

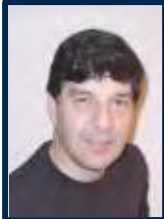
SUSTAIN THIS. SUSTAIN THIS! SUSTAIN THIS?

Industrial Ecology in the Context of a Business/Product Model

The International Society for Industrial Ecology, Inaugural Meeting,
The Science and Culture of Industrial Ecology, The Netherlands, November 12-14, 2001.



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George P. Nassos and John Paul Kusz are affiliated with the Stuart Graduate School of Business at the Illinois Institute of Technology. Stuart is recognized by the World Resources Institute's "Beyond Gray Pinstripes" report as a leader in developing curricula that combine business and environmental issues.

George, whose experience includes chemical engineering and environmental business management, directs the Environmental Management Program, a course of study that leads to a Master of Science in Environmental Management. George also teaches one of the program's capstone courses - "The Sustainable Enterprise".

JohnPaul, whose experience includes product design, development and environmental business management, teaches a required course - "Industrial Ecology". He is the Director of Stuart's Center for Sustainable Enterprise.

George and JohnPaul founded "The Center for Sustainable Enterprise" to explore, apply and test models of sustainability at the enterprise level with partners in government, industry and other stakeholder groups.

Changing Course (Courses) in Environmental Management

Today many corporations are faced with the issue of "sustainable development." A term first used by John Elkington in the early 1980s, "sustainable development" is a form of economic development that fairly balances economic growth with society's current and future needs and the environment. Although difficult to understand in the current economic model, the United Nations' World Commission on Environment and Development, also known as the Brundtland Commission, in 1987 adopted the concept of "sustainable development" as a worldwide goal. Based on the Brundtland Commission's recommendations, the UN set the year 2000 as the target date for achieving sustainable development throughout many of the world's major industries. Five years later The Business Council on Sustainable Development (BCSD) also forwarded the goal of "sustainable development" in its 1992 report "Changing Course." The goal of achieving sustainable development by the year 2000 may not have been achieved, but the course has been set.

As the title of this presentation suggests, the making of a sustainable enterprise is the agenda for many leading corporations and, as a consequence, their suppliers. However, getting to sustainability will not be the result of another program like the quality assurance, or management systems of earlier eras. Making an industry sustainable will require a strategic perspective that begins the process of integrating the three legs of sustainability (economic viability, environmental integrity and social equity) in corner offices, not on the factory floor or at the end of the pipe. The simple declaration "Sustain this." may be a challenge that pushes the limits of an organization with pressures of survival and profitability that result in the exclamation "Sustain this!" Ultimately, some industries may face an inquisition "sustain this?" Those industries may find themselves questioning their viability and purpose in a sustainable world.

In the early 1990's The Stuart Graduate School of Business developed a traditional Environmental Management Program with courses that reflected a model of compliance with a "command and control" regulatory framework. These courses included Environmental Law, Risk Management, Air and Water Pollution Control, Solid and Hazardous Waste Management, and Industrial Health and Safety. The coursework reflected needs defined by industry and was crafted in the belief that the business community needed to be armed with a knowledge base that was able to contend with the regulatory framework – a framework that was largely viewed by many businesses as a restriction to the activity associated with a profitable enterprise.

Knowledge in these traditional areas is essential to managing an entity within a compliance model, but the knowledge to create greater efficiencies and new business models that resonate with a sustainable enterprise was not being presented and explored. We determined that we needed to differentiate the program and shift the curriculum from one that solely presents traditional courses to a curriculum that includes the creative and proactive integration of an environmentally conscious model of sustainability with the business model. As a result, we have introduced and refined courses that redirect the program toward a model of proactive assertion of strategies that reposition and expand the role of environmental management in an organization. The new model moves from managing environmental effects at the end of the pipe and on the factory floor to one that includes participation with strategic planning, marketing, product design/development and management in the corner offices and in the boardroom.

The new view starts with perception of environmental management as allied with strategic concerns of the enterprise as opposed to an internal representative of regulatory imposition. We ask the students, many of whom are already engaged in environmental management, to assess their position as it is viewed by their organization's leadership. We then ask them to speculate about the perception of that leadership with a simple question:

**"Is environmental management in your organization viewed as a
"money maker," "money saver" or "money taker?"**

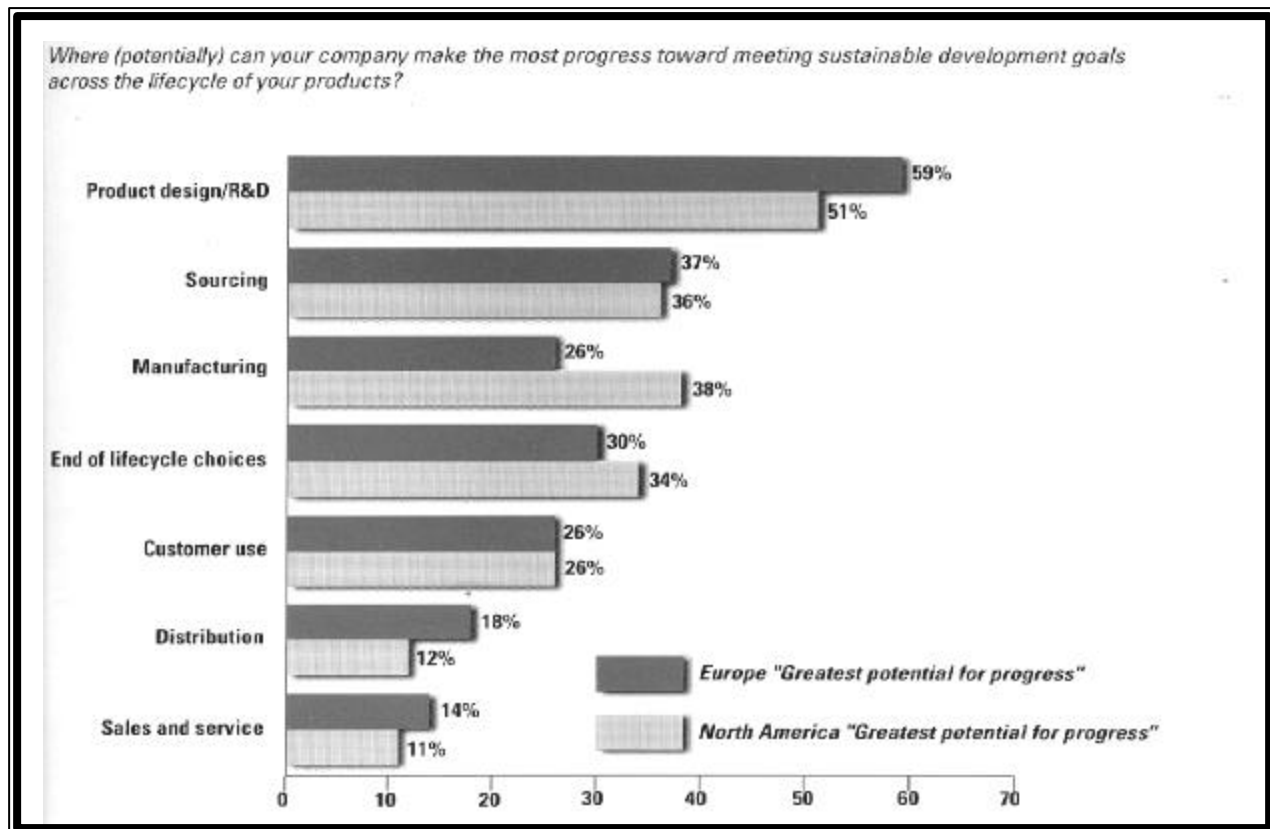
The response is typically the least favorable, that is, environmental management is viewed as taking money from the firm. It is viewed as a cost center. As such, environmental management has little power in the decision-making that drives strategy. It is our view that environmental management should be repositioned as a contributor to the bottom line as a source of new wealth based on both efficiency gains in the operation of the enterprise and on the role of environmental management in promoting and developing a vision of sustainability within the organization that is directed to the larger concept of "sustainable development."

