

# TEXTILE RECYCLING: A SYSTEM PERSPECTIVE

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## Introduction

The juxtaposition of a throw-away society with the realization that natural resources are threatened is a vivid illustration of the perplexing problem of contemporary lifestyle. As we consider the case of textile and apparel recycling it becomes apparent that the process impacts many entities and contributes significantly, in a broader sense, to the social responsibility of contemporary culture. By recycling, companies can realize larger profits because they avoid charges associated with dumping in landfills while at the same time recycling of textiles also contributes to goodwill associated with environmentalism, employment for marginally employable laborers, contributions to charities and disaster relief, and the movement of used clothing to areas of the world where clothing is needed.

Because textiles are nearly 100% recyclable, nothing in the textile and apparel industry should be wasted. Harley Davidson jackets go to Japan, neckties go to Vietnam, raincoats go to London, cotton shirts go to Uganda, sleepwear goes to Belize, shoes go to Haiti, Levi's are coveted all over the world, and worn out promotional t-shirts are made into shoddy or wiping rags. In 2003, it was projected there would be a 3-5% increase in world fiber consumption which equals 2 million tons per year (<http://bharattextile.com>; Estur and Becerra, 2003). This presents a double-edged sword in that while at the same time it stimulates the economy (projected to add 10-20 new factories to meet the world market demand); it also gives rise to the increased problem of apparel and textile disposal.

This chapter begins with an overview of systems theory then a model that depicts the textiles recycling processes, particularly as it

pertains to apparel. After that a micro-macro model using social systems theory will be presented. Finally, I will provide a synthesis of how systems theory provides a useful tool to project future trends for the textile and apparel recycling process. It is important to note that this work is based primarily on the processes as they are in the United States. My research is based on over five years of qualitative data collection on, primarily, apparel and other fashion products consumed throughout the United States and the world.

## Systems theory

Systems theory provides a useful theoretical framework for understanding the textile recycling process. Because of a holistic view (Olsen and Haslett, 2002), systemic thinking helps to explain the connectedness, interdependencies, feedback processes, and integration of the textile recycling system. General Systems Theory (GST) was first presented in the 1950s by Bertalanffy. His intent was to provide a superstructure that could be applied to various scientific fields. Bertalanffy's work stimulated many theorists to apply systems theories to their own field in one form or another. As a result, GST has been applied to economics, biology, organizations, and engineering to name a few. It has been only recently that systems theory has been applied to complex social (human) systems. Mayrhofer (2004) pointed out that humans were an "essential element in the system's environment" (p. 1). General Systems Theory, as it applies to social systems, provides a way of better understanding human and social units that are not only distinct, but also interrelated.

Social systems theory offers a unified framework for the analysis of social reality

at a higher level. The theory allows for the understanding of individual behavior in the context of the environment and situational factors. Rather than simply acknowledging the importance of environmental factors, social systems theory makes it clear that many things, such as economics, legal/political constraints, technological advancement, cultural perspectives, competitive environment, and infrastructure, must be considered. In the case of individual behavior of textile recycling, environmental factors such as local solid waste policies, convenience of local charity shops and local attitudes toward recycling can all effect individual recycling behavior.

In this chapter, *social systems* means systems constituted mainly by human beings, ranging from the micro unit such as individuals, families, and friends, to macro groups such as family owned companies, large corporations, governments, and entire cultures. The interrelationship between human behaviors and decisions, environmental concerns, policies, technology, infrastructure, and competition are considered.

### **The textile and apparel recycling process \ A brief overview**

Western lifestyle is a significant contributor to landfill waste. Not only are products consumed at a high level, but western goods are often over-packaged, contributing even more to the waste stream. As landfill capacity continues to be scarce, the costs of dumping will continue to rise. These rising costs are of concern for businesses as they seek ways to reduce their overhead costs.

#### **The problem of over-consumption.**

To compound the notion of over-consumption is the notion of *fashion* itself. The very definition of fashion fuels the momentum for change, which creates demand for ongoing replacement of products with something that is new and fresh. In addition, fashion has reached its

tentacles beyond apparel to the home furnishings industry. Thus, fashionable goods contribute to consumption at a higher level than need. Without the notion of fashion the textile, apparel, and home furnishings industries would realize even more vulnerability in an environment that is already extremely competitive. Apparel companies in the United States today have continual fashion “seasons” that constantly capture consumer interest as it stimulate sales and profits.

As consumers continue to buy, waste will continue to be created, further compounding the problem of what to do with discarded waste, apparel, and home textile products. Clothes in today’s marketplace are different from those of several decades ago, not only in design but also the fiber content. After synthetic fibers came onto the market in the 20<sup>th</sup> century, textile recycling became more complex for two distinct reasons: (1) Fiber strength increased making it more difficult to shred or “open” the fibers, and (2) fiber blends made it more difficult to purify the sorting process. Nonetheless, the recycling industry must cope with everything that the fashion industry has generated.

