

# **43rd International Annual Conference of the American Society for Engineering Management (ASEM 2022)**

**Engineering Managers as the  
Champions of Change**

**Tampa, Florida and Online  
5-8 October 2022**

## **Editors:**

**G. Natarajan  
E.H. Ng  
P.F. Katina  
H. Zhang**

**ISBN: 978-1-7138-6638-1**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2022) by American Society for Engineering Management (ASEM)  
All rights reserved.

Printed by Curran Associates, Inc. (2023)

For permission requests, please contact American Society for Engineering Management (ASEM)  
at the address below.

American Society for Engineering Management (ASEM)  
200 Sparkman Drive, Suite 2  
Huntsville, AL 35805  
USA

Phone: (256) 503-8482  
Fax: (256) 723-8877

ASEM-HQ@asem.org

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## Index of Published Papers

Page:	AUTHORS
1	INTEGRATION OF MODEL BASED SYSTEMS ENGINEERING AND COMPLEX SYSTEM GOVERNANCE.....Polinpapilinho F. Katina, Ph.D. Charles B. Keating, Ph.D.* William Edmonson, Ph.D James C. Pyne, Ph.D. Joseph Sisti, Ph.D. Adrian V. Gheorghe, Ph.D.
11	ENGINEERING EDUCATION: RESEARCH AND PROFESSIONAL SKILLS DEVELOPMENT .....Simon P. Philbin
21	AN ANALYTICAL APPROACH FOR MANAGING INTEGRATION OF NEW TECHNOLOGIES .....Alejandro S. Hernandez, PhD* Anthony G. Pollman, PhD Mary L. McDonald, MS Karen Mislick, MS
31	RESULTS OF ROLE DELINEATION STUDY TO DEVELOP EXAM BLUEPRINT FOR CPEM AND CAEM CERTIFICATION EXAMS .....Swati Pandey, M.S., CSM, PMP Hiral Shah, Ph.D., CEI, CPEM, CSM, PMP* Ben Baliga, Ph.D., CPEM, P.E.
41	FIRMS AND THEIR LIFECYCLE: CIRCUMSTANCES THAT IMPEDE THE LEARNING PROCESS IN HI-TECH MARKETS.....Tamas Kopolyay, Ph.D., M.B.A., M.Sc., M.A.* Larissa Kopolyay, M.A. Michael Steinberg, M.Res., M.A.
51	SYSTEM IMPROVEMENT OPPORTUNITIES ACROSS WATER INFRASTRUCTURE MANAGEMENT.....Keith H. Horbatuck*, Mario G. Beruvides, Ph.D., P.E.
62	QUANTUM FORMALISM'S CONTRIBUTIONS FOR DECISIONS: THE IDENTIFICATION OF OPTIMAL STRATEGIES.....Amine Amar, Ph.D., P.Eng.*
70	CONCURRENT ENGINEERING'S FUNCTIONAL ROLE IN MANUFACTURING MEDICAL ROBOTICS.....Luciano Formilan, M.E.M. Alexandr M. Sokolov, Ph.D., M.B.A. * Niamat Ullah Ibne Hossain, Ph.D., M.B.A.
77	FIELD SERVICE QUOTING PROCESS IMPROVEMENT USING DMAIC.....Alexandr M. Sokolov, Ph.D., M.B.A. Brooks Hoffman Niamat Ullah Ibne Hossain, Ph.D., M.B.A.
85	OPTIMIZATION OF A PACKAGING STATION USING DMAIC .....Alexandr M. Sokolov, Ph.D., M.B.A. Marissa D. Nixon Niamat Ullah Ibne Hossain, Ph.D., M.B.A.

