

Engineering Better Care A Systems Approach To Health And

A guide to combining two powerful management techniques to transform any business organization into a masterpiece of business efficiency. Lester Dean Thurow, Dean of MIT's Sloan School of Management, recently stated that benchmarking combined with process engineering will be the most important management technique of the 1990s. Now, in this groundbreaking book, Gregory Watson describes how top corporations worldwide have already successfully implemented that powerful cutting-edge technique—which he calls “business systems engineering”—to promote continuous improvement. More importantly, he clearly demonstrates how you can do the same in your organization. * Introduces business systems engineering, a dynamic new approach to rethinking and redesigning business processes to achieve dramatic improvements in quality, cost, service, speed, and more * Offers clear guidelines for using business systems engineering techniques to make your organization more dynamic, productive, and able to adapt to change in today's global marketplace * Incorporates key aspects of TQM, business process improvement, policy deployment, industrial engineering, teamwork, problem solving, and information technology into one holistic system * Includes business systems engineering success stories, including those at Compaq, United Services Automobile Association and Motorola, as well as a survey of the effect of systems change across the global automobile industry

Improving our nation's healthcare system is a challenge which, because of its scale and complexity, requires a creative approach and input from many different fields of expertise. Lessons from engineering have the potential to improve both the efficiency and quality of healthcare delivery. The fundamental notion of a high-performing healthcare system—one that increasingly is more effective, more efficient, safer, and higher quality—is rooted in continuous improvement principles that medicine shares with engineering. As part of its Learning Health System series of workshops, the Institute of Medicine's Roundtable on Value and Science-Driven Health Care and the National Academy of Engineering, hosted a workshop on lessons from systems and operations engineering that could be applied to health care. Building on previous work done in this area the workshop convened leading engineering practitioners, health professionals, and scholars to explore how the field might learn from and apply systems engineering principles in the design of a learning healthcare system. Engineering a Learning Healthcare System: A Look at the Future: Workshop Summary focuses on current major healthcare system challenges and what the field of engineering has to offer in the redesign of the system toward a learning healthcare system.

America's health care system has become too complex and costly to continue business as usual. Best Care at Lower Cost explains that inefficiencies, an overwhelming amount of data, and other economic and quality barriers hinder progress in improving health and threaten the nation's economic stability and global competitiveness. According to this report, the knowledge and tools exist to put the health system on the right course to achieve continuous improvement and better quality care at a lower cost. The costs of the system's current inefficiency underscore the urgent need for a systemwide transformation. About 30 percent of health spending in 2009—roughly \$750 billion—was wasted on unnecessary services, excessive administrative costs, fraud, and other problems. Moreover, inefficiencies cause needless suffering. By one estimate, roughly 75,000 deaths might have been averted in 2005 if every state had delivered care at the quality level of the best performing state. This report states that the way health care providers currently train, practice, and learn new information cannot keep pace with the flood of research discoveries and technological advances. About 75 million Americans have more than one chronic condition, requiring coordination among multiple specialists and therapies, which can increase the potential for miscommunication, misdiagnosis, potentially conflicting interventions, and dangerous drug interactions. Best Care at Lower Cost emphasizes that a better use of data is a critical element of a continuously improving health system, such as mobile technologies and electronic health records that offer significant potential to capture and share health data better. In order for this to occur, the National Coordinator for Health Information Technology, IT developers, and standard-setting organizations should ensure that these systems are robust and interoperable. Clinicians and care organizations should fully adopt these technologies, and patients should be encouraged to use tools, such as personal health information portals, to actively engage in their care. This book is a call to action that will guide health care providers; administrators; caregivers; policy makers; health professionals; federal, state, and local government agencies; private and public health organizations; and educational institutions.

