

Running Head: VALUE TEACHING SUSTAINABILITY IN TEXTILE INDUSTRY

Inquiry Project
Study to Determine the Value of Teaching
Sustainability in the Textile Industry

ACE 599

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Abstract

Sustainability is a systemic concept, relating to the continuity of economic, social, institutional and environmental aspects of human society. It is intended to be a means of configuring civilization and human activity so that society, its members and its economies are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely. Sustainability affects every level of organization, from the local neighborhood to the entire planet (Sustainability, n.d.).

This research study investigated the appropriateness, relevancy, benefits and advantages of instituting a new textile related course into the Textile Development and Marketing curriculum at the Fashion Institute of Technology titled, *Creating a Sustainable Textile Industry*. The 30 voluntarily participants in this quantitative/qualitative study form an unusually diverse group including educators, professionals, business entrepreneurs and executives, political advocates, and farmers. They represent a cross-section of industries that make use of textile fiber producing plants. Data has been gathered using questionnaires, telephone and in-person interviews. The results of this study reveals the growing market for graduates with a good working knowledge of sustainability, which in the long run will become the driving force behind sustainable development in the textile industry.

Study to Determine the Value of Teaching Sustainability in the Textile Industry

Introduction and Purpose

It is the hope of this researcher that the results of this study will encourage institutions of higher education to consider offering their students a course titled, *Creating a Sustainable Textile Industry*. In order to develop an understanding of the vital role **sustainability** will play in the global textile industry of the 21st century, this survey course would provide a comprehensive overview of the many aspects of **sustainability** and focus on the benefits of understanding, practicing and supporting **sustainable development** in the textile industry. The purpose to this study is as follows:

1. To reveal what value there is in offering such a course
2. To discover if it will fulfill an industry need
3. To determine the viability of sustainable development in the textile industry

There were instances throughout this research when it was difficult to separate one or more of these purposes from another. While at first, the reader may think that this is no way to conduct a research study, you must stop and consider that this will always happen when delving into a topic that is not well understood. This is why the researcher has spent a considerable amount of time and energy, doing preliminary research of her own before deciding to follow through and explore this particular subject.

A major concern to the researcher was bias. There seemed to be no way to avoid being biased so the researcher resolved to use it as a tool instead of an obstacle.

Most times it will be used as an indicator of the passion and drive of the participants and researcher. At times though it will sadly point out that many organizations have no clue of what sustainability is all about or how the environment is affected. Many corporations feel that they meet the requirements as set forth by the government and need not go any further or perhaps they feel they have something to lose which is further from the truth as we will soon discover.

It is not the researcher's intention to force her personal opinion on the reader. Her objective is to do away with the confusion and complication that exists in most discussions of sustainability and to clearly present, the research necessary to make your own decision.

Lastly, it is important to note that the views expressed in this study will be those of the author and participants and not necessarily those of National-Louis University or the Fashion Institute of Technology.

Keywords and Terms

Abaca: sometimes spelt **Abaká** or **abacá** (*Musa textilis*) is a species of banana native to the Philippines. The plant is harvested for its fiber, called Manila hemp, extracted from the leaves and stems. The fiber is used for making twine and rope. Two other common names for Manila hemp are Cebu hemp and Davao hemp (Wikipedia, n.d.).

Bamboo fiber: is produced from raw materials of bamboo pulp by patented technology. First, all bamboo pulp is refined from bamboo through a process of hydrolysis- alkalization and multi-phase bleaching. Then Bamboo pulp is processed into bamboo fiber. Repeated tests have proved it is durable, has good stability and tenacity. The thinness and whiteness degree of bamboo fiber is similar to classic viscose rayon fiber. This manufactured fiber is of regenerated natural cellulose fiber which will biodegrade in the soil, and not cause any pollution to the environment (China Bambro Textile Co., Ltd., 2003).

Bast fiber: a fiber that is found in the stem of certain plants, especially flax, hemp and **jute** (Houghton Mifflin Company, 2004).

Cleaner Production (CP): The continuous application of an integrated, preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment (United Nations Environmental Program (UNEP), 2001).



Cotton fiber: a soft natural cellulosic fiber that grows around the seeds of the cotton plant. It is a valuable crop because only about 10% of the raw weight is lost in processing. United States farmers apply nearly one-third of a pound of chemical fertilizers and pesticides for every pound of cotton harvested which accounts for twenty-five percent of all the pesticides used in the U.S. (Houghton Mifflin Company, 2004) and (Wikipedia, n.d.).

Corporate social responsibility (CSR): entails how businesses align their values and behavior with the expectations and needs of stakeholders. This means not just customers and investors, but also employees, suppliers, communities, regulators, special interest groups and society as a whole. CSR describes a company's commitment to be accountable to its stakeholders (Csrnetwork 2006).

Eco-Efficiency: term coined by the World Business Council for Sustainable Development (WBCSD) in its 1992 publication 'Changing Course'. It is based on the concept of creating more goods and services while using fewer resources and creating less waste and pollution (Wikipedia, n.d.).

Green Economics: is the economics of the real world—the world of work, human needs, the Earth's materials, and how they mesh together most harmoniously. It is primarily about “use-value”, not “exchange-value” or money. It is about quality, not quantity for the sake of it. It is about regeneration---of individuals, communities and ecosystems---not about accumulation, of either money or material (Wikipedia, n.d.).



Hemp: a common name for a tall annual herb (*Cannabis sativa*) of the family Cannabinaceae, native to Asia but now widespread because of its formerly large-scale cultivation for the **bast fiber** (also called **hemp**) and for the drugs it yields. Known and cultivated in ancient China, the plant was introduced into Europe before the Christian era. In the United States it was cultivated chiefly in the Midwest. The fiber, retted from the stem, was one of the most important for various kinds of cordage; it was also used in making paper, cloth (canvas and other kinds), oakum for calking ships, and other products. The male and female flowers are borne on separate plants. The chemical derived from the female flowering tops is used medicinally and is the source of marijuana and hashish. **Hemp** seed is used as bird food, and the oil from the seeds is used in the manufacture of paints, varnishes, and soap. The dried leaves are used in Asia for a beverage (Columbia University Press, 2003) and (Houghton Mifflin Company, 2004).

Industrial Hemp: a number of varieties of *Cannabis sativa* L. that are intended for agricultural and industrial purposes. They are grown for their seed and fiber content as well as the resulting byproducts such as oil, seed cake, hurds, etc. Industrial hemp is characterized by being low in THC (delta-9 **tetrahydrocannabinol**) and high in CBD (cannabidiol). THC is less than 1% and in Canada and the European Union the current legal level for cultivation is 0.3%. The ratio of CBD to THC is greater than one (Wikipedia, n.d.).

Jute: a glossy fiber from a plant of the genus *Corchorus*, tropical annuals of the family Tiliaceae (linden family). Many species yield fiber, but the chief sources of commercial jute are two Indian species (*C. capsularis* and *C. olitorius*), grown



primarily in the Ganges and Brahmaputra valleys. It is seen most often in sacks, rope, twine, and as backing on carpeting. The fiber strands in the bark are 6 to 10 ft long (2–3 m) and are separated from the woody stalk centers by retting. The fiber deteriorates quickly and, because of its uneven diameter and comparatively low cellulose content, is relatively weak. However, because of its low cost and the ease of dyeing and spinning, jute is the principal coarse fiber in commercial production and use (Wikipedia, n.d.).

Kenaf: a valuable fiber from an East Indian hibiscus plant (*Hibiscus cannabinus* L), which is now widespread in cultivation and used especially for its cordage, canvas and sacking. It is related to cotton and okra, and grows well in many parts of the U.S. It is primarily grown in India and Pakistan but also grows in Africa, South East Asia, Indonesia, Russia, Mexico, the Philippines, Cuba and the United States. Kenaf grows quickly, rising to heights of 12-14 feet in as little as 4 to 5 months. U.S. Department of Agriculture studies show that kenaf yields of 6 to 10 tons of dry fiber per acre per year are generally 3 to 5 times greater than the yield for Southern pine trees, which can take from 7 to 40 years to reach harvestable size (Answers Corporation, 1999-2005) and (Wikipedia, n.d.).

Organic Cotton: is cotton grown without pesticides or chemical additives to fertilizer, relying instead on methods with less ecological impact. Organic cotton is used to manufacture everything from handkerchiefs to kimono robes. Different levels of certification exist, but at a minimum, a crop must be grown in soil that has been chemical-free for at least three years (Wikipedia, n.d.).



Organic Farming: the practice of raising plants—especially fruits and vegetables, but ornamentals as well—without the use of synthetic pesticides, herbicides, or fertilizers. In the United States, as elsewhere, awareness of the environmental damage and threats to health (see pollution; environmentalism) caused by DDT, dieldrin, and other insecticides and by the excessive use of chemical fertilizers has fostered interest in organic gardening, particularly among home gardeners (Columbia University Press, 2003).

Manila hemp: see **Abaca**

PLA Fiber: a corn-based polymer manufactured fiber. The PLA in the fibers name stands for poly-lactic-acid. The fiber can be used in blends with cotton and polyester, or alone. PLA is biodegradable like natural fibers. In the future, it is anticipated that microfibers will be made from the fiber as well. PLA fiber, being an aliphatic polyester which has a melting point around 170°C, a glass transition point around 57°C and sharing the hydrophobic properties of polyester, can be dyed with the use of disperse dyestuffs generally used for polyester (Imada, n.d.).

Ramie: a bast plant fiber and similar to flax. It is natural white in color, has a high luster and an unusual resistance to bacteria and molds. Used in fabrics, and often mistaken for linen, it is extremely absorbent and dries quickly. Ramie has excellent abrasion resistance and has been tested to be three to five times stronger than cotton and twice as strong as flax. It is an inexpensive fiber from an East Asian plant and can be spun or woven into a fabric (Houghton Mifflin Company, 2004).



Renewable resource: any natural resource (as wood or solar energy) that can be replenished naturally with the passage of time (Houghton Mifflin Company, 2002).

Sustainability: an economic, social, and environmental concept. It is intended to be a means of configuring civilization and human activity so that society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely. Sustainability affects every level of organization, from the local neighborhood to the entire planet. It is sometimes a controversial topic (Wikipedia, n.d.).

Sustainable Development: Sustainable development means different things to different people, but the most frequently quoted definition is from the report Our Common Future (also known as the Brundtland Report): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Wikipedia, n.d.)."

Sustainable Resources: Capable of being continued with minimal long-term effect on the environment: sustainable agriculture (Wikipedia, n.d.).



Tetrahydrocannabinol (THC): Also known as dronabinol, is the main psychoactive substance found in the **hemp** plant *Cannabis sativa*. In pure form it is glassy solid in the cold and becomes viscous and sticky if warmed. THC has a very low solubility in water, but a good solubility in most organic solvents like ethanol or hexane (Wikipedia, n.d.).

Background Information

How are we Teaching and Why?

The technical advances of the previous 250 years have engendered the development of new methods of production and ways of teaching for the textile industry. In January 1994, The North American Free Trade Agreement (NAFTA) went into effect and created the world's wealthiest trading bloc. By February of 1999, Levi Strauss, announced that it would close 11 of 22 US plants and lay off 5,900 factory workers (Emert, February, 1999). The last decade though, has brought even more drastic changes to the textile industry in the United States.

As one Brian Milani, a Canadian economist observed,

We have been sold a bill of goods about the need for "competitiveness" in the global economy and its relationship to efficiency. The corporate-global economy, with its giant loops of production and consumption; its pseudo-diversity of superfluous product choices; and its energy and agricultural monocultures, is probably the most inefficient, irrational and wasteful system we could have. Its markets ignore major social and environmental costs that ultimately must be paid. Long-distance free trade is, of course, based on pollution. As Wayne Roberts (1995) has argued, the global economy would likely collapse overnight if subsidies to cheap dirty energy (which essentially subsidize long-distance transport) were suddenly eliminated. The system also continues to define "productivity" as labour- rather than resource-productivity. Technology and resources are substituted for people, while the world population and mass unemployment are growing, and as all living systems are in decline (Milani, 2001).