92	PROJECT MANAGEMENT: ENGINEERING VS. NON-ENGINEERING.....	Alexandr M. Sokolov, Ph.D., M.B.A. Jessica L. Schulze, M.E.M., M.Ed. Niamat Ullah Ibne Hossain, Ph.D., M.B.A. Luciano Formilan, M.E.M.
100	THE IMPORTANCE OF VALUE ANALYSIS (VA) EARLY IN AN INFRASTRUCTURE PROJECT'S LIFE CYCLE.....	Alexandr M. Sokolov, Ph.D., M.B.A. Kyle J. Gauthier, PE Niamat Ullah Ibne Hossain, Ph.D., M.B.A.
108	BUSINESS CYCLE ANALYSIS USING STATISTICAL PROCESS CONTROL: DATA AND METHODOLOGICAL ISSUES RELATED TO ANALYSING EUROPEAN ECONOMIES ....	Alexander Wendler, M.S.* Mario G. Beruvides, Ph.D., P.E.
118	SCARCITY AND COMPROMISE, BUILDING A DIFFERENT SKILLSET FOR ENGINEERING MANAGERS .....	Joseph Munn, M.S. Mario Beruvides, Ph.D., P.E.
126	SUPPLY CHAIN VULNERABILITIES OF THE U.S. DEFENSE INDUSTRIAL BASE.....	Caleb Suh* Vikram Mittal, Ph.D., M.S. James H. Schreiner, Ph.D., M.E. Jonathan Spaner, M.B.A., M.S.
137	WARGAMING: A PRACTICAL AND AFFORDABLE APPROACH FOR STRATEGIC PLANNING .....	Darrell Kleinke, Ph.D. * Alan Kleinke, B.Sc.
146	REIMAGINING ENGINEERING UNDERGRADUATE PROGRAMS TO FILL THE TALENT PIPELINE.....	Darrell Kleinke, Ph.D. * Shuvra Das, Ph.D. David Pistrui, Ph.D.
156	BUSINESS PROCESS REENGINEERING FOR PROCESS OPTIMIZATION: A CASE STUDY.....	Chuks Medoh* Muchairi Alfred Arnesh Telukdarie
166	SYSTEM INTEGRATION FOR SMALL ENTERPRISES: SYSTEMATIC LITERATURE REVIEW.....	Chuks Medoh* Arnesh Telukdarie
176	ATTRITION, COMPETENCY, AND PRODUCTIVITY IN THE AGE OF THE GREAT RESIGNATION .....	David Williams, B.S., MBA* Mary Williams, B.S.
186	OPTION GAME MODEL FOR GENERATION INVESTMENT ANALYSIS IN RENEWABLE ENERGY NON-CONVENTIONAL IN THE ELECTRICITY MARKET. A CASE FOR COLOMBIA.....	Claudia María García Mazo, Ph.D.*

- 196 INVENTORY MANAGEMENT OPTIMIZATION FOR CAPITAL  
GOODS MAINTENANCE..... Islan de Castro Gomes Mechanical Eng \*  
Fernando Deschamps, Ph.D.
- 203 APPLICATION OF SYSTEM MODELING LANGUAGE (SysML) IN CYBER LEVEL ARCHITECTURE  
OF INDUSTRY 4.0..... Ifaz Ahmed  
Mehayrun Nesa Shupti  
Md. Saiful Islam  
Niamat Ullah Ibne Hossain\*  
Alexandr M. Sokolov
- 212 IMPROVING RELIABILITY INDICES OF POWER DISTRIBUTION SYSTEM LEVERAGING  
MANAGEMENT ORIENTED APPROACH..... Nafis Sadik  
Niamat Ullah Ibne Hossain, Ph.D.\*  
Mustafa Masood  
Alexandr Sokolov, Ph.D.
- 222 WORKFORCE DISENGAGEMENT - THE EASIEST MANAGEMENT METHOD..... David C. Paulus, PhD, PE, CPEM
- 228 FEEDBACK RESEARCH PROCESS: FINDING YOUR RESEARCH FASTER AND  
MORE EFFECTIVELY ..... Ben Park, M.S.\*  
Timothy Kotnour, Ph.D
- 233 STARTING UP A GLOBALLY DISTRIBUTED TEAM: A PRESCRIPTIVE APPROACH BASED ON  
REAL-LIFE EXPERIENCE VALIDATED WITH RESEARCH..... Ben Park, MS\*,  
Timothy Kotnour, Ph.D.
- 242 A PRELIMINARY REVIEW OF GUIDANCE FOR TECHNICAL MEASURE SELECTION IN  
ACADEMIC LITERATURE ..... Casey Eaton, M.S.\*  
Grace Liverett  
Bryan Mesmer, Ph.D.
- 250 CRITICAL SUCCESS FACTORS FOR LEAN PRODUCTION: A CONCEPTUAL  
FRAMEWORK-BASED LITERATURE REVIEW..... Mohammed Alrezq
- 259 RELIABILITY ANALYSIS IN THE ADOPTION OF CLOUD COMPUTING..... Kagiso Mokoena,  
Meng Bheki Makhanya, PhD\*  
Nel Hannelie, Deng
- 269 DEEP LEARNING MODELS AND TOOLS FOR DISASTER  
EVACUATION AND ROUTING ..... Nick Kutheis  
Suzanna Long, PhD, CPEM F.ASEM, F.IISE\*  
Steven Corns, PhD, CPEM F.ASEM
- 275 ISOMORPHOLOGICAL CONNECTIONS BETWEEN FINANCIAL AND  
WATER SUPPLY PORTFOLIOS ..... Richard A. Burgess, M.A.\*  
Mario G. Beruvides, Ph.D., P.E.