Agile Systems Engineering presents a vision of systems engineering where precise specification of requirements, structure, and behavior meet larger concerns as such as safety, security, reliability, and performance in an agile engineering context. World-renown author and speaker Dr. Bruce Powel Douglass incorporates agile methods and model-based systems engineering (MBSE) to define the properties of entire systems while avoiding errors that can occur when using traditional textual specifications. Dr. Douglass covers the lifecycle of systems development, including requirements, analysis, design, and the handoff to specific engineering disciplines. Throughout, Dr. Douglass couples agile methods with SysML and MBSE to arm system engineers with the conceptual and methodological tools they need to avoid specification defects and improve system quality while simultaneously reducing the effort and cost of systems engineering. Identifies how the concepts and techniques of agile methods can be effectively applied in systems engineering context Shows how to perform model-based functional analysis and tie these analyses back to system requirements and stakeholder needs, and forward to system architecture and interface definition Provides a means by which the quality and correctness of systems engineering data can be assured (before the entire system is built!) Explains agile system architectural specification and allocation of functionality to system components Details how to transition engineering specification data to downstream engineers with no loss of fidelity Includes detailed examples from across industries taken through their stages, including the "Waldo" industrial exoskeleton as a complex system

Building a Safer Health System
Building Safer Systems for Better Care
Management Engineering
System of Systems Engineering
HCSE, Montréal, Canada, May 30 - June 1, 2019
Systems Engineering
Biomedical Engineering for Global Health

Patient-centered, high-quality health care relies on the well-being, health, and safety of health care clinicians. However, alarmingly high rates of clinician burnout in the United States are detrimental to the quality of care being provided, harmful to individuals in the workforce, and costly. It is important to take a systemic approach to address burnout that focuses on the structure, organization, and culture of health care. Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being builds upon two groundbreaking reports from the past twenty years, To Err Is Human: Building a Safer Health System and Crossing the Quality Chasm: A New Health System for the 21st Century, which both called attention to the issues around patient safety and quality of care. This report explores the extent, consequences, and contributing factors of clinician burnout and provides a framework for a systems approach to clinician burnout and professional well-being, a research agenda to advance clinician well-being, and recommendations for the field.

Clinical Systems Engineering: New Challenges for Future Healthcare covers the critical issues relating to the risk management and design of new technologies in the healthcare sector. It is a comprehensive summary of the advances in clinical engineering over the past 40 years, presenting guidance on compliance and safety for hospitals and engineering teams. This contributed book contains chapters from international experts, who provide their solutions, experiences, and the successful methodologies they have applied to solve common problems in the area of healthcare technology. Topics include compliance with the European Directive on Medical Devices 93/42/EEC, European Norms EN 60601-1-6, EN 62366, and the American Standards ANSI/AAMI HE75: 2009. Content coverage includes decision support systems, clinical complex systems, and human factor engineering. Examples are fully supported with case studies, and global perspective is maintained throughout. This book is ideal for clinical engineers, biomedical engineers, hospital administrators and medical technology manufacturers. Presents clinical systems engineering in a way that will help users answer many questions relating to clinical systems engineering and its relationship to future healthcare needs Explains how to assess new healthcare technologies and what are the most critical issues in their management Provides information on how to carry out risk analysis for new technological systems or medical software Contains tactics on how to improve the quality and usability of medical devices

Discover the emerging science and engineering of System of Systems Many challenges of the twenty-first century, such as fossil fuel energy resources, require a new approach. The emergence of System of Systems (SoS) and System of Systems Engineering (SoSE) presents engineers and professionals with the potential for solving many of the challenges facing our world today. This groundbreaking book brings together the viewpoints of key global players in the field to not only define these challenges, but to provide possible solutions. Each chapter has been contributed by an international expert, and topics covered include modeling, simulation, architecture, the emergence of SoS and SoSE, net-centricity, standards, management, and optimization, with various applications to defense, transportation, energy, the environment, healthcare, service industry, aerospace, robotics, infrastructure, and information technology. The book has been complemented with several case studies—Space Exploration, Future Energy Resources, Commercial Airlines Maintenance, Manufacturing Sector, Service Sector, Intelligent Transportation, Future Combat Missions, Global Earth Observation System of Systems project, and many more—to give readers an understanding of the real-world applications of this relatively new technology. System of Systems Engineering is an indispensable resource for aerospace and defense engineers and professionals in related fields.