#### **Textile recycling statistics**

The textile and apparel recycling effort is concerned with recycling, recycle-ability, and source reduction of both pre-consumer and post-consumer waste. According to the Environmental Protection Agency, the per capita daily disposal rate of solid waste in the United States is approximately 4.3 pounds, up from 2.7 pounds in 1960 (Environmental Protection Agency, 2003). Although textiles seldom earn a category of their own in solid waste management data, the Fiber Economics Bureau (2004) reported that the per capita consumption of fiber in the United States is 83.9 pounds with over 40 pounds per capita being discarded per year. A recent report shows that China has surpassed the United States, making China the number one consumer of fiber in the world. This report points out that China will

continue to have the fastest growing fiber consumption market for the next ten years (<http://Bharattextile.com>).

It is well established that recycling is economically beneficial, yet much of the discarded clothing and textile waste in the United States fails to reach the recycling pipeline. The United States textile recycling industry annually diverts approximately 10 pounds per capita or 2.5 billion pounds of post-consumer waste from the waste stream. These pounds represent only about 30 percent of the total post-consumer annual textile waste (Brill, 1997). As an example, although there are several well established uses for denim waste, the denim industry still deposits more than 70 million pounds of scrap denim in US landfills annually (McCurry, 1996, p. 84). Furthermore, analysis of municipal solid waste indicates that unrecovered textile waste contributes to approximately 4.5% of the United States landfills (Hammer, 1993). According to the Environmental Protection Agency (2003), this equates to 4 million tons of textiles going to the landfills each year. While this may not seem like a large amount, it is when one considers that nearly 100% of the post-consumer waste is recyclable. Cognizant of this, the textile industry's current efforts, enthused by the American Textile Manufacturer's E<sup>3</sup> – Encouraging Environmental Excellence program, focus on trying to increase recoverable textile waste that would otherwise end up in the landfills.

### **The textile recycling industry**

The textile recycling industry is one of the oldest and most established recycling industries in the world. In general, few people understand the industry, its myriad players, or reclaimed textile products. Throughout the world, used textile and apparel products are salvaged as reclaimed textiles and put to new uses. This "hidden" industry (Divita, 1996) consists of more than 500 businesses that are able to divert over 1,250,000 tons of post-consumer textile waste annually (Council for Textile

Recycling, 1997a). Furthermore, the textile recycling industry is able to process 93% of the waste without the production of any new hazardous waste or harmful by-products. The Council for Textile Recycling has indicated that virtually all after-use textile products can be reclaimed for a variety of markets that are already established (personal communication, Ed Stubin, July, 17, 2001). Even so, the textile recycling industry continues to search for new viable value-added products made from used textile fiber.

Textile recycling can be classified as either pre-consumer or post-consumer waste; a textile recycling removes this waste from the waste stream and recycled back into the market (both industrial and end-consumer). Pre-consumer waste consists of by-product materials from the textile, fiber, and cotton industries that are re-manufactured for the automotive, aeronautic, home building, furniture, mattress, coarse yarn, home furnishings, paper, apparel and other industries.

Post-consumer waste is defined as any type of garment or household article made from manufactured textiles that the owner no longer needs and decides to discard. These articles are discarded either because they are worn out, damaged, outgrown, or have gone out of fashion. These textile products are sometimes given to charities and passed on to friends and family, but additionally are disposed of into the trash and end up in the municipal landfills.

### **Textile Recycling Constituents Textile recycling companies**

The textile recycling industry has a myriad of players that includes consumers, policy makers, solid-waste managers, not-for-profit agencies, and for-profit retail businesses (Hawley, 2000). The primary focus on this project is on post-consumer apparel and textiles. Textile sorting companies, known as "rag graders", acquire, sort, process, export, and market pre- and post-consumer textile products for various markets. Most rag-

sorting companies are small, family-owned businesses that have been in operation for several generations (Allebach, 1993; S. Shapiro & Sons, 1961). However, start-up entrepreneurs have begun new textile recycling businesses because they perceive it as a low-cost, easily accessible form of entrepreneurship. What many of the startups fail to realize, however, is that this business is highly dependent on global contacts that take years of nurturing in order to have markets to sell their sorted goods. As one informant told me, "I have spent as much as a year at a time away from my family while I developed and nurtured markets across Africa, Asia, and Latin America. Now that these business contacts have been established, I can pass the contacts on to my son who will be taking over the business soon." An informant from a different company said, "Establishing contacts in Africa is particularly difficult. But once those contacts are made, the bond between us is very strong and full of respect." And an international broker from Europe stated:

Buying and selling in Africa is an underground business. The used-textile brokers in Africa are substantially wealthier than many of the citizens who are the consumers of the used clothing. They must hide their wealth in order to maintain credibility among the citizens. One of our buyers has a beautiful burled-wood and gilded office that is actually located underground. When we go to Africa to do business we have to be secretly escorted underground to conduct business!