- 282 DISCRETE CHOICE EXPERIMENT TO STUDY CONSUMER PREFERENCES FOR RENEWABLE ENERGY PROCUREMENT OPTIONS ..... Ankit Agarwal, M.S.\*
- 291 USING KEY ECONOMIC FACTORS FOR ENERGY PORTFOLIO TRANSITIONS IN CARIBBEAN ISLANDS ..... Ashley-Ann Davis  
Suzanna Long, PhD, CPEM, FASEM, F.IISE\*  
Casey Canfield, PhD
- 298 LEAN SIX SIGMA FOR MITIGATING HIGH SCHOOL DROPOUTS ..... Wolday Abrha, Ph.D., CPEM, LSSBB\*  
Raga Ahmed, Ph.D.  
Patricia Gould, M.S.  
Charlton McCollum, M.S.
- 305 CORPORATE RESTRUCTURING SPIN-OFF OF PROJECT MANAGEMENT ORGANIZATION: IDENTIFYING THE KEY RESEARCH FACTORS ..... Stephen Davis, M.S.\*
- 314 METALLOGRAPHIC SAMPLE PREPARATION USING ENGINEERING MANAGEMENT PRINCIPLES ..... Uche Awuruonye, M.Sc.\*  
Yesim Sireli, Ph.D., CPEM
- 324 QUALIFYING THE VALUE OF LIFE-CYCLE PROCESS MODELS IN SYSTEM DEVELOPMENT: AN INVESTIGATION INTO PERCEPTIONS IN ACADEMIC LITERATURE ..... Thomas Teper\*  
Kelly Campo  
Casey Eaton, M.S.  
Bryan Mesmer, Ph.D.
- 335 A COMPARATIVE STUDY ON COPPER CONDUCTOR MANUFACTURING PROCESSES ..... Mudit Bafna, M.S.\*  
Himlona Palikhe, Ph.D.
- 341 OUTLOOK OF ELECTRIC VEHICLE MARKET: PREDICTING EV PRICES USING MACHINE LEARNING TECHNIQUES ..... Hamza Aljarash, M.S.  
Seong Dae Kim, Ph.D.\*
- 352 PROJECT ENGINEERING MANAGER CERTIFICATION: BRINGING THE BRIDGE BETWEEN PROJECT MANAGEMENT AND ENGINEERING MANAGEMENT ..... Artem Shushkov, M.S.\*  
Gene Dixon, Ph.D., CPEM, FASEM
- 362 ANALYSIS OF FACTORS AFFECTING MODEL-BASED SYSTEMS ENGINEERING IN SMALL AND MEDIUM ENTERPRISES IN SOUTH AFRICA ..... Justine Geraldine Nanfuka MEng.  
Rudolph Oosthuizen Ph.D.,\*
- 373 QUANTIFYING RESPONSIVENESS IN THE VACCINE INDUSTRY TO EVALUATE AND IMPROVE PANDEMIC RESPONSE ..... Mary Ann Gaal, Ph.D.\*  
Connor Hill
- 383 APPLYING THE PRODUCTION CULTURAL BIORHYTHM IN THE DMAIC PROCESS ..... Karen Schmahl, Ph.D.\*  
Bernd Langer, Ph.D.

