

■ HOLLY S. LEWIS, Feature Editor, Pennsylvania State University

Environmental and Operations Management Face the Future

Linda C. Angell, Smeal College of Business Administration,
The Pennsylvania State University

On a daily basis, operations managers make a variety of structural and infrastructural decisions which ideally support and implement the strategic priorities of corporate strategy in the areas of cost, quality, service, flexibility, and speed (Wheelwright and Hayes, 1985; Stalk, 1988). Environmental management typically has not held priority-status within corporate-level strategy. As a result, the field of operations management has traditionally treated environmental issues primarily as a series of decision constraints (Angell & Klassen, forthcoming).

However, external pressures relating to the natural environment have slowly gathered strength. Corporations of all sizes, processes, and industries face increasing demands for responsible environmental activity from legislators, regulators, customers, end-consumers, advocacy groups, local communities, and the realities of environmental degradation and dwindling raw material supplies. These increased pressures paralleled the growth of environmental management departments within firms. Environmental management has gradually come to be seen as a valid component of corporate strategy, albeit separate and distinct from operations management (Angell & Klassen, forthcoming).

As such, operations managers and environmental managers now face a similar series of corporate strategic priorities, and are thereby required to develop action programs both consistent with and sup-

portive of one another (i.e., pollution prevention, waste minimization, recycling, and re-manufacturing). In many ways, this evolution in the status of environmental management has followed in the path of quality management, which developed from a relative non-issue after WWII to eventually be assigned to the responsibility of a Quality Control Department in the mid-1980s.

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Extending the logic of this comparison between quality and environmental management leads to an important question — will the environ-

mental management discipline continue to evolve such that it becomes integral to corporate-level strategic priorities and to the daily activities of each functional area within the firm? If so, what does this mean for the field of operations management? In other words, what is the impact of environmental pressures, including strategic environmental priorities, on the structural and infrastructural decision-making of operations managers?

The concept of environmental operations management (Gupta and Sharma, 1996) advocates that “considerations related to the natural environment are integrated into all transformation processes, at both strategic and tactical levels, so that these processes are increasingly efficient and effective, thereby creating value for shareholders” (Angell & Klassen, forthcoming). This idea is relatively radical in the field of operations management, which traditionally focuses on buffering high-volume production and service processes from



Linda C. Angell

is an assistant professor of operations management at the Smeal College of Business, The Pennsylvania State University. Dr. Angell received her DBA from Boston University, her MBA from Babson College, and her BA

from the University of Massachusetts in Amherst. She currently serves as guest editor for a special issue of the International Journal of Operations and Production Management focused on the Impact of Environmental Pressures on Operations Management, to be published in mid-2000. Her research interests focus on environmental operations management, quality management, and work team dynamics, and her work has been published in the Journal of Operations Management and Zeitschrift für Planung. She spent two years at the University of Münster in Germany on a Fulbright Research Grant collecting data for her dissertation on the operational impacts of the 1991 German Packaging Ordinance. She received a Journal of Operations Management Reviewer Excellence Award this year, and won the 1997 Environmental Issues Paper Award, sponsored by Lucent Technologies and the Decision Sciences Institute.

the influence of external pressures. The remainder of this article explores the increasing integration of environmental and operations management concepts in terms of both practice and theory.

Integration in Practice

A recent mail survey of 1,550 manufacturing facilities located throughout Pennsylvania indicates the degree to which environmental and operating issues have become intertwined. The survey, typically completed by the "Environmental Manager" and/or the "Operations Manager," targeted all facilities with 100 or more employees operating in the foodstuff, apparel, printing and publishing, rubber and plastic, primary metals, fabricated metals, electronic equipment, and machinery/computer equipment industries. A total of 575 usable survey responses were received, for a total response rate of approximately 37.1% (Angell & Rands, 1998).

Respondents were asked to indicate whether their facility's Environmental Manager currently has regular and meaningful decision-making input regarding a variety of operations management considerations. Table 1 indicates that environmental managers have achieved significant input into traditional operating decisions, particularly with regard to process technologies, vendors, operations strategy, facility layout/location, and make versus buy choices.

Respondents were also asked to indicate whether their facility's operations manager currently has regular and meaningful decision-making input regarding various environmental management considerations. Table 2 shows that operations managers have achieved significant input into major environmental decisions. These findings suggest that the delineation between environmental and operations management is fading, at least among Pennsylvania manufacturing facilities.