Environmental management in a sustainable enterprise will contribute to the role that the enterprise plays in the natural ecology with its own designed industrial ecology. The environmental manager in the new scenario may help the firm pose and address questions such as:

- **Does our commercial success, as we know it, conflict with environmental health and integrity, and ultimately sustainability?**
- **If it does, can the conflict be resolved?**
- **What is our role, the role of our business and our products/services, in that resolution?**

Answering these questions effectively may be key to survival in a sustainable future.

Our view in with regard to the source of sustainability is supported by continuing research such as a survey conducted by A.D. Little in 1999. It asked nearly 500 business leaders from around the world about where they could make the most progress toward achieving their sustainable development goals across the lifecycle of their products. In both Europe and the United States, the greatest potential for progress was seen to be at the beginning of the product life cycle in research, development and design. The decisions taken at this first phase of the product lifecycle affect all the subsequent phases and are therefore the most critical. Since these decisions are taken at the strategic and business and product planning level in any enterprise, it follows that the environmental benefits and consequences of these decisions must be considered at the strategic and business and product planning level as well. (See figure below.)



Our effort to reposition the environmental manager and expand the role of environmental management has included the development and refinement of three required courses in the Environmental Management Program, "Industrial Ecology" (EM-507) "Contemporary Issues and Global Sustainability (EM-520) and "Business Strategy: The Sustainable Enterprise" (EM-590)

In the courses, projects and exercises center on the often overlooked question, "Why sustain this?" By exploring both the systems and the networks that support a business and its products, students develop an understanding of the elements that influence product choices from the perspective of multiple stakeholders.

Theory and the case study approach is critical to understanding the conditions necessary for the promotion and development of sustainable enterprise. In both the Business Strategy and Industrial Ecology courses, case studies are complimented by final projects that require the development of new product and business models. These reflect the learning and insights developed throughout the semester. Using real products and real businesses, the students are challenged to reduce the environmental footprint associated with the respective products and industries. The process is one of learning, thinking and doing.



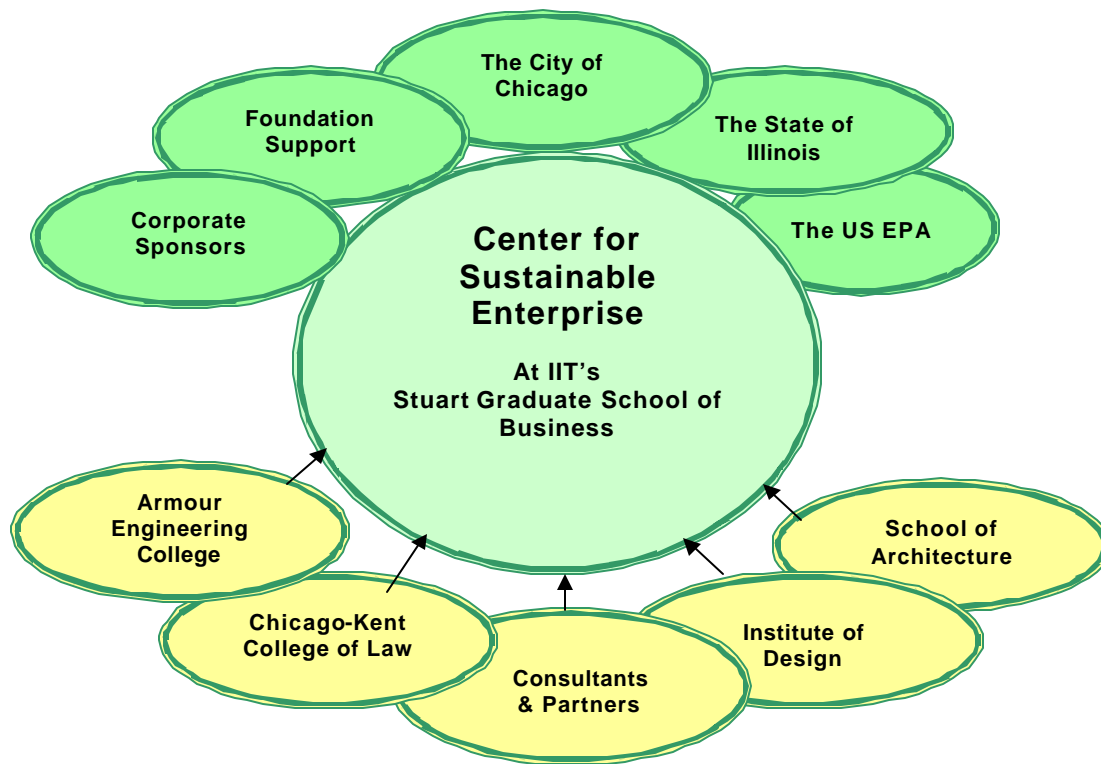
The “**Learn, Think, Do**” model was developed in the Industrial Ecology course nearly four years ago to engage the **learning** of theory, and applied theory (tools/methods/case studies) with creative **thinking** towards a solution that integrates the needs of all the stakeholders, including the environment. Finding the elusive “common set” is the challenge of the final project. It involves a great deal of “**Doing.**”

The Center For Sustainable Enterprise A Community-based Platform for Action (Learning Thinking Doing)

As the Environmental Management program progressed, we realized that we and our students would benefit by more “doing” - applying the learning related to sustainable development to local industries and institutions while providing those same organizations with a venue for learning and exploration that might provide sensitization to the issues, education about the tools, methods and innovations, and the empowerment to affect the changes needed to move toward sustainability. In the process, we might also secure a more desirable present and future for all of us and our city (Chicago). The seed for the Center of Sustainable Enterprise at the Stuart Graduate School of Business was sown.