389	A 2022 SURVEY OF ENGINEERING MANAGEMENT ACADEMIC PROGRAMS.....	David A. Wyrick, Ph.D., P.E., CPEM *
		Robin Hensel, Ed.D.
		Monir Zibaei, MSIE
397	DIGITAL INTEGRATION OF ERP TO THE SENSOR NETWORK FOR BUSINESS OPTIMIZATION.....	Michael Sishi, Ph.D.
		Arnesh Telukdarie, Ph.D.*
406	MIDDLE MANAGEMENT: A SYSTEMIC CONSIDERATION OF MIDDLE MANAGERS ROLE IN ORGANIZATIONS .....	Neal Wilkinson, M.Eng.*
		Javier Calvo-Amodio, Ph.D.
416	IMPROVING PROJECT MANAGEMENT EFFICIENCIES IN THE OFFICE OF CONSTRUCTION AND FACILITIES MANAGEMENT, DEPARTMENT OF VETERAN AFFAIRS .....	Kenneth McDonald, PhD, PE, PMP, CPEM*
		Isaac Dixon
		Leang Tri
		Nikita Larichev
		Nathaniel Jones
423	GIVING LEADERSHIP TIME TO RISE: A CAPSTONE GROUP CASE STUDY.....	Kenneth McDonald, PhD, PE, PMP, CPEM*
430	ENGINEERING MANAGEMENT IN THE AGE OF TECHNOLOGICAL CHANGE.....	Thomas J. Day, Ph.D.*
437	THE TRIUMVIRATE APPROACH TO ENGINEERING MANAGEMENT .....	Thomas J. Day, Ph.D.*
444	LINKAGE EVOLUTION OF CLIMATE CHANGE AND FINANCIAL IMPACT FOR FIRMS: A BIBLIOMETRIC ANALYSIS.....	Carlos Sánchez-González, Ph.D.*
		Christian Lochmuller, M.Sc.
		Ana M. Osorio, M.Sc.
		Carlos E. Bustamante, M.Sc.
455	THE OVERLAP OF STRATEGIC MANAGEMENT AND SUPPLY CHAIN MANAGEMENT FROM AN ENGINEERING MANAGEMENT PERSPECTIVE FOR THE GERMAN AUTOMOTIVE INDUSTRY .....	S. Jimmy Gandhi, PhD*
		Guenter Hofbauer, PhD
465	A COMPARISON OF HOW THE TRANSPORTATION AND LOGISTICS INDUSTRY AND THE AUTOMOTIVE INDUSTRY'S SUPPLY CHAIN PROCESSES HAVE BEEN AFFECTED BY COVID-19 AND HOW ENTREPRENEURIAL COMPETENCIES COULD BE USED TO ADDRESS THEM.....	S. Jimmy Gandhi, Ph.D.*
		Colleen C. Robb, Ph.D.
		John H. Wilson, Ph.D., MBA
		Dirk Hecht, PhD
475	THE NEW FACE OF ENGINEERING MANAGEMENT IN A PROJECT MANAGEMENT SETTING .....	Thomas J. Day, Ph.D.*

- 482 THE INFLUENCE OF TRANSFORMATIONAL AND DEMOCRATIC LEADERSHIP ON MOTIVATION TO ACHIEVE ORGANIZATION GOALS.....Benny Mamimpin\*  
Philip Appiah-Kubi, PhD
- 491 INTERNATIONAL ASPECTS OF CHANGE MANAGEMENT WITHIN ENGINEERING ENDEAVORS Affected BY THE PANDEMIC..... Dr. Richa Gulati, Ph.D., MoAPM, Exec. MBA, BIT  
Prof. Leonie Hallo, Ph.D
- 501 APPLICATION OF LEAN SIX SIGMA TO REDUCE THE DOWNTIME OF THE HYDROSTATIC TEST MACHINES ..... Paulo H. Cortez, M.S.  
Ben Baliga, Ph.D., P.E.  
Hiral Shah, Ph.D., P.E.\*
- 511 THE POWER OF LEADERSHIP IN INITIATING CHANGE: A CASE STUDY FROM AN EGYPTIAN CLASSROOM ..... Mariam Makramalla, PhD\*  
Amr Ibrahim, Ph.D., P.E.
- 517 DESIGN OF AN EXPERT SURVEY TO EVALUATE SUCCESS FACTORS FOR KAIZEN EVENTS IN HOSPITALS ..... Kimberly Harry, M.S.
- 537 WHAT WE HAVE LEARNED FROM TELEHEALTH IMPLEMENTATION DURING THE COVID-19 PANDEMIC: SYSTEMATIC INVESTIGATION OF CHALLENGES IN ESTABLISHING VIRTUAL CONSULTING ..... Maryam Tabibzadeh  
Mohamed Yoosha Tungekar
- 537 CONSIDERATIONS FOR THE DEVELOPMENT OF A DATA-DRIVEN AND MACHINE LEARNING-BASED PREDICTIVE MAINTENANCE IMPLEMENTATION PLAN FOR THE SOUTH AFRICAN RAILWAY INDUSTRY ..... Lindelani Nethamba, B.Eng.  
Schalk Grobbelaar, Ph.D. \*
- 547 MARKETING MODEL AND STRATEGY FOR LOCAL FOOD BRANDS IN AN AREA OF FOOD INSECURITY ..... Benny Mamimpin\*  
Dr. Philip Appiah-Kubi, PhD  
Dr. Sandra Furterer, PhD
- 557 ENHANCING THE ENERGY EFFICIENCY OF AN AUTOMOTIVE MANUFACTURING SHOP THROUGH THE APPLICATION OF PROJECT MANAGEMENT CONCEPTS ..... Niamat Ullah Ibne Hossain, Ph.D., M.B.A.\*  
Clint Kendrick, M.E.M.  
Alexandr M. Sokolov, Ph.D., M.B.A.  
Luciano Formilan, M.E.M.
- 564 CONCEPT PAPER FOR ECONOMIC ANALYSIS OF WORKING FROM HOME ..... Karan Shah, M.S.  
Manish Ranjit, Ph.D.