Consumers often take apparel that is worn, out of fashion, and wrong sized to charity organizations such as Goodwill or Salvation Army. Charity agencies then sort the clothes, choose items for the sales floor, and then the "leftovers" are sold to rag sorters for pennies on the pound. The price per pound of used clothing is dependent on

current market value, but often ranges from 3-6 cents per pound. At regularly scheduled times, trucks are dispatched to pick up the merchandise. Textile recycling companies are often located in large metropolitan areas because it is imperative to keep transportation costs to a minimum. It has been found that transportation and sorting costs can be the decisive criteria for profitable business (Nousiainen & Talvenmaa-Kuusela, 1994). Once the clothing excess from the charity shops is taken to the recycling warehouses it is then emptied onto a sorting deck, and the sorting process begins

Depending on the current economic climate (primarily associated with materials availability, current value-added markets, and the current commodity price for used textiles), for-profit rag-sorting companies realize both success and hardship. Although the primary goal for these small businesses is to earn profits, the business owners also are very committed to environmental philosophies and take pride in their contribution to waste reduction. As one informant offered:

This is not a particularly lucrative business. The profit margin is so small, that when the commodity prices increase, policy makers put up barriers, or the market becomes too saturated, it becomes very difficult to make a living. But, we in the textile recycling industry also take great pride in the role we play in improving the environment.

These business owners continue to seek, develop, and nurture markets for reclaimed textiles to not only increase their company profits, but also to continue to increase the amount of pre- and post-consumer textile goods diverted from the landfills. Many of the textile recycling companies in the United States are third or fourth generation. But as the competitive nature of the business has increased, and profit margins are threatened, the younger generations have

opted for careers different from their parents. A result has been the closing of several textile recycling companies in the past decade (personal communication with informant).

Many markets exist for used textile and apparel. This means that sorting companies have had to evolve with the markets and remain sensitive to its requirements, whatever they may be. A recent discussion at an annual meeting of the members of SMART Association (Secondary Materials and Recycled Textiles) focused on the need for the textile sorting industry to consider ISO 9000 certification. DNR reported that the International Organization for Standardization (ISO) agreed to “craft norms for second-hand, defective or recalled [apparel] products...to benefit both suppliers and consumers and help close a gap in global commerce” (April 13, 2004). The report went on to say that second-hand clothing shouldn’t mean inferior or shoddy.” Therefore, the intent is to develop ISO certification that would facilitate quality assurance in used textiles. Many US recyclers recognize the importance of this, especially in light of competition from their European counterparts who have already adopted ISO classification.

### **The sorting process**

Crude sorts include the removal of heavy items such as coats and blankets, followed by separation of e.g. trousers from blouses from dresses. As the process proceeds, the sorts get more and more refined. For example, once all trousers are picked, they are further sorted based on women’s or men’s, fabric (e.g. woolens go to cooler climates, while cottons and linens go to hot climates), condition (e.g. tears, missing buttons, and discoloration), and quality. Certain brands and styles (e.g. Levi’s, Tommy Hilfiger, and Harley Davidson or Boy Scout uniforms and bowling shirts from the 1950s) are sorted because they are

considered *diamonds*<sup>1</sup> based on the premium prices they bring in certain markets. As the recycled goods are sorted, they are also graded to meet specific markets. It is not uncommon for a fully integrated rag sorter to have over 400 grades that are being sorted at any given time (personal communication with informant). It is often the quality of the grading process that distinguishes a competitive advantage of one rag sorter over another. One of the largest U.S. sorting houses is in El Paso, Texas where they sort a semi-trailer load of post-consumer textiles per day. This amounts to over 10 million pounds per year (personal communication with business owner, February 12, 2000).

Most rag sorters have a division of labor whereby the newest employees are trained to do the crude sorts, that is, sorting into categories such as heavy outerwear and bedding from the rest of the apparel items. As expertise increases, employees are promoted to more complex sorting and fine grading. For example, Marguerite, a head sorter and supervisor with several years of experience at one of the facilities in the United States can “tell cashmere from wool at the touch of a hand.” One textile recycling facility employs a person with a Master of Fine Arts degree to forecast fashion trends in the vintage markets. Goods that are torn or stained are separated from the wearable goods and used for a wide variety of markets as will be explained below.

### **The Pyramid Model**

The pyramid model in Figure 1 represents the sorting categories of textile recycling. Sorting categories include sorts that are exported to developing countries, converted to new products from open recycling<sup>2</sup> or

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<sup>1</sup> Interviews with several informants revealed that the special “finds” in the sorting process are often referred to as *diamonds*.

