Planning for Quality in New Products and Services:

Sustainable Perspectives to Design and Innovation

Tuesday & Thursday, 11:00 – 12:15
2170 Grainger Hall

Syllabus

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Course purpose and content
This course provides a leadership perspective that focuses on strategy related to the design of innovative and sustainable products and services, and on the design of systems that create those products and services, with intent to satisfy multiple objectives that deliver benefits to a diverse set of organizational stakeholders. During the semester students select study topics or organizational issues of their own choosing and apply course material to those topics. Topics may include organizational projects and challenges, theses, dissertations, design of products, services and/or systems, or any topic involving design and innovation important to the student.

Why design? The design of a product/service/system determines 70-90% of stakeholder benefits, such as sustainability, value, quality, cost, and response time, as well as other impacts related to material and energy flows associated with product/service life cycles. Thus design strategy offers tremendous leverage for creating an organizational future that is both sustainable and that serves the design’s full spectrum of stakeholders.

Why sustainable? Contemporary economic systems extract non-renewable resources from the earth, disperse and bury them in toxic waste sites, depleting their supplies and limiting the ability of future generations to utilize those resources. These systems harvest renewable resources, a shrinking fraction of consumables, at rates exceeding sustainable production, further eroding natural capital and extinguishing other species through toxic wastes and habitat destruction. Many stakeholders’ needs remain unsatisfied. Five billion people make less than $10 per day while every new-born baby, even in the most remote areas of the earth, carries a body burden of hundreds of known toxic chemicals although toxicity tests evaluate only a few thousand of the more than 60,000 human-made chemicals. Business risks, organizational pressures and opportunities for innovation rapidly expand as scientists and business leaders describe a paradigm shift necessary for a sustainable future that is as substantive in scale as both the industrial and scientific revolutions. This course discusses business implications for these challenges, new emerging forms of management, and innovative practices that help organizations breakthrough toward a sustainable future.

Topics include innovative design strategy and methodology; linkage of design and development to mission central benefits; sustainable design and mission driven approaches to design for the environment; multiple life cycle and cradle to cradle design; infrastructure development that instills sustainable design into an organization’s DNA including organizational structures and learning systems such as process, product and environmental management systems; green sigma, design for six sigma and green quality function deployment technologies; material and life-cycle flow analysis; collection, use and prioritization of lead, volume, loyal and strategic customer information related to innovation and sustainability; messaging and branding; environmental and customer benefit prioritization and profiling including identification of critical benefits unknown to customers; voice-of-the-customer translation technology for turning behavioral and environmental customer information into design requirements, including methodologies for analyzing customer settings, uses and critical events, leading to attractive innovative and sustainable features that have broad market appeal,
even when the green market is small; creativity techniques and mechanisms for identifying attractive innovative and features and creating breakthrough designs; design planning that incorporates market and engineering benchmarking, sales and product strategy and competitive analysis using both economic and sustainability lenses; customer-focused sustainability deployment, quality deployment, cost deployment, reliability deployment, safety deployment, capability deployment and technology deployment; architectural considerations and mechanisms for design of systems for putting both sustainability and customer focus into new services and products.

Content covers both conceptual strategies and "how-to" methodologies and mechanisms for customer-focused conceptualization and design of innovative and sustainable services and products, and of the processes and job functions that will produce the products and deliver the services. Emphasis is on upstream strategy, conceptualization and design since typically they lock-in most of the value (i.e., sustainability, quality and cost) that a product or service delivers. These approaches target both products and services targeted externally to markets and internally to the organization (e.g., job design, new employee orientation).
The course begins with characterization of design typologies organizations employ, and their evolution and the challenges provided by sustainability, including the various conceptual definitions used by organizations and thought leaders to guide their sustainable development. The second part of the course discusses cutting-edge design principles and practices, and the embedding of sustainable design systems into both organizational strategy and operations. The third section of the course focuses on identification and segmentation of stakeholders and customers, and selection of critical benefits that add the stakeholder value, often in areas that customers and stakeholders cannot articulate and do not understand. Discussion includes strategy development for sustainable value creation that satisfies all stakeholders. The fourth course component addresses creativity and innovation around development of breakthrough designs. The final section of the course describes deployment of design into delivery systems, including mechanisms and approaches for design planning, and for identifying and linking critical design elements, parts, functions and delivery systems to enhance both their value to customers and stakeholders, and their sustainability.

Prerequisites: A course or experience in either design, ecology and the environment, market research or system improvement, such as BUS OTM 770.