U.S. textile job losses have accelerated dramatically during the last five years. In the Carolinas alone, more than 94,000 textile jobs have been lost while imports from China have increased by almost 400 percent (AMTAC, July 2004).

Having gone from being a primary industry, the United States textile manufacturing industry is quickly becoming nonexistent. Most colleges in the United States offering just technical textile programs have undergone or are currently restructuring their



programs to include design in order to entice students and by highlighting niche markets. North Carolina University has already done this with their Textile Protection and Comfort Center.

There seems to be a lack of information and inspiration in many of the more technical textile programs being offered. Beginning in 1999, the National Textile Center (NTC), a research consortium made up of eight universities: Auburn University, Clemson University, Cornell University, Georgia Institute of Technology, North Carolina State University, UC - Davis, University of Massachusetts - Dartmouth, Cornell University and Philadelphia University, funded the Teaching and Learning Initiative which was completed in 2002. Its purpose was to determine the most effective methods for instruction in textile programs. To accomplish this, they built it on existing pedagogical techniques, especially those that are not routinely used in textile education. Their goal was to better prepare students to be productive and dynamic members of the textile industry by using teaching methodologies that foster workplace skill development. They discovered that:

"...industry requirements are often not the focus of college learning. When educators focus on a comprehensive presentation of relevant theories, the practicalities and applications of solving day-to-day problems are often neglected (Armstrong-Carroll, Pastore & et al., 2001)."

The results of the National Textile Center study showed that industry is looking for employees competent in creative thinking, problem solving, and decision making. Another aspect of this initiative titled, *Educating the Educators*, encouraged educators to consciously cultivate higher order thinking skills in their students.



In Canada, where **Industrial Hemp** has been grown commercially since 1998, cutting edge colleges and universities have already instituted whole Masters programs devoted to business and the environment or business and **sustainability**. They are also offering courses designed to appeal to people in the community as well as in the university such as *Happiness & Service: The Transformation of Wealth in a Green Economy* which was presented as part of the Summer Institute 2005 program at The Transformative Learning Centre, an integral part of the Ontario Institute for Studies in Education at the University of Toronto (OISE/UT).

The Schulich School of Business at York University states on their website:

Business operates in an increasingly complex setting. Environmental and social concerns are at the forefront of the new issues which are stretching the responsibilities of business and demanding new types of management thinking. These concerns first affected established industries in forestry products, chemicals and mining sectors. Today, however, they are impacting other manufacturers, retailing and service industries, and the financial sector (Schulich School of Business at York University, n.d.).

One must understand that these new programs developed out of students' desire to know more. Brian Milani began teaching about Green Economy, near the end of 1992, to the community. By 2001, he stated,

Our focus is at once visionary and practical. ..., the course can often be a real "high" to the students involved—most of whom are already very knowledgeable and self-motivated. (I'm not immune to the same intoxication myself, since hosting the course allows me to conveniently update myself on new initiatives, and they never cease to amaze me). The students' highs are, however, often closely followed by frustration. They say, "Wow, this is great stuff—but where can we get the education to do this work?" My sad answer is that, aside from the odd course in this school or that college, there is nowhere that provides comprehensive education on ecological alternatives. The most relevant education is provided by workshops, seminars, courses and conferences offered by movement groups or individuals in civil society (Milani, 2001).

The Foundation for Interior Design Education Research (FIDER), headquartered in Grand Rapids, MI, is responsible for setting standards and

evaluating interior design academic programs for accreditation, the mark of quality education. FIDER is taking a careful look at **sustainability** to see what it means for future interior designers to see when and how it impacts their work and lives. They feel that in order to prepare their interior design students to enter the world once they graduate they must be taught the principles of sustainable design (Harmon-Vaughan, Beth (August, 2004).

How did it come to this? Why did we let it come this far?

Throughout history, there have been those individuals and corporations who have set good examples or researched better ways for **eco-efficiency** in production and consumption but the fact is their achievements went unknown to the majority of the United States population.

Where We Were

Let's go back a bit and try to understand how industry, education, governmental policies, our earth and people got to where we find ourselves now, with the most urgent callings concerning sustainable development beginning to be heard, once more.

This country and the textile industry was founded and built on sustainable practices, even though there were also scattered corrupt occurrences throughout our history. Let us look back now to see where we initially took the turn onto a destructive path and go back and think about what our preferred direction would be if we decided to change course? The author's purpose is to engage the readers to journey back in history and learn from our past.



Towards the end of the 17th century, many of the small farms along the coastal areas of the South were being transformed into large plantations. This was possible because they were being developed with the slave labor of Africans, who were imported in increasingly greater numbers.

After the colonies were established overseas, by the end of the 17th century and the beginning of the 18th century, the British Empire had accumulated a vast source of raw materials and a vast market for goods, as well. Goods were manufactured in small volume, mostly in homes by families who used their own equipment, such as weavers' cottages. Then the goods were transported around the country by horse and cart, or by river boat. Animals supplied power for farming and hauling the goods.

Knowing that there was such a vast marketplace to serve, attention was directed on how to increase the scale of industry and the sources of power. During this time, Great Britain started to develop the textile manufacturing industry and it marked the beginning of the Industrial Revolution.

During the 18th century, the export of woolen goods accounted for one-quarter of Britain's exports while their cotton industry was only close to a tenth. Due to the competition with the wool and the linen industries, in 1700, the government placed a ban on imported cotton goods from India. Since, cotton was already popular, a home-based cotton industry sprung up using **cotton fiber** imported from the colonies (The Open Door Web Site, 2005).



This led to necessary improvements in the processes of the production of cotton goods from the raw material to spinning the fibers into yarn and weaving the yarns into cloth:

1764 - James Hargreaves or Thomas Highs invents the Spinning Jenny (patented 1770)

1769 - Richard Arkwright's Water Frame

1769 - James Watt invents the steam engine

1775, Another Englishman, John Wilkinson invented a precision horizontal-boring machine that made efficient steam engines possible.

1779 - Samuel Crompton invents the Spinning Mule.

1784 - Edmund Cartwright invents the power loom.

1794 - Eli Whitney patents the cotton gin.

Then came answers to the Industrial Revolution:

1798 - Eli Whitney and Americans solved issues of speed and mass production.

Whitney secured a US government contract (for \$134,000) to produce 10,000 army muskets. Whitney refined and successfully applied the "Uniformity-System" of production using inter-changeable parts

1816 - Francis Cabot Lowell builds the first power loom in America.

1818 - Whitney invents the first milling machine.

...And the birth of the Textile Industry and more improved technologies:

Americans Elias Howe and Isaac Singer with their sewing machines

Cyrus McCormack with harvesters

Henry Ford with his automobiles

These were followed with more inventions and innovations that used Whitney's examples of mass production and interchangeable parts. Production became faster and more efficient.

George Washington, himself a farmer, launched the first move to aid American agriculture in his message to congress in 1790. Then in his last message on December 7, 1796, President Washington, even more strongly, urged the establishment of organizations to collect and distribute agricultural information. In 1797 a House of Representatives committee recommended the creation of an American Society of Agriculture, funded by the federal government, with headquarters in Washington, DC. It never happened.

During the 19th century a rise in the disputes of slavery between the north and the south became the main cause leading up to the Civil War. As the north held anti-slavery movements the south felt strongly that an end to slavery would threaten their economy and way of life. The Civil War represents the harshest conflict ever within the United States. It was the only war fought by Americans on American soil and it split the nation.

Proposals for a Department of Agriculture were made many times and in House Report 321 of August 5, 1856, the committee had this to say:

Agriculture is the basis of our national prosperity. It is the substratum of all other interests; and the degree of advancement which marks the progress of our country and its people in wealth, enterprise, education, and substantial independence, is measured by the prosperity of its rural interests.



It is one of those arts which, from the earliest periods, have been deservedly held in the highest estimation. One of the first injunctions upon our original progenitor, after his expulsion from the Garden of Eden, was that he should "till the soil" (House Committee on Agriculture, n.d.)

Earlier that year, in England, in an attempt to synthesize the anti-malaria drug quinine from coal tar, William Perkin discovered the first synthetic dye, aniline purple which came to be known as mauve.

Growing and harvesting cotton was very labor intensive. The Southern workforce was made up of about 4 million slaves. In spite of the African slave trade having become illegal earlier in the century, the existing slaves were not freed. The people of the North were pushing to abolish slavery, completely. The South feared the severe economic impact that losing the slaves would have on cotton plantations.

When Abraham Lincoln, who was against slavery, was elected President in 1860, seven Southern states seceded from the United States. The Confederate States of America was formed. The Civil War began after four more states seceded.

In 1861 Isaac Newton, a Pennsylvania dairy farmer who supplied butter to the White House, was appointed Superintendent of the Agricultural Division Chief of the Patent Office. As a delegate to meetings of the United States Agricultural Society, Newton had repeatedly lobbied Congress to establish a department of Agriculture.

On May 15, 1862, President Abraham Lincoln signed into law an act of Congress establishing the United States Department of Agriculture, 65 years after it had first been proposed and in the middle of the Civil War. The Southern congressmen who previously opposed it were now no longer in congress. The North,

whose many farmers had gone to war, felt the need for agencies to stimulate food production. More public schools were opening and agricultural colleges helped pave the way for educated farmers. Isaac Newton, formerly Chief of the Agricultural Division of the Patent Office, was promoted to be first Commissioner, from 1862-67 (Shurtleff and Aoyagi, 2004).

In his first annual report, Newton outlined objectives for the Department. These were: (1) Collecting, arranging, and publishing statistical and other useful agricultural information; (2) Introducing valuable plants and animals; (3) Answering inquiries of farmers regarding agriculture; (4) Testing agricultural implements; (5) Conducting chemical analyses of soils, grains, fruits, plants, vegetables, and manures; (6) Establishing a professorship of botany and entomology; and (7) Establishing an agricultural library and museum. These objectives were similar to the charges given the Department by the Congress in its legislation establishing the new agency.

Such is one of the great lessons of history; and any nation that desires permanent prosperity and power should learn it well, wisely protecting labor and capital, and encouraging the division and cultivation of the soil.

On cotton, Newton reported:

The culture of cotton has lately attracted much attention in the free States—especially in Illinois—owing to the rebellion and the consequent scarcity of the staple. Last summer, as a matter of experiment, 500 to 1,000 pounds of cotton were raised per acre by many farmers of Illinois. This department will take early and active measures to induce farmers in Kentucky, Missouri, Southern Illinois, Indiana, and Kansas—all of which States will undoubtedly produce cotton—to turn their attention to the culture of this important staple....The attention of the department has been particularly directed, by an act of Congress, to the mode of preparing flax and **hemp** as a substitute for cotton. Persons engaged in experimenting on these fibres feel sanguine of success. The department has already been put in possession of some fine specimens of the flax-cotton, as well as several samples of fabrics woven from the thread of that material. The investigation will be continued (National Agricultural Library NAL, 2003)."

Upon completion of his investigations he sent this letter, dated February 28, 1865 with his report:

Dear Sir: I beg through you to present to the Senate the report of the commission appointed by me under the act of Congress approved February 25, 1863, for investigations to test the practicability of cultivating and preparing flax or **hemp** as a substitute for cotton, twenty thousand dollars."

I regard the report as one of great interest, and suggest to you that twenty thousand copies be ordered to be printed for this department.

Very respectfully,

ISAAC NEWTON, *Commissioner*.

Hon. H. B. ANTHONY (Department of Agriculture, 1865).

In what ended up being his last annual message to the Congress, Lincoln said:

"The Agricultural Department, under the supervision of its present energetic and faithful head, is rapidly commending itself to the great and vital interest it was created to advance. It is precisely the people's Department, in which they feel more directly concerned than in any other. I commend it to the continued attention and fostering care of Congress (National Agricultural Library NAL, 2003)."

The Union army eventually overcame the Confederate army. Five days after the surrender treaty was signed, President Abraham Lincoln was assassinated by a Southern sympathizer.