Integration in Research

The increased integration of environmental and operations management issues appears to be sparking significant research interests as well. The past year has seen a flurry of special publication issues dedicated to the

Operating Issues	Number with Significant Input*	Percentage
Process Technology	318	55.3
Vendors/Suppliers	304	52.9
Operations Strategy	268	46.6
Facility Layout & Location	262	45.6
Make vs. Buy	192	33.4
Workforce Management	149	25.9
Quality Management	147	25.6
Product Development	141	24.5
Capacity	124	21.6
Scheduling	91	15.8
*Out of 575 Respondents		

Table 1: Extent of environmental managers' input into typical operating decisions.

Environmental Issues	Frequency*	Percentage
Environmental Management Strategy	316	55.0
Environmental Training	288	50.1
Environmental Reporting	261	45.4
Environmental Audits	259	45.0
Environmental Technologies	205	35.7
Relationships with Regulators	201	35.0
*Out of 575 Respondents		

Table 2: Extent of operations managers' input into typical environmental decisions.

intersection between environmental and operations management (Table 3). Focusing specifically on the *IJOPM* special issue, as guest editor, I can report that a total of 30 papers were submitted from researchers around the world. Topics were highly varied, exploring the relationship between environmental pressures or management practices and the full spectrum of structural and infra-structural operating decisions (Wheelwright & Hayes, 1985). Instead of focusing on the efforts of separate operations- and environmental-management departments to coordinate and accommodate each others' initiatives, this body of research investigated the extent to which routine operating decisions could and should fundamentally integrate environmental considerations.

A group of *IJOPM* submissions, typically using empirical methods, studied examples of environment-related improvements in the following structural operating decisions: process technology (i.e., green process innovations, process control techniques, key environmental technology investments, advanced manufacturing techniques, green process innovations); facilities (i.e., brown-field locations, waste treatment and/or recycling layouts), capacity (i.e., resource recovery, waste treatment facilities), and vertical integration (i.e., supply chain management, reverse logistics, industrial ecology).

Similarly, research topics focusing on environmental aspects of infrastructural operating decisions included: suppliers (i.e., green purchasing, vendor innovations,

Journal/Book	Special Issue Focus	Submission Deadlines
<i>Interfaces</i>	Ecologically Sustainable Business/Operations Practices	February 1998
<i>Computers and Industrial Engineering</i>	Operational Issues in Environmentally Conscious Manufacturing	February 1998 (For publication in 1998)
<i>European Journal of Operational Research (EJOR)</i>	Recoverable Product Environments and Systems for Reuse: Integrating Environmental Issues into Decision Making	March 1998
<i>Academy of Management Journal (AMJ)</i>	The Management of Organizations in the Natural Environment	May 1998
<i>Greener Marketing: A Global Perspective to Greening Marketing Practice</i> , by Greenleaf Publishing, U.K.	Strategic Issues & Rationale for Green Marketing; and Tactical Operating Issues	June 1998 (For publication in 1999)
<i>International Journal of Operations and Production Management (IJOPM)</i>	The Impact of Environmental Pressures on Operations Management	September 1998 (For publication in 2000)
<i>Environmental Management in Developing Countries</i> , by Greenleaf Publishing, U.K.	Varied, but includes: Leapfrogging Technology and Development	January 1999 (For publication in 1999)

Table 3. Recent special issues relating to environmental operations management.

and green technology transfers); new products (i.e., design for environment, design for disassembly, re-manufacturing, green product design); workforce (i.e., green teams, environmental compliance training, the role of environmental managers, appropriate framing of environmental issues on the factory floor); quality management (i.e., environmental awards, total quality environmental management, ISO 14000); and planning & control systems (i.e., environmental management systems, ISO 14000 implementation).

However, the concept of environmental operations management appears to spark interests far beyond the traditional scope of tactical operating decisions. A variety of additional *IJOPM* submissions addressed environmental operations management in developing nations, service operations, and treatment or waste management facilities. Others outlined approaches and opportunities for developing and measuring the performance of environmental operating strategies.

Summary

The field of operations management continues to expand in scope, currently towards the integration of environmental improvements into all areas of structural and infrastructural operating decisions. Increasing pressures and opportunities make environmental requirements everyone's business. This article outlines the development of environmental operations management, and discusses the integration of environmental and operations management in terms of both practice and recent research.

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Holly S. Lewis
 Pennsylvania State University
 303 Business Administration Building
 University Park, PA 16802
 (814) 863-3797
 fax: (814) 863-2381
 email: hsl2@psu.edu