

IEEE ENGINEERING MANAGEMENT SOCIETY

The Engineering Management Society is an organization within the framework of the IEEE, of members with professional interest in engineering management. All members of the IEEE are eligible for membership in the Society and will receive this TRANSACTIONS upon payment of the annual Society membership fee of \$30.00. For information on joining, write to the IEEE at the address below. See inside back cover for list of affiliated organizations, members of which may affiliate with EMS for \$58.00, plus EMS fee of \$30.00. *Member copies of Transactions/Journals are for personal use only.*

BOARD OF GOVERNORS

IRVING ENGELSON, *President*

CHARLES P. RUBENSTEIN, *Vice President—Conferences*

GUS GAYNOR, *Vice President—Publications*

DENNIS BODSON, *Past President*

G. A. ALPHONSE
J. H. BELLEFEUILLE
R. B. BISHOP
D. BODSON
M. W. BUCKLEY, JR.
V. A. CARR
C. DESMOND

T. S. DURRANI
P. A. ECKSTEIN
M. A. ERIKSSON
G. H. GAYNOR
J. GREFFORD
T. H. GRIM

L. A. LUCERI
T. J. MALKINSON
L. S. PETERS
M. REIDY
C. RUBENSTEIN
S. SALEM

MARK WERWATH, *Vice President—Education*

JOEL SNYDER, *Vice President—Recognition and External Affairs*

LOUIS A. LUCERI, *Treasurer*

TARIQ DURRANI, *Executive Vice President*

W. H. SHAW
J. SNYDER
M. WERWATH
H. WOLFMAN
B. K. ZIMET
B. ZIROLLI

Honorary Life Members:

V. A. CARR
M. W. BUCKLEY, JR.
A. GOLDSMITH
J. VAN SAVAGE

CELIA DESMOND, *Vice President—Member Relations*

PETER A. ECKSTEIN, *Secretary*

VIVIAN A. CARR, *Financial Advisor*

ROBERT B. BISHOP, JR., *Historian*

Ex Officio (With Vote)
G. F. FARRIS
T. J. MALKINSON
W. H. SHAW

Ex Officio (No Vote)
C. J. ANDREWS
M. WARD-CALLAN

IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT

Department Editors

Editor-in-Chief

GEORGE F. FARRIS
312 Technology Management
Research Center
Rutgers Business School -
Newark and New Brunswick
Rutgers, The State University of
New Jersey
111 Washington Street
Newark, NJ 07102-3027 USA
(973) 353-1077
Fax: (973) 353-1664
ieecetm@business.rutgers.edu

Editorial Assistant

YI-YU CHEN
312 Technology Management
Research Center
Rutgers Business School -
Newark and New Brunswick
Rutgers, The State University of
New Jersey
111 Washington Street
Newark, NJ 07102-3027 USA
(973) 353-1077
Fax: (973) 353-1664
ieecetm@business.rutgers.edu

People and Organizations

ROBERT T. KELLER
University of Houston
Dept. of Mgmt.
C. T. Bauer College of Business
keller@uh.edu

Information Technology

RAJIV SABHERWAL
University of Missouri, St. Louis
College of Business Administration
www.umsl.edu/~busrsabh/

R&D and Engineering Projects

JEFFREY K. PINTO
Penn State University, Erie
Samuel A. and Elizabeth B. Breene Prof. of Mgmt.
Sam and Irene Black Schl. of Business
jkip4@psu.edu

e-Business

ALOK CHAKRABARTI
New Jersey Inst. of Technol.
School of Management
chakrabarti@njit.edu

Models and Methodologies

ANN MARUCHECK
University of North Carolina
at Chapel Hill
Kenan-Flager Business Schl.
Ann_maruchek@unc.edu

Technology & Innovation Mgmt.

FARIBORZ DAMANPOUR
Rutgers University
Rutgers Business School -
Newark and New Brunswick
damanpour@business.rutgers.edu

Manufacturing Systems

JEFFREY LIKER
University of Michigan, Ann Arbor
Dept. of Industrial Eng.
liker@engin.umich.edu

Book Reviews

DAVID J. WELLS
Director, Division of
Engineering & Physics
Wilkes University
wells@wilkes.edu

Past Editors-in-Chief

ALBERT H. RUBENSTEIN (1958-1985)
DUNDAR F. KOCAOGLU (1986-2002)

JOHN AJE
SOENKE ALBERS
THOMAS ASTEBRO
ADEDIJI BADIRU
LOTTE BAILYN
GLORIA BARCZAK
JONATHAN F. BARD
MARIO BERUVIDES
MARKUS BIEHL
PAUL E. BIERLY, III
SUSAN A. BROWN
ELIAS CARAYANNIS
JANICE CARRILLO
RAJESH CHANDY
YIH-LONG CHANG
PATRALI CHATTERJEE
WYNNE CHIN
THOMAS CHOI
VIVEK CHOUDHURY