To save the cotton economy of the South an alternative labor system evolved known as "sharecropping". It was a form of tenant farming which guaranteed landowners that their labor requirements would be met, no matter the risks they faced. The sharecropper exchanged their labor for food, housing, the right to hunt and fish and a share of each harvest.

Unfortunately for the sharecropper, the laws were in favor of the landowner and eventually with the passing of the crop lien laws they became a laborer whose wages were paid in crops instead of a tenant with ownership of a share of the crop. This way, the sharecroppers were kept out of the capital market because he could not offer his crop for lien. Other laws like the "alienation of labor" laws which prevented them from being hired elsewhere and a lack of education kept them illiterate and tied to the landowner. Most times there was little to nothing left of the money from the sales for the sharecropper (Rivoli, 2005).

The Agricultural Adjustment Act marked the introduction of government price supports for agricultural products plus, the new concept of paying farmers to keep some of their land out of production in order to keep the commodity prices stable. Taking the sharecroppers' acreage out of production forced many illiterate sharecroppers to give up and become migrants out west because they did not have the ability to fight their landlords for their fair share of the government subsidy nor fill out the necessary government forms (Rivoli, 2005).

1884 - Louis-Marie-Hilaire Bernigaud, comte de Chardonnet [b. Besançon, France, March 1, 1839, d. Paris, March 25, 1924] begins to produce an artificial fiber made from cellulose, which comes to be known as rayon.

1892 - Cross, Bevan & Beadle invent Viscose Rayon, made by reconvertng cellulose from a soluble xanthate form to tough fibers by washing in acid.

1902 - Arthur D. Little [b. Boston, Massachusetts, December 15, 1863, d. August 1, 1935], William Hultz Walker [b. Pittsburgh, Pennsylvania, April 7, 1869, d. Pasadena, California, 1934], and Harry S. Mork obtain the first U.S. patent for

an artificial fiber, a form of yarn for spinning based on the acetate process for rayon.

During World War I, Harry T. Edwards, the Principal Technologist in the U. S. Department of Agriculture, foresaw the future wartime obstructions with importations due to the breakdown of alliances during wars, i.e. Philippines. As a visionary he promoted production in tropical America, Panama. He recommended that preliminary investigations begin for growing **abaca** in the Panama Canal Zone. It was approved in December of 1921 and the investigations proved successful. Edwards' foresight was instrumental in making commercial development and expeditious importation of **abaca** fiber for cordage possible for use after the United States entered World War II in 1941(Edwards, 1945).

Prior to the United States entering World War II, two important events occurred:

1937 – the **1937 Marijuana Tax Act** (strictly the **1937 Marihuana Tax Act**)

was one of the cornerstone bills that led to the criminalization of Cannabis. It was introduced to U.S. Congress by Harry Anslinger, then Commissioner of the Federal Bureau of Narcotics. It imposes special (occupational) taxes upon persons engaging in activities involving articles or material within the definition of "**marihuana**" contained in the act, and also taxes the transfer of such articles or material.

1939 – Dupont introduces Nylon. It was the first synthetic fiber to be made entirely from inorganic ingredients: coal, water and air. The invention by Wallace Carothers will transform the manufacturing world.

1942 - The synthetic fiber, Polyester was developed. It was produced by the polymerization of the product formed when an alcohol and organic acid react. First commercial Polyester fiber production by DuPont in 1953 had an immediate impact on clothing industry.

Where We Are Going

Industrial Hemp

In just one month alone, April 2005, there were over twenty articles published concerning **Industrial Hemp**. Three-quarters of them related to **hemp** fiber. One of special significance to the textile industry states:

*"In April, for instance, the Government of Canada's Scientific Research and Experimental Development Program awarded Hemptown Clothing, Inc., the world's largest **hemp** T-shirt apparel brand, a \$223,118 grant in recognition of the company's work in developing environmentally friendly fabrics and garments in 2002 and 2003 (Chepesiuk, April, 2005)."*

One of the first economic analyses of industrial hemp's potential as a profitable crop for U.S. farmers was a report prepared by the Economic Research Service (ERS) of the United States Department of Agriculture (USDA) in 2000. The report concluded that:

*"U.S. markets for **hemp** fiber ... and seed ... are, and will likely remain, small, thin markets. Uncertainty about long-run demand for **hemp** products and the potential for oversupply discounts the prospects for **hemp** as an economically viable alternative crop for American farmers (ERS, 2000)."*

This negative forecast by the ERS is likely partially responsible for promoting stronger interest in **industrial hemp** in the United States as later reported in a research study by Small and Marcus (2002):

Hemp fiber is amenable to use in a wide range of products including carpeting, home furnishings, construction materials, auto parts, textiles, and paper. **Hemp** seed, an oilseed, likewise has many uses, including industrial oils, cosmetics, pharmaceuticals, and food.

The crop was widely grown in the United States from the colonial period into the mid-1800s; both fine and coarse fabrics, twine, and paper from **hemp** were in common use. However, by the 1890s, labor-saving machinery for harvesting cotton made the latter more competitive as a source of fabric for clothing, and the demand for coarse natural fibers was met increasingly by imports. Between 1914 and 1933, in an effort to stem the use of Cannabis flowers and leaves for their psychotropic effects, 33 states passed laws restricting legal production to medicinal and industrial purposes only.

In 1937, Congress passed the first federal law to discourage Cannabis production for marijuana while still permitting industrial uses of the crop (the Marihuana Tax Act; 50 Stat. 551). Under this statute, the government actively encouraged farmers to grow **hemp** for fiber and oil during World War II. After the war, competition from synthetic fibers, the Marihuana Tax Act, and increasing public anti-drug sentiment resulted in fewer and fewer acres of **hemp** being planted, and none at all after 1958.

The past decade has witnessed a resurgence of interest in the United States in producing **industrial hemp**. Farmers in regions of the country that are highly dependent upon a single crop, such as tobacco or wheat, have shown interest in hemp's potential as a high-value alternative crop, although the economic studies conducted so far paint a mixed profitability picture (Rawson, 2005 pp. 1-2).

Recently and for the first time since the federal government outlawed **hemp** farming in the United States, a federal bill has been introduced that would remove restrictions on the cultivation of non-psychoactive **industrial hemp**. H.R. 3037, the "Industrial Hemp Farming Act of 2005," defines **industrial hemp** and assigns authority over it to the states, allowing laws in those states regulating the growing and processing of **industrial hemp** to take effect. To date, In the United States, 26 states have introduced **hemp** legislation and 14 have passed legislation; 5 have legalized its production (VOTEHEMP, 2005). (See table 1 for more information)

Strictly speaking, the Controlled Substances Act (CSA) does not make Cannabis illegal; rather, it places the strictest controls on its production, making it illegal to grow the crop without a DEA permit. DEA officials confirm issuing a permit for an experimental plot in Hawaii in the 1990s (now expired), and they confirm that DEA



still has not ruled on an application submitted in 1999 by a North Dakota researcher. **Hemp** industry officials assert that the security measures the DEA requires are substantial and costly, and deter both public and private interests from initiating research projects requiring growing plots. All **hemp** products sold in the United States are imported or manufactured from imported **hemp** materials (Rowan, 2005 p.3).

In all, more than 30 countries in Europe, Asia, and North America grow **hemp**, although most banned production for certain periods of time in the past. The United States is the only developed nation in which **industrial hemp** is not an established crop. Great Britain lifted its ban in 1993 and Germany followed suit in 1996. In order to help reestablish a **hemp** industry, the European Union instituted a subsidy program in the 1990s for **hemp** fiber production.

*"The countries exporting **hemp** products to the United States vary considerably from year to year. Over the last five years, the most consistent exporters of raw and processed **hemp** fiber to the United States have been China, the Philippines, Poland, Romania, Canada, and India (Rowan, 2005 p.3)."*

Hemp proponents base their economic arguments for legalizing the crop on its potential value as a component in a wide array of industrial and consumer products because if grown here in the United States it can provide many opportunities and because there are many uses for the entire plant thus generate entire new niche markets as a profitable alternative crop for farmers. They contend that a commercial **hemp** industry would generate its own profitable niche markets, even where conventional or alternative commodities already exist, and that basing estimates of future profitability on the current usage of imported **hemp** ignores the crop's larger potential.

It could be argued that the government has already recognized that industrial **hemp** is capable of contributing to national defense needs and to the readiness of U.S. defenses during times of peace as well as national emergency (Rowan, 2005).



Opponents of **industrial hemp** point out that U.S. agricultural history illustrates the great difficulty of bringing promising alternative crops into profitable commercial use. USDA has supported research on alternative crops and industrial uses of common commodities since the late 1930's. Currently, under the Critical Agricultural Materials Act of 1984, the supplemental and alternative crops provisions of the 1985 and 1990 omnibus farm acts and other authorities, the federal government supports about \$15 million annually in research and development on alternative crops at USDA and state laboratories. An alternative crop that has become established is **kenaf** (for fiber), in Texas, jojoba (for oil) in Arizona and California, and amaranth (for nutritious grain) in the Great Plains states, for example — **kenaf** has similarities to **hemp**, however this fiber is not complicated by having a drug variety within the same species as **hemp** is with marijuana, therefore it is considered for government supports and **hemp** is excluded.

It often takes 10 to 15 years for the industries associated with a new agricultural crop to mature. While it is true that foreign imports have been the basis for **hemp** products in North America for at least a decade, North American production is only 4 years old in Canada ...

Viewed from this perspective, the **hemp** industry in North America is still very much in its infancy ... and is likely to continue experiencing the risks inherent in a small niche market for some time.

[However,] **hemp** ... has a diversity of possible uses. Currently **hemp** is being promoted by extremely enthusiastic market developers, and attracting much attention which is likely to carve out a much larger share of the North American marketplace than its detractors are willing to concede.



A December 2003 report from Agriculture Canada draws an even more positive conclusion, based on its reading of consumer interest:

Hemp's remarkable advantages are hard to beat: it thrives without herbicides, it reinvigorates the soil, it requires less water than cotton, it matures in three to four months, and it can yield four times as much paper per acre as trees. **Hemp** can be used to create building materials that are twice as strong as wood and concrete, textile fiber that is stronger than cotton, better oil and paint than petroleum, clean-burning diesel fuel, and biodegradable plastics. In addition, it can produce more digestible protein per acre than any other food source. These advantages are in tune with the environmental and health preferences of today's North American public. The growing curiosity of consumers, the interest shown by farmers and processors, and Canada's excellent growing conditions for **industrial hemp** allow optimistic views for its future (Rawson, 2005 pp. 5-8).

The Canadian **hemp** fiber industry is not as developed as its seed and oil industries, because the crop has not been grown for 50 years. No government or private research funds were spent until recently on breeding fiber varieties or tackling the problems associated with harvesting and processing. Similarly, the infrastructure for efficiently transporting and handling the heavy, bulky product is lagging.

The finest fiber comes from outer-core, or **bast fibers**, of the plant, while the inner core fibers are suitable for low-end industrial use, such as in building products.

Markets for both must be developed simultaneously in order to be economical (Rawson, 2005 pp. 5-8).

Bamboo

Bamboo seems to have come into the limelight like the proverbial “sleeper” fiber and is emerging as one of nature's own sustainable performance material. Those who are selling it claim this “supergrass” is nearly as strong as steel and can be woven as soft as silk for one-twentieth the cost. It also grows pesticide-free, self-regenerates when cut down, and can reach 100-foot maturity in three years.

Flooring manufacturers became the first modern companies to take advantage of **bamboo fiber** —Asians have used this plant in construction for centuries—but, today you can now find it in everything from bikes to underwear (Khanh, 2004).

Rich Delano, president of Bamboo Textile in Brea, Calif., imports Chinese bamboo yarn for six customers, including underwear maker Stone International LLC of Columbia, S.C. He said his clients are in the development stage. He pointed out that, besides being soft, bamboo yarn is antibacterial and nearly three times more absorbent than cotton (Khanh, 2004).

Designers are also drawn to it for its affordable price (Khanh, 2004), Kate O'Connor, the Los Angeles based designer, known for creating ponchos and knits that languidly drape a woman's curves, typically uses alpaca, silk and other supple yarns for her designs. She recently discovered bamboo. She couldn't afford the best silk, which costs \$65 a pound. Cotton, she found, can be “sticky” and lacks silk's fluidity.