Introduction to Clinical Engineering focuses on the application of engineering practice within the healthcare delivery system, often defined as clinical engineering. Readers will explore the fundamental concepts integral to the support of healthcare technology to advance medical care. The primary mission of clinical engineers is the utilization of medical devices, software, and systems to deliver safe and effective patient care throughout technology's lifecycle. This unique and interdisciplinary workforce is part of the healthcare team and serves as the intersection between engineering and medicine. This book is aimed at practitioners, managers, students, and educators to serve as a resource that offers a broad perspective of the applications of engineering principles, regulatory compliance, lifecycle planning, systems thinking, risk analysis, and resource management in healthcare. This book is an invaluable tool for healthcare technology management (HTM) professionals and can serve as a guide for students to explore the profession in depth. Offers readers an in-depth look into the support and implementation of existing medical technology used for patient care in a clinical setting Provides insights into the clinical engineering profession, focusing on engineering principles as applied to the US healthcare system Explores healthcare technology, hospital and systems safety, information technology and interoperability with medical devices, clinical facilities management, as well as human resource management

Systems Analysis Tools for Better Health Care Delivery
Applications and Case Studies
To Err Is Human
Best Care at Lower Cost
A Systems Approach to Professional Well-Being
Systems Engineering in the Fourth Industrial Revolution
Biomedical Engineering

Production Systems Engineering (PSE) is an emerging branch of Engineering intended to uncover fundamental principles of production systems and utilize them for analysis, continuous improvement, and design. This volume is the first ever textbook devoted exclusively to PSE. It is intended for senior undergraduate and first year graduate students interested in manufacturing. The development is first principle-based rather than recipe-based. The only prerequisite is elementary Probability Theory; however, all necessary probability facts are reviewed in an introductory chapter. Using a system-theoretic approach, this textbook provides analytical solutions for the following problems: mathematical modeling of production systems, performance analysis, constrained improvability, bottleneck identification and elimination, lean buffer design, product quality, customer demand satisfaction, transient behavior, and system-theoretic properties. Numerous case studies are presented. In addition, the so-called PSE Toolbox, which implements the algorithms developed, is described. The volume includes numerous case studies and problems for homework assignment.

This book presents some recent systems engineering and mathematical tools for health care along with their real-world applications by health care practitioners and engineers. Advanced approaches, tools, and algorithms used in operating room scheduling and patient flow are covered. State-of-the-art results from applications of data mining, business process modeling, and simulation in healthcare, together with optimization methods, form the core of the volume. Systems Analysis Tools for Better Health Care Delivery illustrates the increased need of partnership between engineers and health care professionals. This book will benefit researchers and practitioners in health care delivery institutions, staff members and professionals of specialized hospital units, and lecturers and graduate students in engineering, applied mathematics, business administration and health care.

Biomedical Engineering: Health Care Systems, Technology and Techniques is an edited volume with contributions from world experts. It provides readers with unique contributions related to current research and future healthcare systems. Practitioners and researchers focused on computer science, bioinformatics, engineering and medicine will find this book a valuable reference.

Build complex embedded systems faster and with lower costs by:

- * Knowing when and how much simulation testing is appropriate
- * Applying engineering methods to simulation design and development
- * Using the best tools available to develop simulations. * Va

Managing Breakthrough Changes for Productivity and Profit

The Path to Continuously Learning Health Care in America

Introduction to Clinical Engineering

From Devices to Systems

Advancing Diversity, Inclusion, and Social Justice Through Human Systems Engineering