In April of 2000, we developed a plan for the center, presenting it to the business, governmental and non-governmental communities, in July of that year. The reception and feedback were beyond our expectations, and with refinement of mission and principal activities, the Center for Sustainable Enterprise was established at Stuart this year.

The Stuart Graduate School of Business is ideally positioned to be the platform for a center dedicated to the sustainability of Chicago and Illinois at the enterprise level. Within Stuart as its core, The Center for Sustainable Enterprise is designed bring the many disciplines resident at the Illinois Institute of Technology together in a collaborative relationship with business corporations, other academic institutions, government agencies and members of the NGO community to identify, develop, communicate, and help implement practical and equitable business strategies that advance the ecological sustainability of the Greater Chicago Area, while fostering our current and future economic viability.



It is platform of excellence that can merge the diverse elements necessary to learn about, develop, test and help implement new enterprise models that are designed to protect, complement and restore the natural capital that is essential for sustainability.

The mission of the Center for Sustainable Enterprise:

To serve as a resource center where business, academic, government agency and NGO communities collaborate to identify, develop, communicate, and help implement practical and equitable business strategies to advance the ecological and economic sustainability of the Greater Chicago Area.



The principal activities of the Center for Sustainable Enterprise include:

1. Providing a Common Ground.
Serve as a forum where groups can collaborate to remove barriers to achieving ecological and economic sustainability while learning, teaching and sharing the elements of sustainable enterprise.
(This common ground would be the foundation for all the center projects and activities.)
2. Executive Education.
Educate, sensitize and empower key corporate executives/managers and small/medium business owners with practical and equitable business strategies that foster ecological and economic sustainability
3. Educational Support
Provide sustainable enterprise instruction, curricula and internship projects to university-based programs and community colleges within the Greater Chicago Area.
4. Commercial Applications of Research
Provide the platform for quick and efficient transfers of university-based research and proven industry-based applications to companies, especially small and medium enterprises.
5. Focused Business Support
Work with existing businesses and organizations to develop the tools for success in an emerging, sustainable economy.
6. New Business Development
Incubate start-up companies that promote sustainable environmental technologies and/or practices with the center's Strategic Workgroup on Alternative Paradigms. (SWAP)
7. Research.
Gather data on current use of elements of sustainability and develop reliable metrics and feedback loops that demonstrate the benefits related to the use of sustainable strategies.
8. Information Sharing
Expand the benefits of the learning and teaching efforts of the center by sharing the systems, methods, and technologies developed through the center with other organizations and businesses, locally and nationally.

Since inception, we have embarked on several projects, with others pending, that meet the CSE mission. They are aligned with its principal activities and provide the real world experience that is essential to students in the Environmental Management Program and allied programs at the Illinois Institute of Technology.

Some of the programs and projects include:

- A research and implementation project dedicated to exploring wind power with an innovative turbine technology that provides approximately 30% more energy than conventional wind turbines. The center and its partners will evaluate the technology, demonstrate it with the City of Chicago, Department of the Environment and, if feasible, engage in the development of green energy systems that combine wind, solar and clean energy storage in a reliable off-grid system.
- A Information Management project that will synchronize environmental and industrial data from over 60 organizations on a newly established 6,000-acre brownfield redevelopment on Chicago's southern border. The redevelopment will include future refinement management of the data with IT and GPS to create baseline information on the site, identify opportunities for environmental improvement, and potentially remediate approximately 3,000 acres of the site for wetland and fly-through habitat.
- A homeowners' energy analysis in conjunction with the City of Chicago, Department of the Environment and Home Depot that brings students into the community to assist homeowners in reducing their energy bill through comparative analysis, rewarding the homeowners who participate with vouchers for energy saving purchases such as insulation.

- An industrial metabolism project with a Real Estate Investment Trust In which we will work with the developer in selecting energy efficient systems for a new multi-purpose project in the heart of Chicago. In addition, we will convene with tenants of the project to evaluate purchases from interior treatments to supplies in order to minimize the environmental effects of their choices and to create synergies in selections that will further reduce environmental impacts by reducing redundancies and enhancing complimentary effects.
- Other planned projects include sector specific stakeholder group projects in industries that have major impacts on the viability of large urban centers. (See: CSE website - www.stuart.edu/cse)

The work that we've put into the program as we've redirected its course has not gone unnoticed.

The World Resources Institute has recognized the Environmental Management Program at Stuart for the second time in its ranking of MBA programs. Stuart Graduate School of Business at Illinois Institute of Technology has been ranked among the world's 15 leading MBA programs incorporating environmental management. And the environmental management curriculum is ranked among the top six in the nation.



The rankings were released in a report issued jointly by the World Resources Institute and the Aspen Institute's Initiative for Social Innovation through Business. The report, *Beyond Grey Pinstripes 2001: Preparing MBAs for Social and Environmental Stewardship*, is the only business school survey evaluating how well MBA programs integrate social, environmental and sustainability topics into business training. (The complete report is available on the Internet at: www.beyondgreypinstripes.org.) (See: Appendix-A)

Crain's Chicago Business featured the Environmental Management Program as a key to the success in the transition of a recent graduate Laura Sylvester, a manager at Fisher Service Co., and how she now uses what she learned in the program and how that learning, and the philosophy it engendered, contributes to the bottom line of her employer, Fischer Service Company.

In a report entitled: *Environmental Training Makes the Grade, Not the old school*, September 9, 2001, quotes like the ones below attest to the benefits of the reshaped Environmental Management Program at the Stuart Graduate School of Business.