O'Connor said:

“I was looking for an alternative to the silk. (B)amboo is like a cotton-and-silk blend. It feels light but has a silky weight to it, which is so gorgeous (Khanh, 2004).”

Avita's Shi was looking in China to find a fabric that is lighter than a silk and cashmere blend and can be worn in the summer. Shi thought bamboo was more matte than Tencel lyocell and viscose rayon and thicker than Modal fiber. She said:

“People are calling it cashmere from plants (Khanh, 2004).”



The manufacturing process for bamboo yarn is similar to that for rayon. The bamboo stems and leaves are pummeled into a starchy pulp in hydrolysis alkalization. A finishing treatment transforms the pulp into soft fibers. The bamboo yarn is then bleached and dyed (Walker, 2005).

It is evident that further research must be done. When it was first disclosed that Armani designed Woody Harrelson's tuxedo for the 1996 Academy Awards out of **industrial hemp**... the furor took a long time to die down because of the assumed association with the drug MARIJUANA. It is, therefore imperative we provide accurate education regarding this fiber, its qualities, its ultimate production capabilities and uses. This can provide the textile industry with the impetus it needs to re-emerge from the ashes.

However in order for us to go forward it is incumbent upon us to further research all alternative plant fibers and verify all the claims attested to them. At this point the term "sustainable fabrics" is being used improperly especially if the fabric is being dyed, for now biodegradable is a better choice of terms to use.

Generally people, institutions and corporations are already integrating sustainable practices into their lives, businesses, politics, beliefs, missions and visions. They are our examples and we will use them as our case studies and role models. Many of them will become teachers or at the very least they will work together to expand **sustainable development** worldwide.

Then there will be those who would like to integrate **sustainability** into their business practices but are in need of assistance, they will be helped and will assist



others. There will also be those who fear **sustainability** because they do not understand, they must be taught.

Then there will be those who would like to know more and help, they are the present and future generations who will be taught how and will succeed if we begin to teach them now.

Limitations

These were the limitations that the researcher discovered when compiling the data from the responses:

1. Poor response rate, two thirds of the people did not respond to the questionnaire because of busy schedules.
2. The negative connotation associated to **industrial hemp** because of its relationship to **marijuana**.
3. Respondents were not familiar with what "**sustainability**" is all about

While Industrial hemp is the same species as marijuana (Cannabis sativa) it has no psychoactive properties and is of no value to the 'drug community'. It will not exacerbate marijuana use. On the contrary, it will harm marijuana production by cross fertilisation, destroying seed lines and reducing the psychoactive value of marijuana crops (Merfield, 1999 p. 3).

Both are members of the cannabis family, yet they are separate varieties, with different growing characteristics. **Industrial hemp** has no psychoactive qualities because it contains less than 1 percent **Tetrahydrocannabinol** (THC).

The biggest challenge is economics especially since it normally seems to take precedence over any health or environmental concerns as long as regulatory limits are met. The researcher knows that as more corporations realize the benefits of **sustainability** it will eventually become the norm for industry, especially since the educated consumer will demand more sustainable business practices to be implemented concerning products they purchase. That will require education and a rise in consciousness, which the researcher feels is the most constructive way to approach this subject. In addition it allows society to choose instead of government enforcement.

Procedures

The 30 voluntarily participants in this quantitative/qualitative study form an unusually diverse group including educators, professionals, business entrepreneurs and executives, political advocates, and farmers. They represented industries and sectors within them, which make use of textile fiber producing plants. The remainder of the participants are members of the Industry Advisory Board for the Fashion Institute of Technology's Textile Development and Marketing Department. Data has been gathered using questionnaires, telephone and in-person interviews. First those already involved in **sustainability** were contacted by telephone to determine if they would be willing to participate in some way. Next the researcher made three on site visits in Memphis, Tennessee to gather more information. The first was to the United States Department of Agriculture for a tour of their cotton grading facilities with Darryl Earnest. The second visit was to the Cotton Council to meet with Cotton Nelson. The last was to meet with Peter Nelson, the co-founder and vice-president of Agro-Tech Communications, Inc., and discuss his past research of **kenaf** and **hemp**



(personal communication, June 22, 2005). By proceeding in this manner the author gained an important, additional perspective of **sustainability**, concerning what methodology to consider, which prevented finishing the study in a timely manner. However, the researcher felt that the additional time required for this investigative analysis was necessary for a more thorough and conclusive approach to the subject matter.

Telephone discussions were conducted with Brian Milani, a **green economics** professor in Canada (personal communication, May 17, 2005); Barbara Fillipone, founder and president of EnviroTextiles (personal communication, August 18, 2005); Hugh McKee, president of FlaxCraft (personal communication, July 12, 2005); Ray Anderson, founder and chairman of Interface, Inc. (personal communication, September 18, 2005); Rich Delano, president of Bamboo Textile (personal communication, October 22, 2005) and Dr. Phillip J. Wakelyn of the National Cotton Council (personal communication, July 12, 2005).

Data analysis

The data was collected and analyzed to determine similarities and differences between the various industry sectors and sustainable production development. The skills and qualifications that the industry is looking for in graduating students is an individual who has the potential and capability to advance the future of the textile industry. This researcher has taken special care to find common themes in the participants' missions and visions. The results compiled in this written report will also be presented to the Fashion Institute of Technology's curriculum review committee and at appropriate future trade and/or educational conferences.



To read the original survey, see Appendix A. To read the revised survey without open ended questions, see Appendix B. To read answers to open ended questions, see Appendix C. For a summary of all the answers to the revised summary, see Appendix D.

Summary

The results of this study revealed that there is a growing market for graduates with a good working knowledge of "**sustainability**." This gradual transition will become the driving force behind the textile industry's sustainable development expansion.

The results show that the smaller organizations, of up to 50 employees, seem to find it easiest to use business practices which lead to sustainable development. They also are the most satisfied with their recently hired employees and have very high ethical values.

The larger organizations which took part in this research (many did not), over 500 employees, are working to become more active in offering environmentally sustainable products and social **sustainability**. Those who claimed that sustainable development is part of their business strategy most often have employees dealing with sustainable development on a daily basis and social concerns are being integrated into their management system in regard to society as a whole.

Their company's way of thinking about the relationship between company's activities and environmental activities are either that environmental consideration is one of their social commitments or it is incorporated into business activities as one of their most important strategies

Mid-size companies thought keeping up with regulations was adequate, because further participation in environmental issues does not contribute to the business' bottom line. It is possible that this was only due to the lack of responses and not a true picture of industry.

There is still hope that by running a course such as, *Creating a Sustainable Textile Industry*, we will give educators the refreshing opportunity to inspire their students to consider new possibilities, in lieu of informing them of just the facts. It is this very process of teaching, that the researcher is confident will help educate the educator and promote lifelong learning for both the student and the educator.

Future Opportunities

There are unlimited new opportunities to be unleashed concerning **sustainability** and the textile industry, many of which will cross over from traditional 2 and 4 year undergraduate programs into graduate programs, corporate training programs, consumer education and other civil society areas of interest. Optimistically, introduction to **sustainability** should begin at the beginning in K-12 in Citizenship, Human Ecology, Fashion and Environmental science courses, and other interdisciplinary fields.

The last quarter of the twentieth century has already shown us some very promising role models:

Ken Geiser

Ken Geiser is Associate Professor of Work Environment at the University of Massachusetts Lowell. After the disaster at Bhopal, India, when methyl isocyanate



gas escaped from a Union Carbide plant and killed thousands; he went to Bhopal to give a talk at a memorial conference on plant safety in 1985. After spending a couple of afternoons with two colleagues outdoors near the plant listening to survivors' tell of their horrific recollections, losses, health problems and nightmares. Dr. Geiser writes in the preface of his book, *Materials Matter: Toward a Sustainable Materials Policy* (Geiser, 2001), that:

It was a profound and moving experience. There was little that I or the others could offer except a willingness to sit and listen. When I asked these distraught and grieving people what they wanted me to do, they repeatedly pleaded that I go back to the United States and make certain such an accident could never happen again. Sitting there in the heat and grief, I made a silent promise that I would commit what energies I had in my life to filling that request (Geiser, 2001).

Today, Ken Geiser is director of the Toxics Use Reduction Institute (TURI), a multi-disciplinary research, education and training, and policy center. TURI was established at the University of Massachusetts Lowell by the Toxics Use Reduction Act (TURA) of 1989. Dr Geiser is also the co-director of the University's Lowell Center for Sustainable Production, a new research and technical assistance center promoting environmentally sound and occupationally safe forms of workplace organization.

For the record, the Lowell Textile School was founded in 1895 to train technicians and managers for the textile industry, the dominant industry in the region at the time. From 1928-1953 it was known as the Lowell Textile Institute. In 1953, after extending its offerings in engineering, technology, and business administration, the institute changed its name to Lowell Technological Institute. In 1975, the Lowell Technological Institute merged with Lowell State College (originally the Massachusetts State Normal School at Lowell), a state college which had traditionally specialized in teacher education, to form the University of Lowell. Meanwhile, the



Lowell Textile School Lowell State and Lowell Tech merged in 1975 to form the University of Lowell. In 1991, the campus became part of the University of Massachusetts system and was renamed the University of Massachusetts at Lowell.

Patagonia

A progressive organization, they bit the bullet and decided to switch to use **organic cotton** in their clothing products. Patagonia's switch to **organic cotton** was prompted after they received the results of an environmental impact assessment that they commissioned an independent research company to conduct. Of the four major fibers, they expected to learn that oil-based polyester and nylon were big energy consumers and sources of pollution. Their expectations were confirmed but, they were surprised to discover the scale to which cotton is, also:

The "natural" fiber used in most of our sportswear proved to be by far the greatest environmental evildoer of the fibers studied. We learned that 25% of all toxic pesticides used in agriculture was (and is) used in the cultivation of cotton, that the resulting pollution of soil and water was (and is) horrific, and that evidence of damage to the health of fieldworkers is strong, though difficult to prove (Patagonia, n.d.).

Cotton was the biggest villain – and it didn't have to be. Farmers had grown cotton organically, without pesticides, for thousands of years. Only after World War II did the chemicals originally developed as nerve gases become available for commercial use, to eliminate the need for weeding fields by hand (Patagonia, n.d.).

Patagonia began experimenting with T-shirts made of **organic cotton**:

"Then, after several trips to the San Joaquin Valley, after we smelled the selenium ponds and saw the lunar landscape of cotton fields, we asked a critical question: How could we continue to make products that laid waste to the earth this way?(Patagonia, n.d.)."

In the fall of 1994, they made their decision and set a goal for all their cotton

sportswear to be 100% organic by 1996. They had eighteen months to make the switch for 66 products – and only four months to line up the fabric. They found that there simply wasn't enough **organic cotton** commercially available to buy through brokers. They had to go direct to the few farmers who had gone back to organic methods. And then they had to go to the ginners and spinners and persuade them to clean their equipment after running what would be for them very low quantities. They had to talk to the certifiers so that all the fiber could be traced back to the bale. They succeeded. Every Patagonia garment made of cotton in 1996 was organic, and has been ever since (Patagonia, n.d.).

They decided to use “transitional” cotton temporarily as well as certified organic. Transitional cotton is grown using all the organic processes, but the practices haven't been in place long enough to earn official certification. Second, they decided that they would sell “clothing made from organically grown cotton” rather than “organic clothing.” The difference seemed small, but they didn't want to mislead buyers about the fact that they would still be using synthetic dyes and conventional cotton thread in the production (Patagonia, n.d.).

To encourage others to use **organic cotton** and to help make **organic cotton** farming a sustainable business, they organized busloads of employees, journalists and representatives from other clothing companies to go to the Central Valley of California to see for themselves that “factory farming” isn't a metaphor, but a simple, stark description of a once-beautiful landscape. In the San Joaquin's cotton fields, for miles around no birds sing or insects hum; the air stinks, the eyes burn,



toxins stain the irrigation ditches. Hired men with shotguns sit in lawn chairs by the “lakes” in order to scare off waterfowl and shorebirds before they land in the toxic soup (Patagonia, n.d.).