A New Health System for the 21st Century

Business Systems Engineering

Experts estimate that as many as 98,000 people die in any given year from medical errors that occur in hospitals. That's more than die from motor vehicle accidents, breast cancer, or AIDS--three causes that receive far more public attention. Indeed, more people die annually from medication errors than from workplace injuries. Add the financial cost to the human tragedy, and medical error easily rises to the top ranks of urgent, widespread public problems. To Err Is Human breaks the silence that has surrounded medical errors and their consequence--but not by pointing fingers at caring health care professionals who make honest mistakes. After all, to err is human. Instead, this book sets forth a national agenda--with state and local implications--for reducing medical errors and improving patient safety through the design of a safer health system. This volume reveals the often startling statistics of medical error and the disparity between the incidence of error and public perception of it, given many patients' expectations that the medical profession always performs perfectly. A careful examination is made of how the surrounding forces of legislation, regulation, and market activity influence the quality of care provided by health care organizations and then looks at their handling of medical mistakes. Using a detailed case study, the book reviews the current understanding of why these mistakes happen. A key theme is that legitimate liability concerns discourage reporting of errors--which begs the question, "How can we learn from our mistakes?" Balancing regulatory versus market-based initiatives and public versus private efforts, the Institute of Medicine presents wide-ranging recommendations for improving patient safety, in the areas of leadership, improved data collection and analysis, and development of effective systems at the level of direct patient care. To Err Is Human asserts that the problem is not bad people in health care--it is that good people are working in bad systems that need to be made safer. Comprehensive and straightforward, this book offers a clear prescription for raising the level of patient safety in American health care. It also explains how patients themselves can influence the quality of care that they receive once they check into the hospital. This book will be vitally important to federal, state, and local health policy makers and regulators, health professional licensing officials, hospital administrators, medical educators and students, health caregivers, health journalists, patient advocates--as well as patients themselves. First in a series of publications from the Quality of Health Care in America, a project initiated by the Institute of Medicine

IOM's 1999 landmark study To Err is Human estimated that between 44,000 and 98,000 lives are lost every year due to medical errors. This call to action has led to a number of efforts to reduce errors and provide safe and effective health care. Information technology (IT) has been identified as a way to enhance the safety and effectiveness of care. In an effort to catalyze its implementation, the U.S. government has invested billions of dollars toward the development and meaningful use of effective health IT. Designed and properly applied, health IT can be a positive transformative force for delivering safe health care, particularly with computerized prescribing and medication safety. However, if it is designed and applied inappropriately, health IT can add an additional layer of complexity to the already complex delivery of health care. Poorly designed IT can introduce risks that may lead to unsafe conditions, serious injury, or even death. Poor human-computer interactions could result in wrong dosing decisions and wrong diagnoses. Safe implementation of health IT is a complex, dynamic process that requires a shared responsibility between vendors and health care organizations. Health IT and Patient Safety makes recommendations for developing a framework for patient safety and health IT. This book focuses on finding ways to mitigate the risks of health IT-assisted care and identifies areas of concern so that the nation is in a better position to realize the potential benefits of health IT. Health IT and Patient Safety is both comprehensive and specific in terms of recommended options and opportunities for public and private interventions that may improve the safety of care that incorporates the use of health IT. This book will be of interest to the health IT industry, the federal government, healthcare providers and other users of health IT, and patient advocacy groups.

As the United States continues to debate reform of its healthcare system, this book argues that providing health insurance for all without improving the delivery system will not improve the current problems of access, affordability, and quality. The US healthcare system has many excellent components; strong scientific input, extraordinary technology for diagnosis and treatment, dedicated staff and top-class facilities among them. But the system has evolved haphazardly over time and although it has not failed entirely, the authors argue that like any system where attention, is paid to individual components at the expense of the system as a whole, it can never hope to succeed. Above all, they point out that the US system does not provide high value healthcare; it has the highest costs in the world and yet many other countries have lower infant mortality rates and better life expectancy. Together with a team of highly regarded thought leaders, the authors of this publication advocate a complete re-thinking of healthcare from a systems perspective - an engineering approach to healthcare--and they then describe how to set about it. Covering a wide range of subjects including: health care costs and economics, barriers to change, integrated health systems, electronic records and computer-based patient support as well as patient safety and palliative and chronic care, this book will be of interest to all those involved in healthcare provision whose goal is affordable care to promote healthy, high quality lives.