- *...now she advises clients about why they should reduce emissions and how Fisher products can help.*
- *"Our biggest problem is getting our customers on board with emission controls," says Scott R. Grunwald, Ms. Sylvester's boss. "We want Laura to be able to go in and talk to them about their emissions. We see it as an increased sales channel." Ms. Sylvester says the program "gave students a vision of what sustainability is, and more than that, it taught you how to incorporate that vision into the manufacturing and service division."* (See Appendix-B)

A Closer Look at Industrial Ecology at The Stuart Graduate School of Business

Industrial Ecology is an interdisciplinary field involving technology (science and engineering), public policy and regulatory issues, and business administration. Within that framework the major goal of the course is to promote *creative and comprehensive problem solving in the application of Industrial Ecology*

Specific objectives of the course include:

- Introduction of the philosophy of Industrial Ecology.
- Introduction of the tools of Industrial Ecology and opportunities to explore and apply tools such as:
 - Industrial Metabolism,
 - Input-Output Analysis,
 - Life Cycle Assessment, Accounting,
 - Design for the Environment.

A key concept in the practice of Industrial Ecology is related to design and creativity. With Industrial Ecology, we DESIGN industrial infrastructures as if they were a series of interlocking ecosystems.”



The design of an Industrial Ecology is based on the Philosophy of IE as forwarded by Hardin Tibbs in his seminal work in 1992:

- Industrial Activities Balanced with Nature
- Industrial Growth with Low Environmental Impact
- Industrial Development that is Sustainable
- Technology is the Expression of Human Curiosity and Ingenuity with Technology and Innovation Designed for Social and Environmental Yield
- Human Activities Are Not Intrinsically “Unnatural”
- Today’s Problems can **Only** be Solved by Future Newness – There Is No “Way Back”

In the Industrial Ecology course students are asked to employ the learning and philosophy from coursework in “product-centered” exercises and projects. The student experience includes examination of the product as the means to meeting a “need”; understanding what needs, and whose needs, are being met; exploring the many forces that shape the product, including systems and networks; and finally, proposing viable alternatives that are designed to reduce or eliminate negative environmental consequences.

“Product-centered” exercises and projects have been created to replicate the product development process. The coursework includes an introduction to several emerging tools and strategies that are changing the way we might address a need in the marketplace.

Starting with an overview of the basic principles of ecology, students explore the relationship of Natural Systems and the innate intelligence within Nature to the emergence of human-made systems and the constructs born of human intelligence that manage those systems. Much of the investigation of the human-made systems explores the “unintended consequences” of seemingly good intentions that are not initially obvious to the system designers.

The course starts with a project based on defining products that are not sustainable. Looking at products in relationship to economic viability, environmental integrity, and social equity, students are asked to find a product that manifests “unsustainability.” Named **“The Dumb Products Contest,”** the exercise helps in the understanding of how much waste and “unsustainable” product is being created.

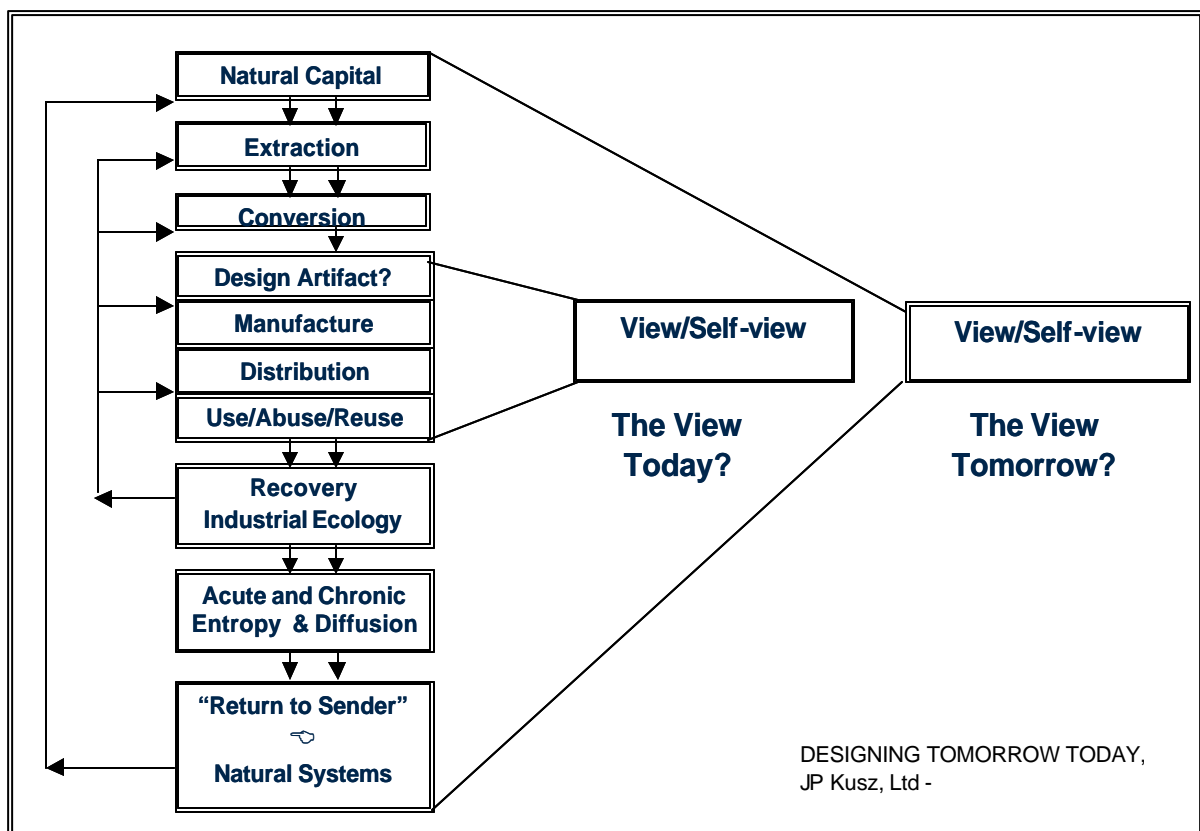
As the course progresses, students are introduced to concepts and tools such as

- “Natural Capitalism,”
- “Life Cycle Assessment,”
- “The Natural Step,”
- “Input/Output Analysis,”
- “Environmental Cost Accounting,” and
- “Product Footprint Reduction Strategies.”