<sup>2</sup> Open recycling refers to the process of mechanically or chemically “opening” the fabric so as to return it to a fibrous form. Mechanically this involves cutting, shredding, carding, and processing the fabric. Chemically it involves

redesign, cut into wiping and polishing cloths, dumped into landfills or incineration for energy, and mined as *diamonds*. For the most part, volume is inversely proportional to value. For example exported second-hand clothing is the largest volume category and earns .50-.75 (\$ US) per pound whereas the rarer finds can bring several thousands of dollars per item, depending on its market and/or collectible value. See Table 1 for approximate volume to value of used textiles.

[insert figure 1 here]

[insert table 1 here]

### Export of Second-Hand Clothing

The largest volume of goods (roughly 48%) is sorted for second hand clothing markets, primarily for export to developing countries or disaster relief. One informant reported that “used apparel serves as the largest export from the United States based on volume” (personal communication with informant, May 10, 2004). On many street corners throughout the developing world, racks of Western clothing are being sold (e.g. the author has seen such racks in Taiwan, Thailand, and Mexico). The United States exports \$61.7 million in sales to Africa. One of its primary export sites is Uganda where a Ugandan woman can purchase a designer t-shirt for US \$1.20 (Packer, 2002). Western clothing is a highly valued commodity and perhaps serves as the only source of affordable clothing in many developing countries where levels of income are so low that food and clean water is the primary concern. However, some have argued (personal communication with informant, April 10, 2004), that the export of clothing to these nations has threatened the traditional dress for many indigenous cultures and at the same time may threaten the fledgling textile and apparel industries of those countries. While this is certainly an issue that should be taken into

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enzymatic, thermal, glycolyse, or methanolyses methods. Once the post-consumer textiles are “opened” they can be further processed into new products for renewed consumption.

consideration, wearable, climate appropriate, and affordable clothing is a valuable commodity for most of the population in less-privileged areas of the world. Not all used clothing is exported to poorer countries. One informant shared that he has a new market in the United Arab Emirates, one of the richest countries in the world. Used clothes in the United Arab Emirates are not intended for the local population but, instead, for the immigrant labor from Bangladesh, Pakistan, and Indonesia because labor jobs do not allow the worker enough discretionary income to purchase the designer labels that are offered in the local shops.

In recent years, rag sorters have realized that in order to stay viable, sort categories must be further refined to meet the demands of unique markets. They also work with textile engineers to engineer new products from used textiles. Available markets for used apparel flux in the marketplace. For example, wool has received a renewed interest because European flammability legislation for upholstered furnishings and protective clothing has demanded higher wool content. Thus recycled woollens can now command a higher price.

Once sorted, the goods are compressed into large bales (usually 600 – 1000 pounds), wrapped, and warehoused until an order (often from a broker) is received. Several things are considered when sorting for this category: climate of the market, relationships between the exporters and importers, and trade laws for used apparel.

### Conversion to New Products 29%

Two categories of conversion to new products will be used here. Shoddy (from knits) and mungo (from woven garments) are terms for the breakdown of fabric to fiber through cutting, shredding, carding, and other mechanical processes. Then fiber is then re-engineered into value-added products. These value-added products include stuffing, automotive components,

carpet under lays, building materials such as insulation and roofing felt, and low-end blankets. The majority of this category consists of unusable garments – garments that are stained, torn, or otherwise unusable. One informant, however, was sorting for 100% cotton sweaters because he was selling shredded cotton fiber to mix with sand for use in a “Punch-n-Kick” bags made by one of the world’s largest sporting manufacture companies. A vast number of products are made from reprocessed fiber because much of this fiber is re-spun into new yarns or manufactured into woven, knitted, or non-woven fabrications including garment linings, household items, furniture upholstery, insulation materials, automobile sound absorption materials, automobile carpeting, and toys (personal communication, Querci, July 22, 2000). New yarn producers like those in Prato, Italy who reduce cashmere sweaters to fiber, spin new yarns and produce cashmere blankets for the luxury market.

This process represents an economic and environmental saving of valuable fiber that would otherwise be lost to the landfill. Ironically, the most unusable and damaged of post-consumer textiles often has the highest level of specifications forced upon it by the end-use industries (e.g., building, auto, aeronautics, and defense). Another informant reports that used fibers are being used in the production of U.S. Currency.

The other category for conversion to new products is the actual re-design of used clothing. Current fashion trends are reflected by a team of young designers who use and customize second hand clothes for a chain of specialty vintage clothing stores in the UK. Its offerings include “cheap chic and occasional designer surprises” (Ojumo, 2002; Packer, 2002). As another example, a young designer in Dallas, Texas creates new from the old and sells wholesale to various trendy stores such as Urban Outfitters. This concept is common among boutiques with a youth-oriented target market.