They offered all of their information and discoveries to other apparel firms like Marks & Spencer, Timberland and Nike because they knew they weren't large enough to sustain **organic farming** by themselves and they hoped the entire industry would switch over just because it's the right thing to do (Patagonia, n.d.).

Their **organic cotton** program is a success because their customers are making the same choice they made – to pay more now for organics rather than pay the hidden environmental costs down the road. It's also a success because their cotton clothing is carefully thought out, and it sells well. As of this year, there are more encouraging signs. Just as in the organic food industry, which is currently growing at a rate of 20 percent a year, the worldwide demand for **organic cotton** is booming; it has tripled since they first made the switch in 1996. The farmers, gins, spinners, weavers and cloth manufacturers who followed their lead have all created a new source of revenue for themselves. The costs of **organic cotton** have gone down to where it is on the average only two times more expensive than industrial grown cotton, and more and more companies, encouraged by them, are switching over (Patagonia, n.d.).

Switching from industrially grown and processed cotton to organically grown is a positive step forward, but doesn't completely solve the problem. Even when cotton is grown without toxic chemicals, it still uses an inordinate amount of water, and



cannot be grown year after year without permanently depleting the soil. When a cotton garment is worn out, it is usually thrown away. We have to dig deeper and try to make products that close the loop – clothing that can be recycled infinitely into similar or equal products. We have to accept the responsibility for what happens to each product when it reaches the end of its life cycle, just as a computer manufacturer should be responsible for what happens to its old model computers that end up in landfills (Patagonia, n.d.).

Another Role Model

Ray C. Anderson, Founder & Chairman of Interface, Inc., the world's largest commercial carpet corporation.

This researcher took a chance and called Ray C. Anderson at home to ask him a question that she had not been able to find an answer to. After apologizing for bothering him on a Saturday morning, I briefly explained my research and had hoped to complete it with some inspiration from him because I already knew that the road ahead would have obstacles. I told Mr. Anderson that there must have been a transformational turning point for him. He told me that it was Paul Hawken's book, *The Ecology of Commerce*. The chapter titled *Death of Birth* about the reindeer on St. Matthew Island, which as he read it speared him through the chest and started him and Interface on a journey past compliance to ultimate purpose. Mr. Anderson told me exactly where it began on page 19 (personal communication, September 18, 2005).

I asked what it was like when he went into work with this new perspective. He responded that sometimes different thinking takes a little while to grow and for

traction to form. He assured me that I was not alone and that there are more people, than I realize out there who feel the same and are working toward **sustainability** (personal communication, September 18, 2005).

Then I told him that I had one more question about the PLA corn fiber that I could not get anyone at Cargill to answer for me:

How much pesticide is being used on the corn crops used for PLA fiber? He said that he did not know for sure but he assured me that the advantage of being a major player in industry, Interface has already been able to affect the amount of genetically modified organism (GMO) corn being grown by demanding more non-GMO corn (personal communication, September 18, 2005). That I believe is the beginning of the grand scale effect that the larger sustainable corporations will have in the 21st century. It is certainly more refreshing than the continual reports of powerful corporate giants like Wal-Mart who employs more people than any other company in the United States outside of the Federal government, yet the majority of its employees with children live below the poverty line (Public Broadcasting Service (PBS), n.d.).

The conversation with Mr. Anderson made it quite clear to this researcher that there is no right or wrong. The smaller corporations have the same shared vision as Interface even though they may go about conducting their businesses somewhat differently. Ultimately, their goal and purpose is similar to Interface as we are all working for the greater good of our planet.



The Industry will welcome future graduates. Positions will be created to begin sustainable development programs: such as social responsibility, employee wellness programs, consumer awareness and in-house learning programs. In addition, there will be opportunities in innovative product design and development, in-sourcing, marketing, planning, implementation and much more.

“Is this enough?”

That is the question we must keep asking.

“Is this enough?”, was also the question hovering over the workshop when Ray Anderson, chairman of Interface, in his keynote address, challenged FIDER leaders to consider their impact on the planet. Describing it as “the crisis of our times and perhaps all times to come,” Anderson talked about “the systematic destruction of the biosphere by you and me and our species.” He also offered a ray of hope.

Doing well by doing good

“Industrial ecology tells us the industrial system, as it operates today, simply cannot go on and on and on, taking, making, wasting—abusing the web of life,” Anderson said. His company was challenged by customers to consider the environmental impact of manufacturing carpet. For the past 10 years, Interface has been responding with a plan with seven objectives: waste elimination, benign emissions, renewable energy, closed loop material flows, resource efficient transportation, sensitizing employees, customers, suppliers and communities, and reinventing commerce (Hamon-Vaughn, 2004). To view the Interface Model, see figures 1 and 2 (Interface, Inc., 2004).

Anderson reported that, “**Sustainability** has been unbelievably good for business” and suggested that other companies and industries must transform in order to

survive (Hamon-Vaughn, 2004). His passionate commitment to **sustainability** encouraged Foundation for Interior Design Education Research leaders to consider their own roles, both as individual interior designers and as people with influence in the education of future interior designers.

Conclusion

There are currently two major types of industries which are working towards sustainable textile product development. The smaller businesses, under 50 employees where **sustainability** means "business as usual" and the mammoth corporations who have transformed themselves into learning organizations working in a more sustainable manner each new day of business.

Rarely does a single act alter the course of history. However, companies in connection with schools and educators will be the visionaries for sustainable product development. As a researcher and teacher, I personally look forward to these historic changes.

Future Research

This researcher is currently working together with Barbara Fillippone of EnviroTextiles, exploring the antimicrobial properties of alternative plant fibers and a "Sustainable/Biodegradable Products"™ Rating system.

References

- American Manufacturing Trade Action Coalition (AMTAC), (July, 2004). *Textile CEOs demand action on China at Washington unity event*. Retrieved April 28, 2005, from <http://www.amtacdc.org/media/040721.asp>
- Anderson, Ray C. (1998). *Mid-course correction, toward a sustainable enterprise: The interface model*. Chelsea Green Publishing: White River Junction, VT.
- Anonymous (1997). *Market analysis for hemp fiber as a feed stock for papermaking*. Retrieved April 28, 2005, from <http://www.gametec.com/hemp/mktanalysis.html>
- Answers Corporation (1999-2005). *AnswerNotes information*. Retrieved January 12, 2005 from <http://www.answers.com/library/AnswerNotes-cid-733382259>
- Armstrong-Carroll, E., Pastore, C. M., Dougherty, C., & Pierce, J. (2001). *Textile teaching & learning initiative: Educating the educators*. First presented as part of the National Textile Center (NTC), October 2001 NTC Annual Report. Retrieved April 29, 2005 from <http://fibers.philau.edu/ntc/I99P01/index2.html>
- Calder, Wynn and Clugston, Richard M. (John C. Dernbach ed., 2003). *Stumbling toward sustainability, Progress toward sustainability in higher education*. Environmental Law Institute®, Washington, DC. Retrieved September 24, 2005 from http://www.ulsf.org/pdf/dernbach_chapter_short.pdf
- Chepesiuk, Ron (April, 2005). *Hemp industry poised for a comeback*. Vermont Guardian, Friday, April 22, 2005. Retrieved April 29, 2005 from <http://www.vermontguardian.com/national/0904/Hemp.shtml>



- China Bambro Textile Co., Ltd. (2003). *Patented technology of bamboo fiber*.
Retrieved October 24, 2005 from
http://www.bambrotex.com/second/bamboocenter_patented.htm
- Columbia University Press (2003). *The Columbia electronic encyclopedia, sixth edition*. Columbia University Press.
- Csrnetwork (2006). *What is CSR?* Retrieved January 12, 2006 from
<http://www.csrnetwork.com/csr.asp>
- Department of Agriculture (1865), (Isaac Newton, ed.). *Letter of the Commissioner of Agriculture. Department of Agriculture: Washington, D. C.*
- Edwards, Harry T. (1945), (Smithsonian, ed.). *The introduction of Abaca' (Manila Hemp) into the western hemisphere*. Prepared as part of the 1945 Smithsonian Report.
- Emert, Carol (February, 1999). Levi's to slash U.S. plants competitors' foreign-made jeans blamed. San Francisco Chronicle, Tuesday, February 23, 1999.
Retrieved April 29, 2005 from <http://sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/1999/02/23/MN94000.DTL>
- Geiser, Kenneth (2001). *Materials matter: Towards a sustainable materials policy*. The MIT Press, Massachusetts Institute of Technology: Cambridge, MA.
- Harmon-Vaughan, Beth (August, 2004). *Sustainable design + students: The Foundation for Interior Design Education Research (FIDER) Board takes a close look at sustainability as an important element of undergraduate education*. Retrieved from Interior Sources Magazine September 26, 2005 from <http://www.isdesignet.com/Magazine/2004/aug/fider.html>
- Hawken, Paul (1993). *The ecology of commerce: A declaration of sustainability*. HarperCollins Publishers, Inc.: New York, NY.

- Hawken, Paul; Lovins, Amory and Lovins, L. Hunter (1999). *Natural capitalism: Creating the next industrial revolution*. Back Bay Books / Little, Brown and Company: New York, NY.
- House Committee on Agriculture (n.d.). *Committee history*. Retrieved on October 16, 2005 from House Committee on Agriculture website at <http://agriculture.house.gov/inside/hist.html>
- Houghton Mifflin Company (2004). *The American Heritage® dictionary of the English language, Fourth Edition*. Published by Houghton Mifflin Company.
- Hund, Andrew (1999). *Monsanto: Visionary or architect of bioserfdom? A global socio-economic examination of genetically modified organisms*. Graduate Student of Sociology at Humboldt State University Retrieved September 15, 2005 from <http://www.organicconsumers.org/Monsanto/bioserf.cfm>
- Imada, K. (n.d.). *Dyeing of polylactic acid (PLA) fiber*. Retrieved January 7, 2005 from <http://textileinfo.com/en/tech/imada/bunnsann/page06.html>
- Interface, Inc. (2004). *Interface sustainability: The Interface model*. Retrieved January 7, 2005 from <http://www.interfacesustainability.com/model.html>
- Internet Modern History Sourcebook (1999), (Paul Halsall, ed.). *The industrial revolution*. Retrieved on October 10, 2005 from the Internet Modern History Sourcebook website at <http://www.fordham.edu/halsall/mod/modsbook14.html#The%20Industrial%20Revolution>
- Jenkins, Heather (1997). *Dr. Bronner's All-One-God-Faith: A soap messenger success story and the marketing that wasn't*. Retrieved from Dr. Bronner's Magic Soaps website on September 24, 2005 from <http://www.drbronner.com/story.html>



- Laslo, Chris (2003). *The sustainable company*. Island Press: Washington, DC.
- Marcus, David (n.d.). *Commercial hemp cultivation in Canada "an economic justification."* Independent Study Submitted to: Prof. Dave Shaw and Prof. Al Mikalachki, Masters of Business Administration, Ivey Business School, University of Western Ontario
- McDonough, William and Braungart, Michael (2002). *Cradle to cradle: Remaking the way we make things*. North Point Press: New York, NY.
- McDonough, William and Braungart, Michael (2002). *Transforming the textile industry/ Victor Innovatex, eco-intelligent polyester and the next industrial revolution, green@work. May-June 2002*. Retrieved September 14, 2005 from the William A. McDonough website at http://www.mcdonough.com/writings/transforming_textile.htm#
- Merfield, Charles (November 1999). *Industrial hemp and its potential for New Zealand: A report for the 1999 Kellogg rural leadership course*. Retrieved April 29, 2005 from <http://www.merfield.com/research/hemp/hemp.pdf>
- Milani, Brian (2001). *Beyond environmental protection: Ecological alternatives & education for a green revolution*. Paper Submitted to Multiple Currents: Conference on Transformative Learning, Nov. 2001, Ontario Institute for Studies in Education University of Toronto (OISE-UT). Retrieved April 29, 2005 from <http://www.greeneconomics.net/EnvironEducation.html>
- National Agricultural Library (NAL), (2003). *Abraham Lincoln and agriculture*. Retrieved October 16, 2005 at <http://www.nal.usda.gov/speccoll/exhibits/lincoln/>
- National Research Council (NRC), Canada (December, 2004). *This bud's for you! NRC works to improve hemp textile technology*. National Research Council Canada