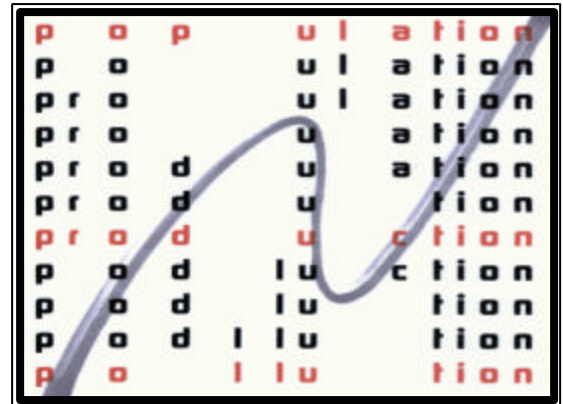
These are supplemented with information about cultural needs assessment based on the theory of Abraham Maslow and exercises in creativity and teamwork based on Edward de Bono and Christopher Barlow.

The learning is applied to, and is centered on, a team project. The project takes a product and assesses it in detail with the application of the tools and concepts that were explored in the class. The investigation literally dissects the product and ends with an exploration of viable alternatives that have a smaller footprint and may approach a sustainable solution set to the utility being provided.

A systems view is furthered with life cycle conceptualization and visioning that includes the designer of the system. Viewing the complete flow of resources and energy embedded in a product allows for opportunities to redirect and/or eliminate particularly offensive environmental effects associated with a product.



With the redesign of systems that include both humans and our propensity to underestimate the consequences of our often, incomplete constructs, issues of unintended consequences that emanate from our otherwise good intentions to organize flows into productive systems are explored. Some examples are the vaporization and release of mercury from the well intended recycling of automotive carcasses, and the more recent misstep related to recycling of protein in animal feed that resulted in bovine spongiform encephalopathy (BSE), also known as Mad Cow Disease.



Included in the discourse on consequences are the issues related to population expansion and contraction and the social and political implications of managing the resource that is us.

Included also are issues of political and social structure that have created the linear framework upon which current linear, business models are built, and how they may need to be revisited or changed to accommodate for healthier, sustainable systems. These are discussed in the context of time, how our assumptions are affected by new knowledge through history, and how those assumptions may need to be rethought and/or updated.

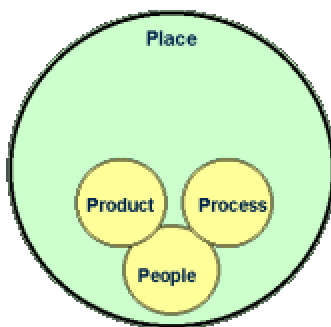
The effects of our assumptions and the resulting constructs are juxtaposed on the interaction that results between people, their products and the processes they devise to create those products. Lastly, the dynamic of **People+Product+Process** (P+P+P) is studied in terms of our role as creative, eco-literate, facilitators of the P+P+P interactions and how our efforts might affect the place where it all happens, right here on this abundant and limited planet called Earth.

Assumptions: Past and Present

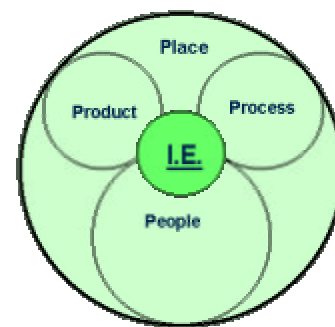
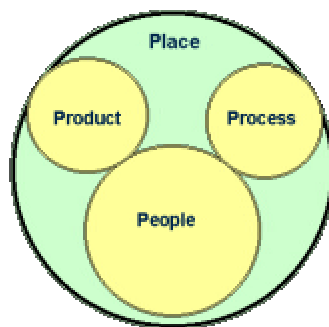
A New Assumption – A Sustainable Future

Our Role in a Sustainable Future?

The View at Adam Smith's Time



The View Today?



**Creative, Eco-literate,
Multi-disciplined, Facilitator**

The course key project is an exercise that asks the students to develop a business plan that takes a current or new product from a linear delivery system to a service system. Using concepts studied in case models, students are asked to create robust schemes that provide wealth within the current economic model that is based on minimizing resources and enhancing value to the market served.

These courses were developed to work together to help the students develop an appreciation of the economic, environmental and societal consequences related to the development and deployment of a product, a business, or any endeavor. **“Sustain This?”** might suggest the first question that should be asked before any enterprise activity is initiated.

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Appendix - A

CHICAGO–November 2, 2001—Stuart Graduate School of Business at Illinois Institute of Technology has been ranked among the world's 15 leading MBA programs incorporating environmental management. In addition, the school's environmental management curriculum is ranked among the top six in the nation.

The rankings were released this week in a report issued jointly by the World Resources Institute and the Aspen Institute's Initiative for Social Innovation through Business. The report, *Beyond Grey Pinstripes 2001: Preparing MBAs for Social and Environmental Stewardship*, is the only business school survey evaluating how well MBA programs integrate social, environmental and sustainability topics into business training. (The complete report is available on the Internet at: www.beyondgreypinstripes.org.)

The survey of 403 American business schools accredited by AACSB (International Association for Management Education) and 60 international business schools determines the emphasis each school places on environmental and social issues. The survey focuses on three key areas: curriculum, institutional support and faculty research. The Stuart Graduate School of Business program in Environmental Management earned its highest ranking in the area of curriculum.

In addition to its strong course program, Stuart School recently launched the Center for Sustainable Enterprise. The Center serves as a resource where the business, academic, government, and NGO communities can collaborate on practical and equitable business strategies to advance ecological and economic sustainability for metropolitan Chicago.

"Although environmental compliance is still an important objective of our program, we are now focusing more on sustainability -- consisting of environmental, social and economic issues," said Environmental Management program director George P. Nassos. "This approach is consistent with Mayor Daley's objective of making Chicago the greenest city in the United States."

ENVIRONMENTAL TRAINING MAKES THE GRADE

September 17, 2001

By [Ed Avis](#)



Not the old school: Laura Sylvester, a manager at Fisher Service Co., uses what she learned in her environmental program in her job. Photo: Todd Winters
When Laura M. Sylvester earned a master's degree in environmental management from the Illinois Institute of Technology in June, it helped her expand her role with her employer, the Oak Forest office of Fisher Service Co., the service arm of industrial valve maker Fisher Controls International Inc. She's still an environmental safety and health manager at the company, but now she advises clients about why they should reduce emissions and how Fisher products can help.

"Our biggest problem is getting our customers on board with emission controls," says Scott R. Grunwald, Ms. Sylvester's boss. "We want Laura to be able to go in and talk to them about their emissions. We see it as an increased sales channel."

Ms. Sylvester says the Illinois Institute of Technology (IIT) program "gave students a vision of what sustainability is, and more than that, it taught you how to incorporate that vision into the manufacturing and service division."