### **Wiping and Polishing Cloths 17%**

Clothing that has seen the end of its useful life as clothing may be turned into a wiping or polishing cloth for industrial use. T-shirts are a primary source for this category because the cotton fiber makes an absorbent rag and polishing cloth. Bags of rags can be purchased at retail stores such as Wal-Mart’s automotive department. But in some cases, because of its excellent wicking and oleophilic properties, some synthetic fiber waste (particularly olefin) is cut into wipers to serve in industries where oily spills need to be cleaned up or wiped. One informant said that he sells wiper rags that he has reclaimed from the sorting process to a washing machine manufacturer for use-testing of the machines. Another informant sells oleophilic wipers to the oil refining industry. And yet another informant reported that oil spills are being cleaned up with large “snakes” that are made with a combination of oleophilic and hydrophobic used fibers.

### **Landfill and Incineration for Energy 7%**

This category has two components. For some reclaimed fiber, no viable value-added market has been established, so the used goods must be sent to the landfill. Rag-sorters work hard to avoid this for both environmental and economic reasons because there is a charge per pound for goods that must be taken to the landfill. In the United States, testing has just begun for the process of incinerating reclaimed fiber for energy production. Although emission tests of incinerated used fibers are above satisfactory, the process of feeding the boiler systems in many North American power plants is not feasible (personal communication, Weide, March 20, 2004). The incineration of used textiles as an alternative fuel source is more commonly done in Europe than in the United States.

### **Diamonds 1-2%**

In May, 2001, an anonymous seller placed a pair of century-old Levis on the E-bay

auction platform. Believed to be the oldest in existence, the jeans (technically denim waist coveralls) were found buried in mud of a mining town in Nevada. In fair to good condition, the anonymous seller opened the bid on May 17, 2001 for \$25,000. One week later, after a frenetic final few hours of bidding, Levi Strauss & Co. won the bid and paid \$43,532 for the 120-year-old dungarees (personal communication, Lynn Downey, Levi's historian, July, 23, 2001). This is believed to be the highest price ever paid for denim jeans. Although the jeans were classified by the Levi's historian to be in "fair to good condition", they provide a paragon for *Digging for Diamonds*.

The *Diamond* category in the model accounts for approximately 1% of the total volume of goods that enter the textile recycling stream, yet this category also accounts for the largest profit center for most textile recycling companies. One informant told me that, "When you find them [the diamonds], they are still diamonds in the rough, but once they are cleaned, pressed, and packaged, they are worth a lot in the marketplace."

Categories of diamonds in the United States include couture clothing and accessories, Americana items such as Harley Davidson and Levis, uniforms such as those worn by Boy Scouts, certain branded items, trendy vintage clothes, luxury fibers (e.g. cashmere and camel hair), and antique items. Many of the customers for diamonds are well-known designers or wealthy individuals. Ralph Lauren and Donna Karan both have vintage collections. Other diamond customers include vintage shop owners who sell their *diamonds* in retail boutiques or on the Internet.

Many diamonds have global markets as evidenced by the fact that used goods move from country to country. For example, Americana items are highly prized in other parts of the world. When collecting data at one of the US sites, five Japanese buyers were rummaging through piles of diamonds to select what they wanted to buy. The owner of the business said that there are

many days out of the month when Japanese buyers are in-house making their selections. Japan is the largest importer of used American *diamonds* and has proved to be very interested in Americana items such as authentic Harley Davidson clothing, Ralph Lauren Polo clothing, or Tommy Hilfiger with the red, white, and blue signature labels. After the September 11, 2001 terrorist tragedy, the second-hand signature red/white/blue Tommy Hilfiger goods realized increased interest in the global market. But perhaps the one item that has had consistent global interest is Levi's jeans, particularly certain older styles. One rag-sorter found a pair of collectible Levi's and sold them on the Paris auction block for \$18,000. Another rag-sorter sold a collectible find for \$11,000 to Levi's corporation. One informant claimed that he has found enough collectible blue jeans to "pay for my three's kids' college education." However, it requires a special eye and a sense of trend forecasting to be able to find diamonds in the huge mine of used textiles that rag-sorters must sort.

Many owners of vintage shops are members of the National Association of Resale and Thrift Shops (NART). Founded in 1984, this Chicago-based association has over 1,000 members and serves thrift, resale, and consignment shops and promotes public education about the vintage shop industry. TR Aid (Textiles Recycling for Aid and Development) is a charity organization that finances itself through the sale of quality second hand clothing. As evidenced here, even though the *diamond* category consists of only 1-2% of the volume of reclaimed goods, the profits for these diamonds can make a big difference to the family business.

### **Textile Recycling Constituents – A System**

As shown above, the textile recycling industry occurs along a pipeline with various activities and numerous constituents who function within a socio-cultural system that affects attitudes and behaviors. Each of these *players* functions within a cultural system that bounds their

attitudes and behaviors. Without the inter-relatedness of the constituents, the system fails to operate to full potential – or perhaps even ceases to exist. As Elliott (1995) pointed out, in order to make progress in the textile recycling process, “all parties must be on common ground of understanding about how to reach an attainable goal” (p. 222).