The Future of Nursing explores how nurses' roles, responsibilities, and education should change significantly to meet the increased demand for care that will be created by health care reform and to advance improvements in America's increasingly complex health system. At more than 3 million in number, nurses make up the single largest segment of the health care work force. They also spend the greatest amount of time in delivering patient care as a profession. Nurses therefore have valuable insights and unique abilities to contribute as partners with other health care professionals in improving the quality and safety of care as envisioned in the Affordable Care Act (ACA) enacted this year. Nurses should be fully engaged with other health professionals and assume leadership roles in redesigning care in the United States. To ensure its members are well-prepared, the profession should institute residency training for nurses, increase the percentage of nurses who attain a bachelor's degree to 80 percent by 2020, and double the number who pursue doctorates. Furthermore, regulatory and institutional obstacles -- including limits on nurses' scope of practice -- should be removed so that the health system can reap the full benefit of nurses' training, skills, and knowledge in patient care. In this book, the Institute of Medicine makes recommendations for an action-oriented blueprint for the future of nursing.

Health Care Systems Engineering
Taking Action Against Clinician Burnout
MITRE Systems Engineering Guide
Health IT and Patient Safety
HCSE, Florence, Italy, May 2017
Holistic Life Cycle Architecture Modeling and Design with Real-World Applications
Healthcare Systems Engineering

The overwhelming majority of a software system's lifespan is spent in use, not in design or implementation. So, why does conventional wisdom insist that software engineers focus primarily on the design and development of large-scale computing systems? In this collection of essays and articles, key members of Google's Site Reliability Team explain how and why their commitment to the entire lifecycle has enabled the company to successfully build, deploy, monitor, and maintain some of the largest software systems in the world. You'll learn the principles and practices that enable Google engineers to make systems more scalable, reliable, and efficient—lessons directly applicable to your organization. This book is divided into four sections: Introduction—Learn what site reliability engineering is and why it differs from conventional IT industry practices Principles—Examine the patterns, behaviors, and areas of concern that influence the work of a site reliability engineer (SRE) Practices—Understand the theory and practice of an SRE's day-to-day work: building and operating large distributed computing systems Management—Explore Google's best practices for training, communication, and meetings that your organization can use

Increasing costs and higher utilization of resources make the role of process improvement more important than ever in the health care industry. Management Engineering: A Guide to Best Practices for Industrial Engineering in Health Care provides an overview of the practice of industrial engineering (management engineering) in the health care industry. Explaining how to maximize the unique skills of management engineers in a health care setting, the book provides guidance on tried and true techniques that can be implemented easily in most organizations. Filled with tools and documents to help readers communicate more effectively, it includes many examples and case studies that illustrate the proper application of these tools and techniques. Containing the contributions of accomplished healthcare process engineers and process improvement professionals, the book examines Lean, Six Sigma, and other process improvement methodologies utilized by management engineers. Illustrating the various roles an industrial engineer might take on in health care, it provides readers with the practical understanding required to make the most of time-tested performance improvement tools in the health care industry. Suitable for IE students and practicing industrial engineers considering a move into the health care industry, or current healthcare industrial engineers wishing to expand their practice, the text can be used as a reference to explore individual topics, as each of the chapters stands on its own. Also, senior healthcare executives will find that the book provides insights into how the practice of management engineering can provide sustainable improvements in their organizations. To get a good overview of how your organization can best benefit from the efforts of industrial engineers, this book is a must-read.