Local companies that want to explore sustainable development have several options.

IIT opened its Center for Sustainable Enterprise last spring. The center is "a resource for business in the Chicago area to get short courses, seminars, conferences, research and consulting for becoming sustainable," says George P. Nassos, director of the environmental management program at IIT's Stuart Graduate School of Business.

"We believe that many major corporations in the Chicago area are either thinking about sustainable development or already practicing it," Mr. Nassos says. "But for a company to be truly sustainable, its entire supply chain must be sustainable. So, we created this center to offer this concept to all the enterprises in the Chicago area."

The center is still raising funds and may be ready to conduct workshops by early next year.

"One of the first things we'd like to do is have a seminar for executives, because the only way managers in the trenches can promote sustainability in the company is if upper management understands it," Mr. Nassos says. Eventually it will offer sustainable development courses, seminars, consulting and research to employees at all levels in all types of businesses, he adds.

In the meantime, IIT continues offering the master's degree in environmental management, which includes courses in environmental issues, pollution control and business strategies for sustainable enterprises. More than three-quarters of enrolled students are like Ms. Sylvester: full-time employees of companies that see the advantage of having an employee trained in sustainable development.

Another local source of education is the University of Chicago's environmental studies undergraduate degree program, which offers one or two free seminars per quarter that are open to the public.

The Environmental Law and Policy Center, a public interest environmental advocacy organization based in Chicago, also offers programs to help businesses learn about sustainability.

"Increasingly, what many businesses find is that implementing best environmental practices helps the bottom line," says Howard A. Learner, executive director of the center.

The center holds seminars to help business owners use sustainable development in building factories and offices, and its staff meets regularly with building owners to help them improve sustainability.

Rocky Mountain Institute, a Snowmass, Colo.-based think tank, recently held a workshop in Chicago on using sustainable principles to increase profits.

The institute is a non-profit organization, but focuses its education and consulting efforts on businesses. "Keeping a finger in the business world keeps us from becoming an ivory tower," says Karl R. Rabago, managing director of the institute. "Business is a major part of the equation."

The institute also offers private workshops for businesses. "We do the full gamut, from an hour-long introductory talk about sustainable development to ongoing initiatives," Mr. Rabago says.

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Appendix - C

EM 507 INDUSTRIAL ECOLOGY

Syllabus

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Instructors

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John Paul Kusz, Adjunct Professor Stuart Graduate School of Business
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Course Objective:

Industrial Ecology is an interdisciplinary field involving technology (science and engineering), public policy and regulatory issues, and business administration. Within that framework the major goal of this course is to promote creative and comprehensive problem solving in the application of Industrial Ecology.

Specific objectives are to:

Introduce students to the philosophy of Industrial Ecology.

Introduce tools of Industrial Ecology and provide examples and opportunities to explore and apply those tools. These tools include Industrial Metabolism, Input-Output Analysis, Life Cycle Assessment, Accounting, and Design for the Environment.

Course Grades:

Final grades will be determined as follows: Half of the grade will be based on group activities, including the product assessment, the life cycle assessment, and the design for environment projects. The group activities will include peer assessment. The other half of the grade will be based on individual activities, including critical reading summaries and miscellaneous assignments; the industrial metabolism assessment, the web site review, and the final exam.

Weekly Reading Assignments:

This course includes a substantial amount of reading from the current literature. Each week you should complete the assigned reading and turn in a typed critical reading assignment. In this assignment you should first briefly identify the three most important points from the article. (Use three paragraphs, one for each point.) Then write three critical questions that you developed from the reading. (Here again, use three paragraphs.) Be concise; you should be able to fit everything on one page.

Critical reading can be defined as the ability to analyze, evaluate, and synthesize what you read.

Reading with a critical eye will help you see relationships of ideas and use them as an aid in reading. My definition of a critical question is a question inspired by the reading, but the answer is not in the reading.

Projects:

There will be product assessment, industrial metabolism assessment, life-cycle assessment, and design for environment projects. Some of the projects are designed to be group efforts; others may be individual efforts. Each project typically occupies two to three weeks. More detailed descriptions of the projects will follow.

SUMMARY OF EM-507 INDUSTRIAL ECOLOGY

Paul Andersen, Ph.D. , and JohnPaul Kusz, MBA, MFA

1

Course Overview

The Concept of Industrial Ecology - JP Kusz , Paul Andersen

Review of early and later writings that defined the concept

The Industrial Ecosystem at Kalundborg, Denmark – Industrial Ecology by Default (Opportunity) - Hardin Tibbs

Eco-Industrial Parks – Industrial Ecology by Design? (Pros/Cons) – Earnest Lowe, John Warren, Stephen Moran

The three key components of sustainability and how they relate to better products and services

Economic Viability, Environmental Integrity and Societal Equity – JP Kusz

Assign Project 1 – The “Dumb” Product Contest (Due in Class 3)

Assign Readings on Industrial Ecology

Allenby

White

Hardin Tibbs

Assign Readings on Natural Capital

Dr. Paul Heltne of the Chicago Academy of Science,

Amory Lovins of Rocky Mountain Institute,

Paul Hawkins and the Natural Step.

2

Understanding the Key concepts of Natural Capital and how these relate to I.E.

Presentation on the natural capital around us - Dr. Paul Heltne of the Chicago Academy of Science
Natural Capital, the Environmental Return on Investment (EROI) and how these relate to the IE metaphor

Emerging Opportunities and the Industrial Ecology Metaphor - JP Kusz , Paul Andersen

Industrial Ecology and Policy Public Policy, Regulation, Community Organization, Government

Industrial Ecology and Technology Natural Science, Engineering, Information Technology

Industrial Ecology and Business Management, Product Development, Marketing, Manufacturing

Product Management/Stewardship

Industrial Ecology and Academia Law, Technology, Business

Industrial Ecology and Community Law, Technology, Business

Assign Energy Reading

Linden

Drucker

Natural Capital Reading Critical Questions Due

3

The Question of Energy

The Rules Of The Energy Game or, The Conservation Of Matter - Matters – Paul Andersen

The Transition Of Energy Through Time (High Carbon To No Carbon) - Drucker, Linden

New Technology Thresholds – Threats in Energy – Earth, Wind and/or Fire - JP Kusz

Embodied Energy, Total Energy Used, Recoverable Energy - Paul Andersen

Static And Dynamic Products - JP Kusz

Dumb Product Contest Results - class vote on the “Dumb, Dumber and Dumbest” products – Awards

Assign Input-Output Analysis Reading

Energy Reading Critical Questions Due

4

The Basic Raw Materials Renewable or Non-renewable?