Hamilton (1997) asserted, “if most research is grounded in paradigms that focus on only one or a few levels of analysis, then the resulting body of knowledge...is incomplete to that extent and integration among levels is virtually impossible” (p. 167). Extending Hamilton’s (1997) micro/macro heuristic tool, data from this paper suggest that the textile recycling system could be illustrated as below in Figure 2.

(Place Figure 2. Here)

The model provides one way of understanding the disposal of textile products. The continuum represents three positions ranging from the micro (the consumer) to the macro (the cultural system). A more detailed description of the framework follows and useful examples from the data are included.

### **The micro level: Individuals**

Here the focus is on individual ideology that determines recycling behavior. Scholarly research in textile recycling and its relationship to consumption of apparel remains limited and exploratory at best. Shim’s (1995) exploratory work looked at the relationship between consumer environmental attitudes and their clothing disposal patterns. Kim, Arnold, and Forney’s (1997) study examined whether or not environmental concerns influenced consumer’s response to fashion advertisements Kim and Damhort’s (1998) work focused on the knowledge consumers have with regard to textiles and the environment and its relationship to consumer behavior. Although all of these works have contributed importantly to the literature, all focused on consumer, or what

DeWalt and Pelto (1985) would identify as the micro component of analysis. Consumers, as individuals, each have idiosyncratic determinants that affect their attitudes and behavior towards textile recycling. The findings from the study revealed that many consumers have positive attitudes toward environmentalism, yet when it comes to discarding their clothing, economic benefit often takes precedence over environmental attitudes. One consumer who had been recently divorced shared that it was difficult to part with her things because of economic uncertainty. She said that she feared that she would “never be able to have nice things again.”

Other informants shared that they often had difficulty in parting with their things. For example, one informant shared that after she cleans out her closets she “carries the old things around in the trunk of [her] car for several weeks before [she] can emotionally handle the drop-off at Goodwill.” This parallels McCracken’s (1988) explanation of divestment rituals which occurs when consumers are about to dispense with a good, either by giving it away or selling it. McCracken explained that individuals make “an attempt to erase the meaning that has been invested in the good by association” (p. 87).

Although many consumers have developed home recycling practices, few if any consider the recycle-ability of used apparel except in terms of donation to charity organizations. Even though this is a viable disposal choice for many usable garments, there remains a limited response to the recycling of textile products (Environmental Protection Agency, 2003).

Individuals negotiate not only with themselves, but also with others in their near environment or the social world in which they function. Americans live in a throw-away, high-consumption society where an individual’s worth is often measured by the clothes that they wear. This is juxtaposed against public pressure to reduce consumption and behave in an

environment-friendly manner. How is it, then, that the American consumer negotiates the wearing of the latest fashions when their closets are already over-flowing with perfectly wear-able merchandise? One way to justify their behavior is to donate their wearable, but slightly-out-of-fashion, clothing to charitable organizations. In this way, their appetites for fashion are satisfied and guilt is erased with benevolent acts through donations.

### **Textile Recycling System Arbiters**

The third position in the micro/macro framework addresses the textile recycling system arbiters. These constituents include the various for-profit and not-for-profit businesses that drive the textile recycling processes. Approximately 200 companies at the primary processing level are currently recycling post-consumer textile waste. An additional 150 secondary processors, such as used clothing exporters, wiper manufacturers, fiber and fabric manufacturers are also part of the multi-faceted industry (Council for Textile Recycling, 1999). Although these companies have historically received their inventory from charity surplus, they have recently begun to expand their base of suppliers by helping municipalities develop curbside and drop-off textile collection programs. This is in part due to supply and demand issues caused from new retail outlets being opened by charitable organizations. Additionally, some contention has arisen from the increased competition as both profit and not-for-profit entities compete for the same markets.

Other arbiters include policy makers at the local, state, and federal level who are involved with setting policy and passing legislation that either supports or inhibits textile recycling. Many trade laws, for example, prohibit trade to certain countries. For example, recent negotiations between the U.S. Department of Commerce with the Tanzanian Bureau of Standards and the U.S. Embassy in Tanzania are concerned with the following: (1) requirement of fumigation