Engineering Solutions to America’s Healthcare Challenges covers the technologies, systems, and processes that are emerging in hospitals, clinics, community centers, universities, and the White House to repair healthcare in the United States. Focusing on the importance of individuals being proactive about their own state of health, it presents a systems approach to changing the way healthcare professionals do business and take care of their patients. Written by a leading government and private sector consultant with more than a decade of experience as an industrial engineer, the book features interviews with leading industry experts, both domestic and international. Describing how industrial engineering practices are shaping healthcare, it explains why systems thinking must be the foundation for every aspect of healthcare. The book presents proven Lean and Six Sigma tools that can help any healthcare organization begin making operational improvements that result in a better quality of care for patients—all while reducing and even eliminating the waste of time, money, and human resources. These solutions include implementing Six Sigma in emergency rooms, 5S in accounting for medical inventory, using Theory of Constraints to form a plan for shortening the length of stay in hospitals, how informatics are used to aggregate and benchmark sensitive data, and design of experiments to recruit and retain the best healthcare talent. The book illustrates the most common factors involved with successful Six Sigma projects in healthcare organizations and considers the implications of a rapidly growing medical tourism industry. It addresses the role of insurance on healthcare improvement and also previews some of the most fascinating technological advances currently in development. It also offers examples and analysis of The Institute of Medicine’s six aims for healthcare: safety, effectiveness, efficiency, timeliness, family-centered focus, and equity. This book presents statistical processes for health care delivery and covers new ideas, methods and technologies used to improve health care organizations. It gathers the proceedings of the Third International Conference on Health Care Systems Engineering (HCSE 2017), which took place in Florence, Italy from May 29 to 31, 2017. The Conference provided a timely opportunity to address operations research and operations management issues in health care delivery systems. Scientists and practitioners discussed new ideas, methods and technologies for improving the operations of health care systems, developed in close collaborations with clinicians. The topics cover a broad spectrum of concrete problems that pose challenges for researchers and practitioners alike: hospital drug logistics, operating theatre management, home care services, modeling, simulation, process mining and data mining in patient care and health care organizations.

Getting to Now

Lean Healthcare Systems Engineering for Clinical Environments

Agile Systems Engineering

Production Systems Engineering

Occupational Outlook Handbook

Build Better Embedded Systems Faster

Building a Better Delivery System

Second in a series of publications from the Institute of Medicine’s Quality of Health Care in America project Today’s health care providers have more research findings and more technology available to them than ever before. Yet recent reports have raised serious doubts about the quality of health care in America. Crossing the Quality Chasm makes an urgent call for fundamental change to close the quality gap. This book recommends a sweeping redesign of the American health care system and provides overarching principles for specific direction for policymakers, health care leaders, clinicians, regulators, purchasers, and others. In this comprehensive volume the committee offers: A set of performance expectations for the 21st century health care system. A set of 10 new rules to guide patient-clinician relationships. A suggested organizing framework to better align the incentives inherent in payment and accountability with improvements in quality. Key steps to promote evidence-based practice and strengthen clinical information systems. Analyzing health care organizations as complex systems, Crossing the Quality Chasm also documents the causes of the quality gap, identifies current practices that impede quality care, and explores how systems approaches can be used to implement change.

Advancing Diversity, Inclusion, and Social Justice through Human Systems Engineering highlights how scholars and practitioners of HSE (inclusively defined to span many fields) can apply their theories and methods to understand and support healthy communities, include and empower diverse populations, and inspire strategies for a more inclusive future. This volume brings together experts from human factors, ergonomics, psychology, human-computer interaction, and more to demonstrate how these fields can be applied to societal challenges and solutions. Through a blend of research reports, literature reviews, and personal narratives, this volume explores these issues from the individual to the global scale, across diverse populations, and across multiple continents. Features Draws upon human factors and ergonomics theories and methods to evaluate, understand, and confront systemic threats to inclusion and social justice Offers actionable methodologies, strategies, and recommendations for conducting human-centered research, design, and training with marginalized or vulnerable populations Offers a venue for reporting and reconsidering the work of human factors and ergonomics from the perspectives of diversity, inclusion, and social justice