- 570 APPLICATION OF DATA DRIVEN QUALITY MANAGEMNT APPROACH TO  
ENHANCE THE EFFICIENCY OF WASTEWATER TREATMENT PLANTS.....Niamat Ullah Ibne Hossain, PhD \*  
Darryl Dromgoole II  
Nafis Sadik  
Alexandr Sokolov, PhD
- 580 CORPORATE ENGINEERING MANAGEMENT IN LARGE  
ENTERPRISES AND GOVERNMENTS .....Thomas J. Day, Ph.D.\*
- 587 EMPLOYING DATA DRIVEN METHODS TO STRENGTHEN THE  
ENGINEERING MANAGEMENT TALENT PIPELINE .....David Pistrui, Ph.D.\*  
Nassif Rayess, Ph.D.  
Ron Bonnstetter, Ph.D.  
Eric Gehrig, Ph.D.
- 598 ELECTRICAL DISTRIBUTION: DEVELOPING A STRATEGIC PLAYBOOK FOR  
OPENING A NEW PROXIMITY EXPANSION LOCATION IN A DENSITY MARKET .....Tracy Scotch, MID\*  
Bharani Nagarathnam, Ph.D.
- 608 A ROUGH ORDER OF MAGNITUDE COSTING TOOL FOR INDUSTRIAL  
CAM FOLLOWERS: A CASE STUDY .....Logan Edwards, MID\*  
Bharani Nagarathnam, Ph.D.
- 618 MANAGING ALIGNMENT BETWEEN ORGANIZATIONAL THINKING AND DOING .....Hua-Ching Liao  
Javier Calvo-Amodio, Ph.D.\*
- 629 EMPIRICAL METHODS TO DEMYSTIFY AND EMPOWER THE NEXT  
GENERATION ENGINEERING TALENT PIPELINE .....David Pistrui, Ph.D.\*  
Ron Bonnstetter, Ph.D.  
Eric Gehrig, Ph.D.
- 640 TEAM DYNAMICS AND PERFORMANCE IN STRATEGIC MANAGEMENT  
BUSINESS CAPSTONE COURSE.....Maria del Carmen Capote, Ph.D., M.B.A., M.O.T., B.F.A.  
Hongtao Dang, Ph.D., P.E., CPEM\*
- 650 STRATEGIC PLANNING FRAMEWORK FOR RESIDENTIAL  
CONSTRUCTION STARTUP COMPANIES .....Maria del Carmen Capote, Ph.D., M.B.A., M.O.T., B.F.A  
Hongtao Dang, Ph.D., P.E., CPEM, ENV SP\*
- 658 INTRODUCTION TO PREDICTIVE MAINTENANCE BASED MACHINE LEARNING WITH  
RISK AND UNCERTAINCIES: A STATE OF THE ART .....Fabrice Chilly Ngamaleu Piengang, MS\*  
Yvan Beauregard, Ph.D., PMP, MBA, P.E.
- 669 ENGINEERING IDENTITY AND THE ENGINEERING MANAGER .....Mario G. Beruvides, Ph.D.\*  
Jennifer Cross, Ph.D.  
Kelli Cargile-Cook  
Naveen Tiruvengadam, Ph.D.  
Armando Elizondo-Noriega

- 677 CREATIVELY THINKING ABOUT (ASEM) STRUCTURE AND  
BUSINESS DEVELOPMENT ..... Gene Dixon, BSMTIE, MBA, PhD, FASEM, CPEM\*  
Neal Lewis CPEM, Ph.D., FASEM  
Paul Kauffmann, BSEE, MENG, PhD, PE, CPEM, FASEM  
Angie Cornelius, pursuing a MSIS
- 687 ADVANCED MANUFACTURING MANAGEMENT: A COMPLEX  
SYSTEMS PERSPECTIVE ..... Polinpapilinho F. Katina, Ph.D., CPEM\*  
Rachel C. Katina
- 695 ANALYSIS OF FACTORS AFFECTING COST PERFORMANCE OF EYE CARE  
SERVICES AT THE VETERANS AFFAIR MEDICAL CENTERS.....Ertunga C. Ozelkan, Ph.D.\*  
Pranita Vashisth, M.S.  
Charles Davis, OD, MPH, MHA