Metals - Ferrous And Non-Ferrous,
Plastics – Thermoset And Thermoplastic
Sand And Clay – Glass, The Original Plastic Material And Ceramics
Natural Fibers – Wood, Paper And Paper Board
Woven Fibers – Cotton, Wool
Water Water Used, Water Contaminated
Air Air Used (how) , Air Contaminated (Emissions)

Input-Output Analysis - Review and discuss the I-O reading – Paul Andersen

Looking at product/services through the time/technology continuum - JP Kusz

The Ecological Footprint – Mathis Wackernagel, William Rees

Needs Assessment and Footprint Reduction Strategies – JP Kusz

Assign Project 2

Product Assessment Project – Team Project (See: Product Assessment Project Outline) (Due in Class 11)

Assign Life Cycle Analysis (Assessment) Readings

Input-Output Analysis Reading Critical Questions Due

5

First: A little Bit About Creativity

Brainstorming Value Engineering Function Analysis Decision Matrix/Teamwork

Dr. Christopher Barlow – The Co-creativity Institute

Ed De Bono – Six Thinking Hats

Life Cycle Analysis (Life Cycle Assessment)

Carnegie Mellon Web Site of Life-Cycle Information

Introduction to Life Cycle Analysis (LCA)

History of LCA -Mary Ann Curran

LCA - philosophy and/or method to compare, improve & develop products (Comparative/Derivative) - JP Kusz

A Comprehensive Approach – Society of Environmental Toxicology and Chemistry

JP Kusz, Paul Andersen

The Streamlined Approach – Joel Ann Todd – The Scientific Consulting Group - Paul Andersen

Team Presentation of Selected Products for The Product Assessment Project.

Disecting of Products and analysis of product components (Class Time)

Assign Life Cycle Design Readings

Life Cycle Analysis (Assessment) Critical Questions Due

6

Life Cycle Design JP Kusz

Dr. Gregory A. Keoleian,. National Pollution Prevention Center, University of Michigan Examples of Life Cycle Design

Life-Cycle Costing US EPA (Full Product/Service Cost Accounting – Internal/External Costing) Paul Andersen

Introduction to Activity Based Cost Accounting – Paul Andersen

Assign Project 3 – The Material Assessment Project -Team Project (See Material Assessment Outline) (Due in Class 8)

Product Assessment Project Component Analysis (Class Time)

Assign Activity Based Cost Accounting Readings

Life Cycle Design Critical Questions Due

7

Product Stewardship – JP Kusz

Product Responsibility or Producer Responsibility - JP Kusz

Design for the Environment - A Sector Specific Approach - US EPA – JP Kusz, Paul Andersen

Activity Based Cost Accounting – Paul Andersen

Activity Based Cost Accounting Critical Questions Due

8

A Little Bit About Decision Theory – Paul Andersen

Environmental WEB Sites – JP Kusz , Paul Andersen

Environmental WEB Site Assignment

The Material Assessment Project - Team Presentations and Discussion Assign

9

Public and Private Sector Management Strategies Related to Industrial Ecology (Overview)

A.D. Little, R.F. Westoon, Pricewaterhouse Coopers, ERM Consulting – From Remediation to Restoration

Presidential Order on Environmentally Preferred Products - Opportunities, Limitations

Product Labeling,

Germany's Blue Angel,

Canada's Environmental Choice,

Ecomark of India

Green Seal

Scientific Certification, Systems

Earth's 911 (1-800-CLEANUP)

ISO – 14000

The Natural Step

American Chemistry Council (formerly-CMA) and Responsible Care

BS-7550,

EMAS,

Web Site Assignment Due - Critical Questions on Business, Policy & Law, and Technology

10

The Evolution Of Industrial Ecology Over The Last Decade (Three Points In Time) – (Videos)

The Changing Face of the Environmental Service Sector – JP Kusz

Course Summary –The Possibilities of Industrial Ecology – What's Next?

Product Assessment Project Review of Team Work on Assessment and Improvement Strategies (Class Time)

Case Review – The Unintended Consequences of IE. Steel Recycling and Mercury, Bovine Spongiform

Encephalopathy (Mad Cow Disease)

Distribution of 10 critical Questions on Course Material to be considered for the Class Final

11

Team Presentation and Discussion of the Product Assessment Project

Instructor Evaluation

Peer Evaluation

12

FINAL EXAMINATION

Essay Format with Three Critical Questions from the List of 10 Previously Distributed Questions.

Appendix - D
Business Strategy: The Sustainable Enterprise
EM 590-077

Instructor: Dr. George P. Nassos

e-mail: nassosgp@stuart.iit.edu

Course Description

This course integrates environmental management issues with use of strategic planning tools for assessing and responding to competitive and social forces. Course will look at the challenge of corporations competing in the global economy of the new millennium in such a way that will allow the planet to support them indefinitely. Emphasis will be on the company's ability to build and sustain a competitive advantage utilizing traditional management concepts as well as new sustainability practices. Topics will include a review of traditional strategic processes, The Natural Step, the servicizing concept and various case studies showing how an enterprise can meet its sustainable goals consistent with its financial and market goals.

Organization of Course

The course will be presented in a simple and straight forward format. We will attempt to cover the entire required text by reviewing the key points during the first hour of four class sessions. In each of these sessions, two case studies have been assigned that relate to the text topics, and, at the same time, deal with environmental issues. We will attempt to cover the two case studies during the remaining time of each class. A list of discussion questions for each case study are either given below or will be provided to you at least one week before the case study will be discussed in class. In the remaining six sessions, we will cover other environmental topics such as: community relations strategy on environmental issues, environmental accounting, emissions trading and sustainable development concepts such as servicizing and The Natural Step.

In lieu of a mid-term exam, each student is expected to be the discussion leader for one of the case studies. The details of this assignment will be discussed during the first class. Come prepared to the first class with your first, second and third choices for this assignment. Overhead and computer projectors will be available.

Required Reading

- Pitts, Robert A. And David Lei, "Strategic Management -- Building and Sustaining Competitive Advantage", Second Edition, South-Western College Publishing, 2000.
- Natrass, Brian and Mary Altomare, "The Natural Step For Business", New Society Publishers, 1999.

Case Studies: A set of 8 case studies as listed in the course outline.