**Biographical sketch**

**Mark P. Finster** serves as a faculty member in the School of Business and College of Engineering at the University of Wisconsin-Madison, and as a contributing member in the Gaylord Nelson Institute for Environmental Studies, the Energy Center and the Center for Quality and Productivity Improvement. He also sits on the executive boards of the Center for Operations and Technology Management, the Global Studies program, and Manufacturing Systems Engineering.

Professor Finster received the Gaumnitz Distinguished Faculty Award and the Mabel W. Chipman Excellence in Teaching Award. He has helped improve more than 150 businesses, government agencies, and nonprofits from four continents.

Professor Finster received his Ph.D. from the University of Michigan and served as a professor at Cornell and Johns Hopkins Universities. He is a five-time National Science Foundation (NSF) Scholar and chaired the NSF session that established a national research agenda for organizational excellence. He also serves on the Board of Directors at Home Savings Bank.

Teaching and research interests include sustainable design and improvement of complex systems, profit, value, resilience, brand, market share and position, response time, quality, productivity, customer and stakeholder satisfaction, quality in work life, environmental management, creativity and innovation, strategic breakthrough, new product and service development, system-wide performance management, quality function deployment, employee involvement and empowerment, policy management and deployment, cross-functional management, learning organizations, benchmarking, structure and organization for performance management, and service management.
How to contact the professor
E-mail: mfinster@wisc.edu
Office: 4250D Grainger Hall
Office hours: T & Th: 12:30 – 1:30 and by appointment
Address: 975 University Avenue Madison, Wisconsin 53706

Projects
Applied learning occurs during hands-on projects. You may select the topic, the duration of the project, and the number of people on your project. Divide the semester into two periods. A project may last seven or 14 weeks. You may work on two seven-week projects or one 14-week project. At the eighth week, some people may continue with a project while others on the team may choose a new topic. You choose the duration of each project and the topic area. For example, you may choose to study an organization, sector or industry and its strategy, design and development of products or services. You might participate in a design project that either develops strategy around a new product or service prototype/concept, or that improves a system that creates customer and stakeholder value through design or development of a product or service. You may form a project to study a topic related to your thesis, dissertation, or any other organizational interest that connects to course material.

Reports and meeting with professor
Within each seven week period, submit two electronic team reports – one describing project plans and one presenting findings. About three weeks into a project submit a report that describes the project in approximately three to five single-spaced pages plus charts, graphs, images and the annotated bibliography. Overview the project and its goals, provide research questions that guide your study, present the logic for why the project is important, present preliminary findings, describe expected findings, and list sources of information. Annotate each source (book, research journal article, web source, individual, organization) by briefly describing the information that appears useful. Reference each source with title, author, date, publisher and web address. After submitting the report, discuss your project with me at least two weeks prior to the second report.

The second report describes the team’s findings. A well written report concisely summarizes team findings (approximately 15-20 single spaced pages plus charts, pictures, graphs, diagrams and bibliography), provides numerous examples of key points, connects well to course material, uses course material to critique existing practices, and integrates material from a variety of sources, including scholarly articles.
written by professional researchers. Each report must connect to class material and integrate course material into your analysis and findings. The format of the final report is the same as that for the preliminary report, except actual findings should replace expected findings.

**Weekly Reading Reports**
Each week, select at least one relevant article from the course web site, and e-mail to me one page elucidating your personal insights on how that your reading applies to your project. Each reading report provides an opportunity by which I can personally discuss your project, personal insights and interests with you. Each report should include three sections. The last two sections are most important.

1. Identify a reading relevant to your project and briefly (1-5 sentences) summarize the most important part of the reading that applies to your project.

2. Describe how that part of the reading applies directly to your project. Make this description unique to your project. Provide examples specific to your project that show how the reading's key point applies to your project. Write about issues that I do not know. To do so, you may have to further develop your project.

3. Indicate a plan of action you, as an individual, will initiate to help your team make the application in (2) above become part of your project. Share your report and integrate these ideas into your project.

**Grades**
Projects, reading assignments and class participation determine the grades according to the weights below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Reading assignments</td>
<td>25%</td>
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<tr>
<td>Class participation</td>
<td>15%</td>
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<tr>
<td>Project Reports &amp; Presentations</td>
<td>60%</td>
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**Reading Assignments**
Reading assignments are assessed in terms of how well they apply to your project. A reading assignment with a high score would 1) provide examples unique to your project that show specific application of the reading’s key point to your project, and 2) indicate how you integrate these examples or findings into your project. In other words, a strong reading report constructs examples specific to your project that exhibit how you use the reading’s key point to contribute to your project. To do so may require additional work on your project.
Class participation
Class participation refers to involvement in class discussion. Involvement requires that you attend class.

