of Consumer Psychology, Aesthetics, 20, no. 4 (October 2010): 459–70. doi:10.1016/j.jcps.2010.06.011.

"What Is Impulse Buying? Definition and Meaning." BusinessDictionary.com. Accessed February 26, 2017. http://www.businessdictionary.com/definition/impulse-buying.html.

"What is Planned Obsolescence?" Accessed October 21, 2016. http://www.technologystudent.com/prddes1/plannedob1.html.

William. McDonough. Cradle to Cradle: Remaking the Way We Make Things. 1st ed.. New York: North Point Press, 2002.

Yinyin, Wang. "Consumer Behavior Characteristics in Fast Fashion," 2011. http://bada.hb.se/handle/2320/7723.

Zady, Maxine Bédat, co-founder of. "Fast Fashion Has a Dirty Little Secret." CNBC, July 3, 2015. http://www.cnbc.com/2015/07/03/fast-fashions-dirty-secret-and-a-solution-made-in-america-commentary.html.