Recommended Reading

- "Green Ledgers: Case Studies in Corporate Environmental Accounting", edited by Daryl Ditz, Janet Ranganathan, & R. Darryl Banks, A World Resources Institute Book
- "An Introduction to Environmental Accounting As A Business Management Tool", U.S. EPA , EPA 742-R-95-001, June 1995.
- Hammond, Allen, "Which World? Scenarios for the 21st Century", Island Press, 1998 (p. 26-61, 87-101)

Grading/Attendance

Basis for grading:

- 1/3 Class participation
- 1/3 Case study presentation
- 1/3 Final exam or project

Summary: Business Strategy: The Sustainable Enterprise EM 590-077

Instructor: Dr. George P. Nassos

e-mail: nassosgp@stuart.iit.edu

Course Outline

Week	Topic	Case Studies/Presenter
1	Environmental Communications	Communications for Management Frank Corrado
2	Chapters 1,2,3 (SM)	Deja Shoe BMW
3	Environmental Accounting	Robert Dennis, PriceWaterhouse Coopers Honda
4	Chapters 4,5 (SM)	DuPont Environmental Accounting Case Study IKEA
5	Emissions Trading	Michael Walsh Collins Pine Company
6	Chapters 6,7,8 (SM)	Interface Scandic Hotels
7	Servicizing	Global Climate Change Molten Metals Technology
8	Chapters 11,12,13 (SM)	Monsanto Weyerhaeuser Company
9	Sustainable Development at Monsanto/Pharmacia	Daniel Becker
10	Fish Banks LTD.	Computer Simulation Strategy
11	Final Project	

Case Study Discussion Questions

Deja Shoe

1. What is your evaluation of Deja's environmental business strategy?
2. What is their core competence and competitive advantage?
3. Can they sustain it?

Bayerische Motoren Werke AG

1. What are the contextual factors driving BMU's actions?
2. Who are the key constituents in the debate and what their goals for the program? What specifically are BMW's goals?
3. What factors must be considered when using secondary materials?
4. What should BMW's take-back and secondary materials strategy be? Why?
5. Can the company gain a competitive advantage through the development of a pro-active recycling strategy? How?

At each point, it will be useful to distinguish between short-term and long-term factors.

Honda of America

1. What is (are) Honda's overall challenge(s) in environmental management, i.e. what's the problem?
2. If you believe that environmental issues have to be balanced with manufacturing objectives, what are some specific areas where trading off might be required?
3. What strategy should Honda of America employ in balancing lean with the constraints of U.S. environmental regulations?
4. What are the benefits and drawbacks of Honda's approach to organization with respect to the environment?
5. How do you see the differences in environmental management between Honda and Toyota affecting their ability to meet regulations?

DuPont – Environmental Accounting Case Study

1. What were some of the accounting problems that DuPont incurred at LaPorte?
2. What was the impact of using full-absorption costing?
3. What are some of the decisions that can be affected by incorrect environmental accounting?

IKEA, Collins Pine, Interface & Scandic Hotels

1. What motivated the company to pursue The Natural Step?
2. What changes were implemented, and what impact did these changes have on the operation of the company?
3. Did the implementation of The Natural Step give the company a competitive advantage? How?
4. Did the implementation of The Natural Step result in an improved bottom line?

Global Climate Change and BP Amoco

1. What is the impact on a) shareholder's value, b) customers, c) competitors, d) government relations, e) NGOs and f) costs?
2. What does BP really want?
3. If you worked for Chevron, what should you do?

Molten Metal Technology

(A)

1. What was the overall business model for MMT: (a) from 1989 to 1995, (b) for the future?
2. Are there any peculiarities about the hazardous waste market that make this start-up company different from other high-tech start-ups?
3. What were the toughest challenges and greatest uncertainties/risks as the company was poised for commercialization at the end of 1995?
4. How well had MMT protected itself from these risks?
5. Looking to the future, if you were Bill Haney, what would you do? If you were Chris Nagel, what would you do?

(B)

1. What went wrong?
2. Could it have been foreseen?
3. What lessons could be taken away from this experience?

The Monsanto Company: Quest for Sustainability

1. What do you think of Monsanto's life science strategy of "Food, Health, and Hope"?
2. Why was there a European backlash? How does European resistance differ from the concerns of the developing world?
3. As a fund manager, would you add Monsanto's stock to your portfolio in June 1998? Why or why not?

Weyerhaeuser Company

1. What is your evaluation of Weyerhaeuser's corporate strategy?
2. What is their core competence and competitive advantage?
3. Does Weyerhaeuser practice sustainable forestry?
4. Is the company well positioned to be competitive in the next century?

Final Written Report and Oral Presentation

In lieu of a final exam, each student will be required to prepare a final written report based on what he or she has learned from Pitts & Lei, The Natural Step For Business and other sustainable concepts, and how it applies to an environmental business. On the last day of class, the report will be presented orally to the class so each student can benefit from each other's effort.

Alternatives - Choose A, B or C

A. The final session will be devoted to presentation of individual projects. Each student will select a product or product line manufactured by his or her business, and convert it to a sustainable service business (servicizing). Develop a business plan for a new service business that will be sustainable during the next ten to thirty years.

Analyze your company's product and critique it for its lack of meeting sustainable concepts. Identify those environmental factors that would be negatively impacted by continued manufacturing of your company's product. How can that product be modified to become sustainable.

Then, recommend your company to become a service company and sell the function of the product rather than the product itself. Prepare a business plan that you could provide to your company's management. The business plan should include the following sections:

- Introduction of the current product to include its functionality, marketing strategy, customers, competition, environmental impact and disposal options.
- Proposal of "servicizing" concept with new marketing strategy.
- Environmental impact of the new concept with particular emphasis on how it is an improvement over the current product.
- Description of the competitive advantage and how this new business meets sustainable principles

B. Pick any publicly held that manufactures a product of interest to you and convert that product to a service business. Use the same analysis and thinking as in option **A.** above.

C. Think of a demand for some service that is currently not filled. Develop a business plan for your new idea. Use the same analysis and thinking as in option **A.** above.

Written Report

Limit: Maximum of 15 pages (preferably 10-12) plus exhibits

Note: Use correct bibliographic form for all references. Do not use any proprietary data.

Grading: Represents 75% of your final project grade.

Oral Report

Content: A short summary of the key ideas with emphasis on what the class should learn from your project efforts. Be open for questions and be prepared to lead a brief class discussion on your presentation.

Limit: 15 minutes (including time for discussion)

Hand out: Prepare a one or two page summary of your oral presentation to be distributed to the class.

Visual aids: Overhead or computer projector

Grading: Represents 25% of your final project grade