certificates, (2) ban on used undergarments, socks, stocking, and nightwear, (3) a requirement that bales should not exceed 50 kgs, (4) a requirement for a health certificate to prove the country of origin is free from diseases, (5) certification of used garments, and (6) sampling of consignment (<http://www.smartasn.org/news.html>, retrieved 7/28/2003). Protectionists cite a list of concerns including infestation of harmful insects, chemicals, and microorganisms. The fact remains, however, that many people in developing nations, even those working in the fledgling textile and apparel industries, cannot afford the clothing that is produced in those factories, particularly clothing that is manufactured with intent for the Western world. Instead, they are thankful to be able to buy used clothing imported from developed nations. Even though trade policies prohibit the export/import of certain items, the industry still finds ways to continue trade in the global market while still maintaining trade policies. As one informant revealed: India has developed a substantial industry of manufacturing wool blankets from used wool clothing. Trade laws between the United States and India do not allow the export of wool clothing from the United States. To meet this market demand, used wool clothing in the United States must be sent through a shredding machine that slashes the garment beyond wearable condition, yet keeping it in one piece so that it can be more easily baled and shipped to India. Thus, the clothing is no longer *clothing*, but is, instead, *used fiber*. Indian manufacturers process the fiber to a more fibrous state, into new yarns, and then into the manufacture of blankets.

### **Cultural and global system elements**

Here we are concerned with the material world, social relationships, and shared cognitive repertoire all of which embody clues that are critical to how the recycling industry plays out in our cultural system. Culture becomes such an integral part of human existence that it *is* the human environment often making it difficult for attitudes and beliefs to change. Much of the

concern here is the ideas, attitudes, behaviors, social organization, level of technology, belief systems, and institutional commitments of a society.

Much of the concern here includes attitudes and ideas put forth by government entities and environmental enthusiasts that contribute significantly to the attitudes and behaviors of textile recycling. At a time of record market demand for recycled textile products, a perplexing problem exists in that there is insufficient supply of raw textile product (personal communication, Brill, July 20, 1999). This can be attributed to the cultural ethos that impacts consumer behavior, municipal solid waste management programs, or charitable organizations. For example, consumers have been encouraged by their social, economic, or political environment to recycle glass, aluminum, and plastics; however, textiles are seldom a category considered by municipal recycling programs. Furthermore, in Shim's (1995) exploratory study, results showed that even though consumers might have strong environmental attitudes and waste recycling behavior this would not be an indicator for textile and apparel recycling.

In many states, waste reduction policies and programs are being implemented that facilitate voluntary pollution reduction. Although national statistics reveal that textiles comprise a significant portion (literature sources range from 4-8%) of US landfills, most states do not consider textiles as a category worthy of solid waste management. Often it is the case that public awareness and marketing is the key for changing the culture so that textiles can become a marketable recycled refuse.

Interviews with consumers revealed that many consumers did not know all of their options for clothing disposal and very few knew that a textile recycling industry existed beyond the not-for-profit charitable organizations. As one consumer shared, "I just set six trash bags full of old clothes out on the curb for the trash man to pick up. It

was so out of fashion and so worn that I didn't think that even Goodwill would have a use for it." This and other statements revealed that many consumers do not know how post-consumer apparel waste gets utilized and perhaps marketing efforts need to be implemented to educate the disposing consumer.

Around the world, cultures vary on interest, values, behaviors and technological complexity to deal with textile recycling. For the United States, environmental concern ranks high, yet Americans are among the highest consumers of apparel in the world. Undoubtedly, Americans consume more in quantity rather than quality resulting in a plethora of used stuff. Often it is the case that we consume something new "for the occasion". In contrast, Europeans tend to consume higher quality goods and lesser quantity, consuming something new "for the season".

### **Situational factors**

The ebb and flow of situational factors such as global economics, international trade laws, technological and engineering advancements, cultural evolution, competitive environments, and infrastructure (including the availability of waste disposal options) are also important factors of the system model. These situational factors are constantly in flux and can impact at both the micro and the macro levels of the system.

### **Discussion and Future Trends**

The discussion of textile recycling as a system cannot be concluded without attention being paid to the global nature of the system. Here there is a two-fold condition: (1) increased textile waste is being created throughout the world because of increased disposable income in developing nations. Thus concerns for disposal must be considered from all parts of the world. This has implications for cross-cultural research. And (2), much of the market for used clothing is located in developing countries

where annual wages are sometimes less than the cost of one outfit at retail price in the United States. The developing country markets provide a venue where highly industrialized nations can transform their excessive consumption into a useful export. For many of these people, used clothing surplus provides a much-needed service. Unfortunately, global trade laws often hamper the free flow of used clothes.

As landfill space becomes scarce and costs continue to raise, so will the ethos for environmentalism. Those in the business sector of the micro/macro framework continue to make progress in creating markets for used textiles. At the same time, consumers must be provided with timely information of these markets so that they can make educated choices as to where and how they will dispose of their used textiles. In addition, laws and political environment must be adapted to make it easy for textiles to be recycled. It is for this reason that the macro level of phenomena most influences the textile recycling process that, in turn, presents disposal choices to the individual consumer.