RENE CORDERO
TUGRUL DAIM
AMITAVA DUTTA
TERI ELKINS
JOHN ETTLIE
MITCHELL FLEISCHER
RICHARD M. FRANZA
JOHN FRIAR
ELIEZER GEISLER
DONALD GERWIN
SOU MEN GHOSH
SHANTHI GOPALAKRISHNAN
SAMUEL B. GRAVES
JANET HARTLEY
DAVID HAWK
TECK HO
KUU-TING HUNG
NANCY LEA HYER

Editorial Review Board

SURINDER KAHAI
ELENA KARAHANNA
JAHANGIR KARIMI
RALPH KATZ
MARKUS KEIL
REZA KHORRAMSHAHGOL
DENIS LEE
MOREN LEVESQUE
MATTHEW LIBERATORE
HAROLD A. LINSTONE
JONATHAN LINTON
ARVINDER P. S. LOOMBA
LEONARD LYNN
MICHAEL J. MAGAZINE
JOSEPH P. MARTINO
EDWARD F. McDONOUGH, III
SARFRAZ MIAN
DRAGAN MILOSEVIC
SABY MITRA

SAMAR K. MUKHOPADHYAY
MICHAEL MUMFORD
SURESH NAIR
SRIDHAR NARASIMHAN
BARRIE R. NAULT
ATUL NERKER
KIYOSHI NIWA
PAUL OLK
ALAN PORTER
SIMIN PULAT
THIAGARAJAN RAVICHANDRAN
A. RAVI RAVINDRAN
EDWARD B. ROBERTS
M. JOHNNY RUNGTHANATHAM
JOSEPH SARKIS
VICKI L. SAUTER
PEG SHIPLEY
DURWARD SOBEK

ANDERS SÖDERHOLM
CHERI SPEIER
JAMES E. STORBECK
BERNARD TAN
MOHAN V. TATIKONDA
HOCK-HAI TEO
CHRISTIAN TERWIESCH
JANICE THOMAS
CHARLES W. N. THOMPSON
RAY VENKATARAMAN
DUSYA VERA
STEVEN T. WALSH
NAZLI WASTI
KWOK-KEE WEI
ANDREW B. WHINSTON
DAVID WILEMON
GRAHAM M. WINCH
YEN-CHUN JIM WU
BILLIE J. ZIRGER

IEEE Officers

LEAH H. JAMIESON, *Vice President, Publication Services and Products*
MARC T. APTER, *Vice President, Regional Activities*
DONALD N. HEIRMAN, *President, IEEE Standards Association*
JOHN R. VIG, *Vice President, Technical Activities*
GERARD A. ALPHONSE, *President, IEEE-USA*

W. CLEON ANDERSON, *President and CEO*
MICHAEL R. LIGHTNER, *President-Elect*
MOHAMED EL-HAWARY, *Secretary*
JOSEPH V. LILLIE, *Treasurer*
ARTHUR W. WINSTON, *Past President*
MOSHE KAM, *Vice President, Educational Activities*

CLINTON J. ANDREWS, *Director, Division VI*

IEEE Executive Staff

DONALD CURTIS, *Human Resources*
ANTHONY DURNIAK, *Publications Activities*
JUDITH GORMAN, *Standards Activities*
CECELIA JANKOWSKI, *Regional Activities*
BARBARA COBURN STOLER, *Educational Activities*

MATTHEW LOEB, *Corporate Strategy & Communications*
RICHARD D. SCHWARTZ, *Business Administration*
CHRIS BRANTLEY, *IEEE-USA*
MARY WARD-CALLAN, *Technical Activities*
SALLY A. WASELIK, *Information Technology*

IEEE Periodicals Transactions/Journals Department

Staff Director: FRAN ZAPPULLA

Editorial Director: DAWN MELLEJ Production Director: ROBERT SMREK
Managing Editor: JEFFREY E. CICHOCKI Associate Editor: PATRICIA M. PENA

IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT (ISSN 0018-9391) is published quarterly by The Institute of Electrical and Electronics Engineers, Inc. Responsibility for the contents rests upon the authors and not upon the IEEE, the Society, Council, or its members. **IEEE Corporate Office:** 3 Park Avenue, 17th Floor, New York, NY 10016-5997. **IEEE Operations Center:** 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. **NJ Telephone:** +1 732 981 0060. **Price/Publication Information:** Individual copies: IEEE Members \$20.00 (first copy only), nonmembers \$88.00 per copy. (Note: Postage and handling charge not included.) Member and nonmember subscription prices available upon request. Available in microfiche and microfilm. **Copyright and Reprint Permissions:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy for private use of patrons, provided the per-copy fee indicated in the code at the bottom of the first page is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For all other copying, reprint, or republication permission, write to Copyrights and Permissions Department, IEEE Publications Administration, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. Copyright © 2005 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Periodicals Postage Paid at New York, NY, and at additional mailing offices. **Postmaster:** Send address changes to IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT, IEEE, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. GST Registration No. 125634188. Printed in U.S.A. No. 125634188. Printed in U.S.A.