- Science & Tech Innovations. Retrieved May 2, 2005 from http://www.nrc-cnrc.gc.ca/education/sti-inno_hemp_e.html
- Nattrass, Brian and Altomare, Mary (1999). *The Natural Step for business: Wealth, ecology and the evolutionary corporation*. New Society Publishers: Gabriola Island, British Columbia, Canada.
- Nebel, K. M. (1995). *New processing strategies for hemp*, Journal of the International Hemp Association 2(1): 1, 6-9. Retrieved April 29, 2005 from <http://www.druglibrary.org/olsen/hemp/iha/iha02101.html>
- Nelson, Peter A. (Fall, 1999). *State hemp legislation updates: Individual state action in relation to the development of a United States industrial hemp industry*, Agro-Tech Communications: Memphis, TN. Retrieved April 29, 2005 from http://www.naihc.org/hemp_policy/state_updates_oct99.html
- Nelson, Peter A. (2001). *Connecting the kenaf industry: Network for marketing, communication and outreach*. Conference proceedings from the fourth annual American Kenaf Society Conference: Atlanta, GA.
- Nelson, Peter and Hopkins, Peter (Summer, 2000). *A pioneer in green design's latest fabric: The William McDonough Collection II closes the loop*, Fiber Ethics.
- Patagonia, Inc. (2005). *Patagonia: A company history and evolution of clothing and design*. Retrieved September 7, 2005 from http://www.patagonia.com/culture/patagonia_history.shtml
- Public Broadcasting Service (PBS) (n.d.). *Store wars: Wal-Mart business practices* Retrieved January 7, 2005 from <http://www.pbs.org/itvs/storewars/stores3.html>

Rawson, Jean M. (January, 2005). *Hemp as an agricultural commodity*.

Congressional Research Service Report. Retrieved May 2, 2005 from

http://www.votehemp.com/PDF/CRS_Hemp_Report.pdf

ReclaimDemocracy.org (2005). *ReclaimDemocracy.org: Restoring citizen authority over corporations, About us*. Retrieved August 29, 2005 from the

ReclaimDemocracy.org website at

http://reclaimdemocracy.org/about_us.html.

Rivoli, Pietra (2005). *The travels of a T-shirt in the global economy: An economist examines the markets, power, and politics of world trade*. John Wiley & Sons, Inc.: Hoboken, New Jersey.

Rowledge, L.R., Barton R. S. and Brady, K. S. in collaboration with James A. Fava, Cynthia L. Figge, Konrad Saur and Steven B. Young (1999). *Mapping the journey: Case studies in strategy and action toward sustainable development*.

Greenleaf Publishing Limited: Sheffield, U.K.

Schulich School of Business at York University (n.d.). *Graduate program*

specializations. Retrieved April 29, 2005 from

<http://www.schulich.yorku.ca/ssb-extra/mba.nsf/0/cc25ca28825ea24a05256b10006e9bfb?OpenDocument>

Senge, Peter (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Currency and Doubleday.

Senge, Peter, et. al. (1994). *The fifth discipline fieldbook: Strategies and tools for building a learning organization*. New York: Doubleday.

Shurtleff, William and Aoyagi, Akiko (2004). *The United States department of agriculture and state agricultural experiment stations: Work with soy, A special exhibit - The history of soy pioneers around the world* - Unpublished

- Manuscript. ©Copyright 2004 Soyfoods Center. Retrieved October 16, 2005 from <http://www.thesoydailyclub.com/SFC/USDA61a.asp>
- Small, E. & Marcus, D. (2002). Hemp: A new crop with new uses for North America. Reprinted from: Trends in new crops and new uses. J. Janick and A. Whipkey (eds.). ASHS Press, Alexandria, VA.
<http://www.hort.purdue.edu/newcrop/ncnu02/pdf/small.pdf>
- The American Heritage® Dictionary of the English Language, Fourth Edition Copyright © 2004, 2000 by [Houghton Mifflin Company](#). Published by Houghton Mifflin Company. All rights reserved. Retrieved July 29, 2005 from <http://www.answers.com/>
- The Columbia Electronic Encyclopedia, Sixth Edition Copyright © 2003, Columbia University Press. Licensed from Columbia University Press. All rights reserved. Retrieved July 29, 2005 from <http://www.answers.com/>
- The State of Queensland (Environmental Protection Agency) 2005. *The business sustainability roadmap*©. Retrieved July 29, 2005 from http://www.epa.qld.gov.au/publications/p00771aa.pdf/The_business_sustainability_roadmap.pdf
- The Open Door Web Site (2005), (© The Open Door Team, ed.). Brief history of the cotton industry. Retrieved on October 10, 2005 from The Open Door Web Site at <http://www.saburchill.com/history/chapters/IR/014.html>
- Thompson, E. C., Berger, M. C., & Allen, S. N. (July 1998). *Potential economic impact of industrial hemp in Kentucky*. *Foresight*, Vol. 5, No. 4. Center for Business and Economic Research, University of Kentucky. Retrieved April 29, 2005 from http://www.kltprc.net/foresight/Chpt_20.htm



- Tran, Khanh T.L. (2004). Designers Go Green with Sustainable Fabric appeared in *Apparel news*, Friday, December 3, 2004. Retrieved September 20, 2005 from <http://www.bambooclothes.com/.sc/ms/ch/1126896964946509/9/nc/ee/khanh>
- USDA (January 2000). *Industrial hemp in the United States: Status and market potential*. Retrieved April 29, 2005 from <http://www.ers.usda.gov/publications/ages001E/ages001E.pdf>
- Vision Paper (2003). *About the kenaf plant*. Retrieved July 29, 2005 from <http://www.visionpaper.com/kenaf2.html>
- Vote Hemp (2005). *Vote Hemp: Political: Legislation*. Retrieved January 7, 2005 from <http://www.votehemp.com/legislation.html>
- Walker, Cameron (2005). Bamboo Boom featured in *Outside magazine*, March 2005. Retrieved September 20, 2005 from <http://www.bambooclothes.com/.sc/ms/ch/1126896964946509/9/nc/ee/bambooboom0305>
- Wikipedia, (n.d.). *Answers.com fast facts*. Retrieved September 28, 2005, from Answers.com Web site: <http://www.answers.com/>
- Wolnik, Chris (n.d.). *Cleaner production in environmental management systems survey*. Retrieved July 12, 2005 from http://www.c2p2online.com/main.php3?section=164&doc_id=538
- Wynne, George; Maharaj, Dhiraj and Buckley, Chris (2001) *Cleaner production in the textile industry – Lessons from the Danish experience*. South African Dyers and Finishers Association, Natal Branch 2Pollution Research Group, School of Chemical Engineering, University of Natal, Durban, 4041. Retrieved July 29,

2005 from

http://www.nu.ac.za/cleanerproduction/pdfs/Paper_Natcon_final.pdf

Appendix A

THE VALUE OF TEACHING SUSTAINABILITY

Hello and thank you for deciding to participate:

The following is a questionnaire developed as part of the research I am conducting on Sustainability and the Textile Industry for my Masters Inquiry Project at National-Louis University. The preliminary research compels me to seek your experience and opinions to help determine the viability of offering such a related college course in the Textile Development and Marketing Department at the Fashion Institute of Technology. The compilation and analysis of the results will help determine the best approach to pursue in developing the actual course if warranted.

In this process, approximately 40 people representing different sectors of the textile industry, other fiber and textile related industries and experts in various areas of sustainable development will participate by answering 30 questions pertaining to sustainable development and its relation to the textile industry. It will take approximately 20-30 minutes to complete the questionnaire.

Your participation in this study is completely voluntary. If you feel uncomfortable answering any questions, please go on to the next question. It is very important for the success of this project to gather as much information as possible concerning current industry practices as well as to learn your opinions for the future.

Your survey responses will be confidential and data from this research will be reported only in the aggregate. Your personal information will remain confidential. If you have questions at any time about the survey or the procedures, you may contact me at 631-650-4875 or by email at the email address specified below.

Thank you very much for your time and support.

Sincerely,

Georgia Kalivas

PART I : CURRENT INDUSTRY PRACTICES

Section A: Company Profile

1. Please fill in the following information about your company.

Type of Business

Annual Revenue

Number of employees at facility

2. Do the responses to this questionnaire reflect (Select one option):

- The whole of a company or organization (group wide).
- A division of a larger group containing several organizations.
- An organization which is part of a larger group.
- A department within an organization.
- My expert view point as a practitioner, i.e. consultant, auditor, standardization employee, certification body, etc.
- The views of an industrial sector or a group of organizations, i.e. as an industry association, etc.
- Views as a stakeholder of organizations with standards, i.e. NGO, government department, regulator, public organization, etc.
- Views as a researcher with experience in this area, i.e. academic, think tank, etc.
- Other

3. How would you, in general, classify your main production activity? (Multiple answers are possible)

- Production of inputs
- Production of intermediate goods
- Production of end products
- Not applicable
- Other



Section B: Corporate Social Responsibility (CSR)

Corporate social responsibility (CSR) entails how businesses align their values and behavior with the expectations and needs of stakeholders. This means not just customers and investors, but also employees, suppliers, communities, regulators, special interest groups and society as a whole. CSR describes a company's commitment to be accountable to its stakeholders.

4. Which one is the closest to your company's way of thinking about the relationship between company activities and environmental activities? (Check one box.)

- It brings a big chance of environmental business
- Environmental consideration is one of social commitments
- Keeping regulations is enough, because environmental activities do not contribute to business results
- It is a big factor that affects business outcome
- It is incorporated into business activities as one of our most important strategies

5. What are your suggestions for integrating more social concerns into your management system?

Section C: Environmental Management

Environmental Management System (EMS): That part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy (United Nations Environmental Program, 2001).

6. What type of Environmental Management System (EMS) does your company use?

- Do not use an Environmental Management System
- Informal
- Registered by a 3rd party to a standard (i.e. ISO14001)
- Industry standard
- Self declared to a standard
- Other



7. What has or could cause your organization to explore environmental management systems? (Please mark all those that are relevant)

- Pressure from those you supply to
- Social responsibility
- Peer organizations/association
- Economic interests
- Marketing interests
- Risk Management concerns
- Environmental concerns
- Other

Section D: Cleaner Production Activities

Cleaner Production(CP): The continuous application of an integrated, preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment (United Nations Environmental Program (UNEP), 2001).

8. Does your facility take or have they taken any of the following actions:

Not considering it	Planning to consider it	Considering it currently	Carrying out to some degree	Carrying it out fully
-----------------------	----------------------------	-----------------------------	-----------------------------------	--------------------------

- a) Integration of environmental considerations into purchasing practices
- b) Integration of environmental considerations into inventory management systems
- c) Use good housekeeping practices to minimize wastes?
- d) Change production schedules to minimize equipment and feedstock changeovers?
- e) Segregate by-products at source (i.e. cotton seed)?
- f) Training staff in materials handling & clean production?
- g) Replacing polluting materials used in production with non-polluting or less polluting materials and feedstock?
- h) Introduced new technologies or approaches to existing operating systems, processes or practices to reduce pollutants generated and materials, energy or water wasted?
- i) Does your organization integrate environmental criteria into the usual design considerations of performance, cost, quality etc.?
- j) Does your organization use methods to prevent pollution over the entire life cycle of the product/service?



Section E: Barriers and Benefits

9. The following factors were identified as barriers to implementing cleaner production and environmental management actions. Please rate their importance.