Projects
Projects are assessed according to the quality of the findings and examples that exhibit the findings, and the connection to course material. The categories below provide examples of course materials. It is unlikely that a project can cover all the topics below.

- Development of a design strategy that effectively integrates business, sustainable, market and competitive perspectives.
- Development of an effective design system to carry out the design strategy and guide the organization and/or team.
- Identification and consideration of a full spectrum of customers and stakeholder groups during market design and development.
- Development, verification and use of customer/stakeholder segmentation structures in the design process.
- Prioritization of customer and stakeholder segments with appropriate method, criteria, logic and data.
- Collection of a wide and rich array of customer information through a diverse and effective set of methods.
- Extraction of potential design characteristics through voice of the customer and voice of the environment translation methods.
- Prioritization of key customer and key environmental needs for each key customer segment.
- Thorough and appropriate performance planning with adequate data.
- Analysis, logic development and data use to extract key design performance characteristics.
- Extraction of key design features and associated business planning to describe their business utilization.
- Prototype and process development, including product service functions, technologies, parts, costs, reliability, operating requirements (e.g., knowledge and skills) and testing.
Schedule
The flexible schedule below will change as class interests dictate. The course addresses a rapidly advancing field where text books do not represent the cutting edge. Articles and the professor’s chapters comprise the main source of readings. Students can access readings and course notebook chapters at Learn@UW. The reading list following this schedule provides additional references that add depth to various topics.

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<thead>
<tr>
<th>Weeks</th>
<th>Topics</th>
<th>Chapter</th>
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<tbody>
<tr>
<td>1-2</td>
<td>Introductions, syllabus &amp; projects; terminology of design &amp; change; management design archetypes; evolution of management – first, second, third &amp; fourth generation design systems &amp; their sustainability; forces shaping sustainable design, metrics, goals, footprints, rucksacks, intensities, natural capital, biodiversity; critique of business, science &amp; marketing definitions of sustainability – Brundtland, triple bottom line, Natural Step, environmental management, marketing and green washing; an organizational model for sustainability.</td>
<td>1</td>
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<tr>
<td>3-4</td>
<td>Foundational concepts &amp; principles for sustainable breakthrough design; infrastructure for managing flows of materials, energy and activities; sustainable value creation approaches for all stakeholders, environmental design characteristics; design changes &amp; continual improvement; inclusive sustainable design principles, crowd sourcing, multiple-objective designs; infrastructures that support system thinking; knowledge management for sustainable design, learning systems and experimentation; smart data systems, understanding variation</td>
<td>2</td>
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<td>5-6</td>
<td>Integration of sustainable design strategy and approaches with daily management systems (e.g., process management, standards management, employee development &amp; environmental management systems), with strategic management systems (formulation, deployment &amp; learning) &amp; with cross functional performance management systems (new service &amp; product development, design for the environment, life cycle assessment)</td>
<td>3</td>
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<tr>
<td>7-9</td>
<td>Project presentations &amp; reports</td>
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<tr>
<td>7-9</td>
<td>Sustainable design, industrial ecology, multiple life cycle design, cradle to cradle design, principles of design, design for reuse, dematerialization, modularization, design for flexibility, design for disassembly, design for inverse manufacturing, etc</td>
<td>3</td>
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### Schedule

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<tr>
<th>Weeks</th>
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<th>Chapter</th>
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<tbody>
<tr>
<td>10</td>
<td>Sustainable building design, critique of BREEAM, LEED, Gold Globe, Green Star &amp; Green Guide for Health Care design approaches, integrated project development</td>
<td>5</td>
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<tr>
<td>11-12</td>
<td>Identification &amp; breakdown structures that describe customers &amp; stakeholders, green marketing, socially conscious consumerism, sources of customer information, collecting information, analyzing customer behavior, translating the voice of the customer, use analysis, structuring customer needs, service gap analysis, prioritizing customer needs</td>
<td>6</td>
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<td>13</td>
<td>Strategic design, Kano technique</td>
<td>7</td>
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<td>14</td>
<td>Sustainability &amp; quality function deployment methods and architecture, measurement, service QFD</td>
<td>8</td>
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<tr>
<td>15</td>
<td>Project presentations</td>
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### Course notebook
At regular intervals, chapters of the text will be available for free electronic download from the course web page at Learn@UW. They comprise the following book.

Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*

### References and Readings
You may access the following readings and accompanying powerpoint from the learn@UW course website.

**Weeks 1, 2**
Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*
Chapter 1: Design Management Archetypes and Evolution

Support readings

Supplementary readings


Kitzes, Justin, Mathis Wackernagel, Jonathan Loh, Audrey Peller, Steven Goldfinger, Deborah Cheng and Kallin Tea, 2007. Shrink and share: humanity’s present and future ecological footprint, Philosophical Transactions of the Royal Society B.


Popular Press

Diamond, Jared, 2008. What’s Your Consumption Factor?


Weeks 3, 4

Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*  
Chapter 2: Key Concepts

Support Readings
Ramaswamy, Rohit, 1996. Designing services (chapter 1) and The service design and management model (chapter 2) in *Design and Management of Service Processes: Keeping Customers for Life*, Prentice Hall.

Supplementary readings

Weeks 5, 6

Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*  
Chapter 3: Design, Strategy and Organizational Systems.

Support readings


**Supplementary readings**


Carbon Disclosure Project, 2008. Making advances in carbon management: Best practice from the carbon information leaders, IBM.


Esty, Daniel and Andrew S. Winston, 2006. Who’s behind the green wave? (Ch 3) in *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value and Build Competitive Advantage,* Yale University Press.

Everard, Dr Mark, Dr Caroline Gervais and Dr Conor Linstead, 2002. Towards the sustainable use of material resources: An evaluation using the natural step framework, *The Natural Step, June.*


**Weeks 7-9 Project reports**

**Weeks 7-9**

Finster, Mark P., 2011. Sustainable Perspectives to Design and Innovation Chapter 4: Sustainable Design.

Support readings


Clarke, Abigail & John K. Gershenson 2006. Design for the Life Cycle. Life-cycle Engineering Laboratory, Department of Mechanical Engineering-Engineering Mechanics, Michigan Technological University

Frosch, Robert A. and Nicholas E. Gallopoulos, 1989. Strategies for manufacturing: Waste form one industrial process can serve as the raw materials for another reducing the impact of industry on the environment, Scientific American.


McDonough, William, Michael Braungart, Paul T. Anastas and Julie B. Zimmerman, 2003. Applying the principles of green engineering to cradle to cradle design, Environmental Science and Technology, December.

Supplementary readings


Everard, Dr Mark, Dr Caroline Gervais and Dr Conor Linstead, 2002. Towards the sustainable use of material resources: An evaluation using the natural step framework, *The Natural Step, June*.


Week 10

Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*  
Chapter 5: Design for the Built Environment

Support Readings


Supplementary Readings

Weeks 11-12
Finster, Mark P., 2011. Sustainable Perspectives to Design and Innovation
Chapter 6: Market Analysis for Sustainable Design

Support Readings
Esty, Daniel and Andrew S. Winston, 2006. Who’s behind the green wave? (Ch 3) in Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value and Build Competitive Advantage, Yale University Press.
Cotte, June and Remi Trudel, 2009. Socially conscious consumerism, a systematic review of the body of research, Network for Business Sustainability, nbs.net
Mintel 2009. Green Living US
Mintel 2008. Green Marketing

Supplementary Readings
Auger, Pat, Timothy M. Devinnery, Jordan J. Louviere and Paul Burke 2006. Do social product features have value to consumers? International Journal of Management Review, 06-067-VI.
Cotte, June, 2009. Socially conscious consumerism, highlights for educators from a systematic review of body of research, Network for Business Sustainability, nbs.net
Friedrich, Katherine, Jennifer Amann, Shruti Vaidyanathan and R. Neal Elliot 2010.
Kornevall, Christian 2008. If you want to go quickly, go alone; if you want to go far, go together. Available at http://www.eeb-blog.org/2008/05/if-you-want-to.html
Ramaswamy, Rohit, 1996. Assessing customer satisfaction (chapter 10), Improving service performance (chapter 11), Setting design performance characteristics (Chapter 4), in *Design and Management of Service Processes: Keeping Customers for Life*, Prentice Hall.

Week 13
Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*  
Chapter 7: Strategic design, Kano technique

Support readings

Supplementary readings
Sakao, Tomohiko, 2009. Quality engineering for early stage of environmentally conscious design, Department of Management and Engineering, Linkoping University, Sweden.

**Week 14**
Finster, Mark P., 2011. *Sustainable Perspectives to Design and Innovation*  
Chapter 8: Green Quality Function Deployment

**Support readings**


**Supplementary readings**


**Week 15**
Project reports