Certainly, it is a double-edged challenge. Consumers must be made aware that nearly 100% of their used clothing is recyclable and that numerous and various markets exist for used textile and fiber products. At the same time, an attitude shift toward purchase of garments made from recycled fibers must be embraced in the United States as it has been for decades in Europe. By raising consciousness concerning environmental issues, channels for disposal, and environmentally conscious business ethics, steps can be made toward a more sustainable environment. Citizen concerns lobbied with municipalities will also increase the number of municipalities that offer textile recycling as one of the categories of their waste management process.

When we consider the complexity of the textile recycling system and the importance of the cooperation between the players, we

then understand how social systems theory provides a way of better understanding human and social units that are not only distinct, but also interrelated. To recycle successfully, consumers must embrace the system, not just make an occasional charitable donation. Meanwhile arbiters must continue to develop new value-markets and market the after-use possibilities so that the system functions at full capacity and with commitment from all.

## References

- Allebach, W. (1993, July 3). Making a pitch for textile recycling. *Neighbor*, 3.
- Bharat Textile. (2004). World's Biggest Fiber Consumer: China. Retrieved from : <http://bharattextile.com> 11/25/2004.
- Brill, B. (1997). *Council for Textile Recycling*. Bethesda, MD: Council for Textile Recycling. Council for Textile Recycling (1997). Retrieved July, 2002 from <http://textilerecycle.org>. Council for Textile Recycling (1999). Available: <http://textilerecycle.org>.
- DeWalt, B. R. and Pelto, P. J. (1985). *Micro and Macro Levels of Analysis in Anthropology: Issues in Theory and Research*. Westview Press. Boulder.
- Divita, L. (1996). *Missouri Manufacturers' Interest in Textile Recycling*. Unpublished Master's Thesis, University of Missouri, Columbia.
- Elliott, E. J. (1995, September). Textiles' role in the environment. *Textile World*, 221-222.
- Environmental Protection Agency. [Online] Recycled Textiles. Retrieved September 28, 2003, from <http://www.epa.gov>.
- Estur, G. and Becerra, C. A. (2003). Retrieved from: [http://www.icac.org/icac/cotton\\_info/speeches/estur/2003/fiber\\_cons\\_pattern.pdf](http://www.icac.org/icac/cotton_info/speeches/estur/2003/fiber_cons_pattern.pdf).
- Fiber Economics Bureau (2004). Retrieved from: <http://www.fibersource.com/feb/feb1.htm>
- Hamilton, J. A. (1997). The macro-micro interface in the construction of individual fashion forms and meanings. *Clothing and Textiles Research Journal*, 15(3), 164-171.
- Hammer, M. (1993). *Home Environment*. Institute of Food and Agricultural Sciences. University of Florida: Gainesville.
- Hawley, J.M. (2000). Textile recycling as a system: A micro/macro analysis. *Journal of Family and Consumer Sciences*, 93(5), 35-40.
- Kim, Y., Forney, J., & Arnold, E. (1997). Environmental messages in fashion advertisements: Impact on consumer responses. *Clothing and Textiles Research Journal*, 15(3), 147-154.
- Kim, H., & Damhorst, M. L. (1998). Environmental concern and apparel consumption. *Clothing and Textiles Research Journal*, 16(3), 126-133.
- McCracken, G. (1988). Culture and consumption: New approaches to the symbolism of consumer goods and activities. Bloomington, IN: Indiana University Press.
- McCurry, J. W. (1996). Blue jean remnants keep homes warm. *Textile World*, 84-85.
- Mayrhofer, W. (2004). Social systems theory as theoretical framework for human resource management – benediction or curse? *Management Revue*. Mering: Vol. 15, Iss. 2, pg. 178, 14 pgs.
- Nousiainen, P., & Talvenmaa-Kuusela, P. (September 27, 1994). *Solid Textile Waste Recycling*. Paper presented at the Globalization--Technological, Economic, and Environmental Imperatives. 75th World Conference of Textile Institute, Atlanta, Georgia.
- Ojumo, A. (2002, November 24, 2002). Charity shops are beating the high street at its Olsen, J. E. & Haslett, T. (2002). Strategic management in action. *Systemic Practice and Action Research*, 15(6), 449-464.
- Packer, G. (2002, March 31). How Susie Bayer's T-shirt ended up on Yusuf Mama's back. *New York Times*, 54.
- S. Shapiro & Sons, I. (1961). *Reclaimed Resources: A handbook of textile fabrics and fibres including lists of Most important grades: .* Baltimore, MD: S. Shapiro & Sons.
- Shim, S. (1995). Environmentalism and consumer's clothing disposal patterns: An exploratory study. *Clothing and Textiles Research Journal*, 13(1), 38-48.
- SMART. (2003). Secondary Materials and Recycled Textiles. Retrieved July 28, 2003, from <http://www.smartasn.org/news.html>.
- Zarocostas, J. (April 13, 2003). Standards to be set for second-hand, recalled products. <http://www.DNRonline.com>.