Very important	Moderately important	Somewhat important	Low importance	Not important
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- a) Lack of management support
- b) Lack of information on available tools/instruments
- c) Lack of skilled human resources
- d) Too costly
- e) Lack of financial resources
- f) Difficult to organize
- g) Lack of clear regulations
- h) No regulatory incentives (such as deregulation, etc.)
- i) No legal requirements
- j) No technological solutions available
- k) Lack of willingness to cooperate from suppliers
- l) Lack of willingness to cooperate from buyers
- m) Lack of willingness to cooperate within our sector
- n) No market demand for green product
- o) No competitive advantage

10. Through initiating **cleaner production** and/or environmental management activities, in what ways has your facility improved? Please mark all those that are relevant.

- Increased productivity or throughput
- Reduced cost
- Improved employee efficiency
- Reduced lost work days
- Improved employees' environmental awareness
- Enhanced company's image
- Improved relationship with regulators
- Improved relationship with insurers and/or financial institutions
- No improvement
- No actions taken
- Other



Section F: Sustainability and Other Initiatives

Sustainability is an economic, social, and environmental concept. It is intended to be a means of configuring civilization and human activity so that society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely. Sustainability affects every level of organization, from the local neighborhood to the entire planet. It is sometimes a controversial topic. Sustainable development means different things to different people, but the most frequently quoted definition is from the report Our Common Future (also known as the Brundtland Report): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

11. LIFE CYCLE ASSESSMENT (LCA): A technique for assessing the potential environmental impacts of a product by examining all the material and energy inputs and outputs at each life cycle stage.

Has your company conducted a LCA (Life Cycle Assessment) study on your products? (Check one box.)

- Yes, and disclosing the study results
- Yes, but have not disclosed yet
- In planning stage
- Interested in LCA, and collecting information on it
- Interested in LCA, but have not taken any activities
- Do not know because do not understand LCA well
- Have no products to be evaluated by LCA
- Other

12. Does your organization undertake any environmental and/or **sustainability** reporting to address stakeholder interests?

- Yes
- No
- Other



13. Does your organization track any of the following indicators? (Please mark all those that are relevant)

- Conservation of resources
- Protection of natural environment i.e.) air and water quality, waste generation
- Alternative measures of economic viability i.e.) corporate image, innovation potential
- Community development i.e.) community partnerships, job creation
- Workers health & safety
- Integration of **sustainability** into product development process
- Other

14. **Sustainability** related to environmental management:

Check as many of those statements below that your facility is carrying out to some degree or carrying out fully. Our organization:

- Reduces energy use per unit of production and is switching to more renewable energy
- Increases the efficiency of resource use
- Focuses on the social and equity aspects of environmental **sustainability** for workers and external stakeholders
- Acknowledges **sustainability** issues throughout the supply chain of our products
- Bears in mind the fundamental redesign of our organization to achieve more sustainable results throughout our processes, products and services
- Creates an environment where internal and external stakeholders are moving toward a greater commitment to **sustainability** practices
- Places **sustainability** impacts high in priority among our objectives and targets
- Incorporates employee training and development in the context of the environment
- Other

15. Products and services contributing to **sustainability**:

Please provide details of how your products or services contribute to solving environmental problems and achieving sustainable development.



16. What are your recommendations for pushing more organizations within the textile industry to move toward **sustainability**?

17. Below are twelve statements with regard to sustainable development. Please specify your personal opinion:

Fully Agree Neutral Disagree Fully
agree disagree

- Before this survey, I had never heard of sustainable development.
- In our company, sustainable development is a well-understood concept.
- Sustainable development runs against our business strategy.
- Environmental management is more important for us than sustainable development.
- We have employees dealing with sustainable development on a daily basis.
- Sustainable development is part of our business strategy.
- We actively engage outside stakeholders in the development of our business strategy.
- It is not our company's task to promote sustainable development
- We use ethical or moral considerations in our marketing strategy
- In our company, social and ecological issues are dealt with in an integrative way.
- We need more regulatory guidance on how to implement sustainable development in our company.
- We are aware of our social responsibility.

18. Please state what "sustainable development" means in your company:



PART II: EDUCATING FOR SUSTAINABILITY

This second part of the survey contains questions about what knowledge and skills students graduating from college should possess if they are interested in implementing sustainability in the textile industry.

Section A: Knowledge Needed

19. Companies working in the textile and related industries need to (Please rate the importance of the following choices):

Very highly important	Highly important	Moderately important	Somewhat important	Not important
--------------------------	---------------------	-------------------------	-----------------------	------------------

- Make an analysis of each aspect of Textile Manufacturing and what it stands to gain from commitment to sustainable development policies.
- To understand what Environmental Management Systems (EMS) are and how to develop and/or choose one and implement it.
- To understand what **Cleaner production** is and how, for manufacturing processes, it includes: Conserving raw materials, water and energy plus, eliminating toxic raw materials and reducing wastes at source.
- To understand what **Cleaner production** means for products by reducing all the negative environmental impacts along the life cycle of the product, from raw material extraction through to end use and final disposal.
- To understand the benefits of material/product benchmarking when procuring raw materials and in product design.
- To be shown how environmental and social issues are company-wide responsibilities and how **Corporate Social Responsibility (CSR)** describes a company's commitment to be accountable to its stakeholders and integrate social benefit considerations.
- To understand the environmental issues in textile wet processing which consume dyes, auxiliaries, chemicals, detergents and finishing agents in the conversion of raw materials to finished product and the emissions from the textile industry that take the form of liquid effluents, wet fabric/fiber wastes from dye processes, solid wastes from the dry processes, hazardous wastes and air emissions.
- An understanding of life cycle assessment which studies the environmental aspects and potential impacts throughout the product life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal.



- Introduce ways of making improvements towards a more efficient and cleaner textile industry that help to reduce production costs, increase efficiency and productivity, improve quality and environmental performance to meet the standards of export markets.

20. What new knowledge must textile students acquire? (Please rate each of the following by level of importance)

Very highly important	Highly important	Moderately important	Somewhat important	Not important
--------------------------	---------------------	-------------------------	-----------------------	------------------

- The concept of **eco-efficiency** in the textile industry and how it relates to both economics and ecology.
- "Best Available Technologies" (BAT) to make the entire textile chain safe, environmentally and healthwise.
- Learning how recent advancements in manufactured cellulosic fiber technology (i.e. PLA) using bio-based alternatives rather than petroleum-based feedstock (raw materials).
- Innovative industrial uses for textile fibers in geotextiles, the automotive industry and building construction materials.

- Using everything from **organic farming** to Nanotechnology for sustainable development.
- Understanding the principles for **sustainability**-oriented textile products.

- How to differentiate between **sustainability**-oriented products and other textile products.
- Identifying new markets for **sustainability**-oriented textile products.

- A basic roadmap for achieving **sustainability** in the textile industry: from compliance to **eco-efficiency** to **sustainability**.

- An understanding of the human impact issues: cultural issues, environmental **sustainability**, ethics, gender issues, historical issues, motivation, and quality.
- Develop awareness of appropriate technology concepts that involve environmental, cultural, ethical, gender, energy issues.

- Awareness of the difference that corporations with well-integrated sustainable development policies are making in their products and profits plus, the demonstrable effects they have in altering the lives of people and the environment both locally and globally.

21. What are your suggestions for additional knowledge that corporations and textile students should acquire to move towards sustainable development in the textile industry?



Section B: Employee Work Skills

22. Please rate how satisfied you are with the work skills of your recent new hires:

Very Highly Satisfied	Highly Satisfied	Moderately Satisfied	Somewhat Satisfied	Barely Satisfied	Not Satisfied
--------------------------	---------------------	-------------------------	-----------------------	---------------------	------------------

- Problem-Solving
- Interpersonal Skills
- Decision Making & Analytical Ability
- Creative Thinking
- Leadership
- Oral Communication
- Ability to Work in Teams
- Self-Directed Learning
- Written Communication
- Time Management
- Computer Proficiency

23. Please rate the following work skills, according to their level of necessity, in working towards sustainable development in the textile industry?

Very highly necessary	Highly necessary	Moderately necessary	Somewhat necessary	Unnecessary
--------------------------	---------------------	-------------------------	-----------------------	-------------

- Motivational
- Diplomacy
- Facilitating group discussion

- Research
- Organizational
- Initiating new ideas
- Promoting change
- Implementing decisions
- Enlisting help
- Accepting responsibility
- Critical thinking
- Ability to use logical and rational argument to persuade and negotiate with others



24. What other work skills would you suggest are necessary, if being considered for a position leading to sustainable development in the textile industry?

Section C: Characteristics Needed

25. Please rate the following characteristics according to their level of desirability in new employees.

Very highly desirable	Highly desirable	Moderately desirable	Somewhat desirable	No desire desirable
--------------------------	---------------------	-------------------------	-----------------------	------------------------

- Integrity
- Perseverance
- Inquisitive
- Sensitivity
- Values diversity
- Rises to new challenges
- Willing to take the initiative
- Passionate
- Commitment

26. What other desirable characteristics would you look for in graduating textile students, who plan to work towards sustainable development in the textile industry?



Appendix B

THE VALUE OF TEACHING SUSTAINABILITY IN INDUSTRY

What good is the greatest teacher if there is no one to teach? Or no need to learn? That is why it is so important to discover what is happening now in the real world regarding **sustainability** in industry. It is also why the results of this survey must include other industries besides textiles, as well as those in and affiliated with the textile industry.

The following is a revised questionnaire developed as part of the research I am conducting on **Sustainability** and how to relate it to the Textile Industry, for my Masters Inquiry Project at National-Louis University. The preliminary research compels me to seek your experience and opinions to help determine the viability of offering such a related college course in the Textile Development and Marketing Department at the Fashion Institute of Technology or as part of another industry related program. The compilation and analysis of the results will help determine the best approach to pursue in developing the actual course if warranted.

In this process, approximately 40 people representing different sectors of industry, as well as fiber and textile related industries and experts in various areas of sustainable development will participate by answering 25 multiple choice questions pertaining to sustainable development and how it can be related to current industry practices, including the textile industry. It will take approximately 10 minutes to complete the questionnaire.

Instead of spending too much time thinking about your answers, it will be interesting to see just how effective and accurate your first insights are. So unless you know an answer can be looked up elsewhere, answer only those questions that you can easily and quickly respond to.

By using the Back and Forward arrows on your browser toolbar, you may go back and forth through the survey without losing your previous answers. Then, if you use the continue button at the bottom of the page it will take you back to where you left off or you may be asked whether you would like to start over or from where you left off.



If you find that you must stop midway through, then the next time you open the survey you will be where you left off. The only drawback with this way is that you cannot view your previous answers.

Your participation in this study is completely voluntary. If you feel uncomfortable answering any questions, please go on to the next question. It is very important for the success of this project to gather as much information as possible concerning current industry practices as well as to learn your opinions for the future.

How best can we provide students with the skills and wisdom to become future leaders? So far, every one of the 12 received responses pointed out leadership skills as vital.

Your one voice will make a big difference in this research. It can definitely change the results of the findings but, without it we will never know.

Your survey responses will be confidential and data from this research will be reported only in the aggregate. Your personal information will remain confidential. If you have questions at any time about the survey or the procedures, you may contact me at 631-650-4875 or by email at the email address specified below.

If this online survey method is not comfortable for you, in a separate e-mail I will be happy to send you a copy of the survey that you may view and print out offline and mail back to me.

Thank you very much for your time and support.

Sincerely,

Georgia Kalivas

Please start with the survey now by clicking on the **Continue** button below.



PART I : CURRENT INDUSTRY PRACTICES

Section A: Company Profile

1. Do the responses to this questionnaire reflect (Select one option):
 - The whole of a company or organization (group wide).
 - A division of a larger group containing several organizations.
 - An organization which is part of a larger group.
 - A department within an organization.
 - My expert view point as a practitioner, i.e. consultant, auditor, standardization employee, certification body, etc.
 - The views of an industrial sector or a group of organizations, i.e. as an industry association, etc.
 - Views as a stakeholder of organizations with standards, i.e. NGO, government department, regulator, public organization, etc.
 - Views as a researcher with experience in this area, i.e. academic, think tank, etc.

2. The number of employees in your organization:
 - 1
 - 2 - 50
 - 51 - 150
 - 151 - 500
 - 501 - 1000
 - over 1000

3. How would you; in general, classify your main production activity? (Multiple answers are possible)
 - Production of inputs
 - Production of intermediate goods
 - Production of end products
 - Not applicable



Section B: Corporate Social Responsibility (CSR)

Corporate social responsibility (CSR) entails how businesses align their values and behavior with the expectations and needs of stakeholders. This means not just customers and investors, but also employees, suppliers, communities, regulators, special interest groups and society as a whole. CSR describes a company's commitment to be accountable to its stakeholders.

4. Is CSR a new concept to you?

- Yes
- No

5. Which one is the closest to your company's way of thinking about the relationship between company's activities and environmental activities? (Check one box.)

- It brings a big chance of environmental business
- Environmental consideration is one of social commitments
- Keeping regulations is enough, because environmental activities do not contribute to business results
- It is a big factor that affects business outcome
- It is incorporated into business activities as one of our most important strategies

6. Are social concerns being integrated into your management system in regard to:

Not considering it	Planning to consider it	Considering it currently	Carrying out to some degree	Carrying it out fully
--------------------------	----------------------------	-----------------------------	-----------------------------------	--------------------------

- Customers
- Investors
- Company employees
- Suppliers
- Local community
- Regulators
- Special interest groups
- Society as a whole



Section C: Environmental Management

Environmental Management System (EMS): That part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy (United Nations Environmental Program, 2001).

7. What has or could cause your organization to explore environmental management systems? (Please mark all those that are relevant)

- Pressure from those you supply to
- Social responsibility
- Peer organizations/association
- Economic interests
- Marketing interests
- Risk Management concerns
- Environmental concerns

Section D: Cleaner Production Activities

Cleaner Production(CP): The continuous application of an integrated, preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment (United Nations Environmental Program (UNEP), 2001).

8. Does your facility take or have they taken any of the following actions?

Not Applicable	Not considering it	Planning to consider it	Considering it currently	Carrying out to some degree	Carrying it out fully
-------------------	--------------------------	----------------------------	-----------------------------	-----------------------------------	--------------------------

- a) Integration of environmental considerations into purchasing practices
- b) Integration of environmental considerations into inventory management systems
- c) Use good housekeeping practices to minimize wastes?
- d) Change production schedules to minimize equipment and feedstock changeovers?
- e) Segregate by-products at source (i.e. cotton seed)?
- f) Training staff in materials handling & clean production?
- g) Replacing polluting materials used in production with non-polluting or less polluting materials and feedstock?
- h) Introduced new technologies or approaches to existing operating systems, processes or practices to reduce pollutants generated and materials, energy or water wasted?



- i) Does your organization integrate environmental criteria into the usual design considerations of performance, cost, quality etc.?
- j) Does your organization use methods to prevent pollution over the entire life cycle of the product/service?

Section E: Barriers and Benefits

9. The following factors were identified as barriers to implementing **cleaner production** and environmental management actions. Please rate their importance.

Very important	Moderately important	Somewhat important	Low importance	Not important
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- a) Lack of management support
- b) Lack of information on available tools/instruments
- c) Lack of skilled human resources
- d) Too costly
- e) Lack of financial resources
- f) Difficult to organize
- g) Lack of clear regulations
- h) No regulatory incentives (such as deregulation, etc.)
- i) No legal requirements
- j) No technological solutions available
- k) Lack of willingness to cooperate from suppliers
- l) Lack of willingness to cooperate from buyers
- m) Lack of willingness to cooperate within our sector
- n) No market demand for green product
- o) No competitive advantage

10. Through initiating **cleaner production** and/or environmental management activities, in what ways has your facility improved? (Please mark all those that are relevant)

- Increased productivity or throughput
- Reduced cost
- Improved employee efficiency
- Reduced lost work days
- Improved employees' environmental awareness
- Enhanced company's image
- Improved relationship with regulators
- Improved relationship with insurers and/or financial institutions
- No improvement
- No action taken



Section F: Sustainability and Other Initiatives

Sustainability is an economic, social, and environmental concept. It is intended to be a means of configuring civilization and human activity so that society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely. Sustainability affects every level of organization, from the local neighborhood to the entire planet. It is sometimes a controversial topic. Sustainable development means different things to different people, but the most frequently quoted definition is from the report Our Common Future (also known as the Brundtland Report): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

11. LIFE CYCLE ASSESSMENT (LCA): A technique for assessing the potential environmental impacts of a product by examining all the material and energy inputs and outputs at each life cycle stage. Has your company conducted a LCA (Life Cycle Assessment) study on your products? (Check one box.)

- Yes, and disclosing the study results
- Yes, but have not disclosed yet
- In planning stage
- Interested in LCA, and collecting information on it
- Interested in LCA, but have not taken any activities
- Do not know because do not understand LCA well
- Have no products to be evaluated by LCA

12. Does your organization undertake any environmental and/or **sustainability** reporting to address stakeholder interests?

- Yes
- No

13. Does your organization track any of the following indicators? (Please mark all those that are relevant)

- Conservation of resources
- Protection of natural environment i.e.) air and water quality, waste generation
- Alternative measures of economic viability i.e.) corporate image, innovation potential
- Community development i.e.) community partnerships, job creation
- Workers health & safety
- Integration of **sustainability** into product development process



14. **Sustainability** related to environmental management:

Check as many of those statements below that your facility is carrying out to some degree or carrying out fully. Our organization:

- Reduces energy use per unit of production and is switching to more renewable energy
- Increases the efficiency of resource use
- Focuses on the social and equity aspects of environmental **sustainability** for workers and external stakeholders
- Acknowledges **sustainability** issues throughout the supply chain of our products
- Bears in mind the fundamental redesign of our organization to achieve more sustainable results throughout our processes, products and services
- Creates an environment where internal and external stakeholders are moving toward a greater commitment to **sustainability** practices
- Places sustainability impacts high in priority among our objectives and targets
- Incorporates employee training and development in the context of the environment

15. What percentage of your products and services contribute to **sustainability**?

- 0 - 5%
- 6% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

16. Below are twelve statements with regard to sustainable development. Please specify your personal opinion:

Fully agree	Agree	Neutral	Disagree	Fully disagree
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- Before this survey, I had never heard of sustainable development.
- In our company, sustainable development is a well-understood concept.
- Sustainable development runs against our business strategy.
- Environmental management is more important for us than sustainable development.
- We have employees dealing with sustainable development on a daily basis.
- Sustainable development is part of our business strategy.
- We actively engage outside stakeholders in the development of our business strategy.
- It is not our company's task to promote sustainable development
- We use ethical or moral considerations in our marketing strategy
- In our company, social and ecological issues are dealt with in an integrative way.



- We need more regulatory guidance on how to implement sustainable development in our company.
- We are aware of our social responsibility.

PART II: EDUCATING FOR SUSTAINABILITY

This second part of the survey contains questions about what knowledge and skills students graduating from college should possess if they are interested in implementing sustainability in the textile industry.

Section A: Knowledge Needed

17. Companies working on implementing **sustainability** into their company vision, mission and /or policies will need to (Please rate the importance of the following choices):

Very Highly Important	Highly Important	Moderately Important	Somewhat Important	Not Important
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- Know how to make an analysis of sustainable development.
- Know what companies stand to gain from commitment to sustainable development policies.
- Understand what Environmental Management Systems (EMS) are and how to develop and/or choose one and implement it.
- Understand what **Cleaner production** means for manufacturing processes.
- Understand what **Cleaner production** means for products by reducing all the negative environmental impacts along the life cycle of the product.
- Understand the benefits of material/product benchmarking when sourcing raw materials and in product design.
- Know how to redefine their company's commitment to be accountable to its stakeholders and integrate social benefit considerations.
- Understand the environmental issues in processing through to the finished product and the emissions given off.
- Understand life cycle assessment throughout a product's life from raw material acquisition through production, use and disposal.
- Learn how to make improvements that reduce production costs, increase efficiency and productivity, improve quality and environmental performance, plus meet the standards of export markets.



18. What new knowledge must textile students acquire? (Please rate each of the following by level of importance)

Very Highly Important	Highly Important	Moderately Important	Somewhat Important	Not Important
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- The concept of **eco-efficiency** in the textile industry and how it relates to both economics and ecology.
- “Best Available Technologies” (BAT) to make the entire textile chain safe, environmentally and healthwise.
- Learning how advancements (i.e. PLA) can be made using bio-based alternatives rather than nonrenewable resources.
- Innovative industrial uses for textile fibers in geotextiles, the automotive industry and building construction materials.
- Understanding the principles for **sustainability**-oriented textile products.
- How to differentiate between **sustainability**-oriented products and other textile products.
- Identifying new markets for **sustainability**-oriented textile products.
- Methodology for achieving **sustainability** in industry: from compliance to **eco-efficiency to sustainability**.
- The impact of human issues: cultural issues, environmental sustainability, ethics, gender issues, historical issues, motivation, and quality.
- How appropriate technology concepts involve environmental, cultural, ethical, gender and energy issues.
- How well-integrated **sustainable development** policies affect company products and profits plus, alter people’s lives and the environment, both locally and globally.

Section B: Employee Work Skills

19. Please rate how satisfied you are with your recent new hires' work skills:

Very Highly Satisfied	Highly Satisfied	Moderately Satisfied	Somewhat Satisfied	Barely Satisfied	Not Satisfied
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- Problem-Solving
- Interpersonal Skills
- Decision Making & Analytical Ability
- Creative Thinking
- Leadership
- Oral Communication
- Ability to Work in Teams
- Self-Directed Learning



- Written Communication
- Time Management
- Computer Proficiency

20. Please rate the following work skills, according to their level of necessity, in working towards **sustainable development** in the textile industry?

Very highly necessary	Highly necessary	Moderately necessary	Somewhat necessary	Unnecessary
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- Motivational
- Diplomacy
- Facilitating group discussion
- Research
- Organizational
- Initiating new ideas
- Promoting change
- Implementing decisions
- Enlisting help
- Accepting responsibility
- Critical thinking
- Ability to use logical and rational argument to persuade and negotiate with others

21. Are there any other work skills that you would suggest as necessary, if being considered for a position leading to **sustainable development** in the textile industry?

- No
- Yes

Section C: Characteristics Needed

22. Please rate the following characteristics according to their level of desirability in new employees.

Very highly desirable	Highly desirable	Moderately desirable	Somewhat desirable	No desire
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- Integrity
- Perseverance
- Inquisitive
- Sensitivity
- Values diversity
- Rises to new challenges
- Willing to take the initiative
- Passionate
- Commitment



Q23. Are there any other desirable characteristics that you would look for in graduating textile students, who plan to work towards **sustainable development** in the textile industry?

- No
- Yes

Section D: Future Outlook

24. Where do you envision inspired, graduating textile students, with an understanding of sustainability, being able to have an effect on the textile industry leading to the pathway of a sustainable materials system? Where the industry:

- | | Very
highly
likely | Highly
likely | Moderately
likely | Somewhat
likely | Unlikely |
|-----------------------|--------------------------|------------------|----------------------|--------------------|----------|
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25. Which of the following do you feel will be the driving force for future actions in the textile industry towards **sustainable development**? (Check all that apply)

- Cost savings
- Customer/client demand
- Risk management
- Activist group pressure
- Worker satisfaction
- Financial and/or strategic advantage
- Certification
- Competitive advantage
- Identity of CEO or brand of company
- Maintaining social license to operate
- Volume of materials reaching a cost-effective point
- Volume of demand
- Shift in national materials policy and investment in sustainable materials, products and services



Section E: Feedback

Are there any other comments or suggestions regarding either the topic of **sustainable development** or the use of this survey method to gather information?

Would you like a summary of the results from this research?

- Yes
- No

Would you or your organization be willing to partner in some way with textile students interested in acquiring experience to move towards **sustainable development** in the textile industry?

- Yes
- No
- Other

Your contact details: (Optional - will only be used for this project and will remain confidential)

Name

Position:

Name of company or organization:

Postal address:

Email address:

Telephone number:

Please contact georgia_kalivas@fitnyc.edu if you have any questions regarding this survey