Author Joseph Dyro has been awarded the Association for the Advancement of Medical Instrumentation (AAMI) Clinical/Biomedical Engineering Achievement Award which recognizes individual excellence and achievement in the clinical engineering and biomedical engineering fields. He has also been awarded the American College of Clinical Engineering 2005 Tom O’Dea Advocacy Award. As the biomedical engineering field expands throughout the world, clinical engineers play an evermore important role as the translator between the worlds of the medical, engineering, and business professionals. They influence procedure and policy at research facilities, universities and private and government agencies including the Food and Drug Administration and the World Health Organization. Clinical Engineers were key players in calming the hysteria over electrical safety in the 1970’s and Y2K at the turn of the century and continue to work for medical safety. This title brings together all the important aspects of Clinical Engineering. It provides the reader with prospects for the future of clinical engineering as well as guidelines and standards for best practice around the world. * Clinical Engineers are the safety and quality facilitators in all medical facilities.

In a joint effort between the National Academy of Engineering and the Institute of Medicine, this books attempts to bridge the knowledge/awareness divide separating health care professionals from their potential partners in systems engineering and related disciplines. The goal of this partnership is to transform the U.S. health care sector from an underperforming conglomerate of independent entities (individual practitioners, small group practices, clinics, hospitals, pharmacies, community health centers et. al.) into a high performance “system” in which every participating unit recognizes its dependence and influence on every other unit. By providing both a framework and action plan for a systems approach to health care delivery based on a partnership between engineers and health care professionals, Building a Better Delivery System describes opportunities and challenges to harness the power of systems-engineering tools, information technologies and complementary knowledge in social sciences, cognitive sciences and business/management to advance the U.S. health care system.

A Guide to Best Practices for Industrial Engineering in Health Care

Engineering Solutions to America’s Healthcare Challenges

Clinical Engineering

The Future of Nursing

Architecture and Principles of Systems Engineering

Crossing the Quality Chasm

Decision Making in Systems Engineering and Management is a comprehensive textbook that provides a logical process and analytical techniques for fact-based decision making for the most challenging systems problems. Grounded in systems thinking and based on sound systems engineering principles, the systems decisions process (SDP) leverages multiple objective decision analysis, multiple attribute value theory, and value-focused thinking to define the problem, measure stakeholder value, design creative solutions, explore the decision trade off space in the presence of uncertainty, and structure successful solution implementation. In addition to classical systems engineering problems, this approach has been successfully applied to a wide range of challenges including personnel recruiting, retention, and management; strategic policy analysis; facilities design and management; resource allocation; information assurance; security systems design; and other settings whose structure can be conceptualized as a system.

According to Transforming Health Care Scheduling and Access, long waits for treatment are a function of the disjointed manner in which most health systems have evolved to accommodate the needs and the desires of doctors and administrators, rather than those of patients. The result is a health care system that deploys its most valuable resource—highly trained personnel—inefficiently, leading to an unnecessary imbalance between the demand for appointments and the supply of open appointments. This study makes the case that by using the techniques of systems engineering, new approaches to management, and increased patient and family involvement, the current health care system can move forward to one with greater focus on the preferences of patients to provide convenient, efficient, and excellent health care without the need for costly investment. Transforming Health Care Scheduling and Access identifies best practices for making significant improvements in access and system-level change. This report makes recommendations for principles and practices to improve access by promoting efficient scheduling. This study will be a valuable resource for practitioners to progress toward a more patient-focused “How can we help you today?” culture.

Explores the breadth and versatility of Human Systems Engineering (HSE) practices and illustrates its value in system development A Framework of Human Systems Engineering: Applications and Case Studies offers a guide to identifying and improving methods to integrate human concerns into the conceptualization and design of systems. With contributions from a panel of noted experts on the topic, the book presents a series of Human Systems Engineering (HSE) applications on a wide range of topics: interface design, training requirements, personnel capabilities and limitations, and human task allocation. Each of the book’s chapters present a case study of the application of HSE from different dimensions of socio-technical systems. The examples are organized using a socio-technical system framework to reference the applications across multiple system types and domains. These case studies are based in real-world examples and highlight the value of applying HSE to the broader engineering community. This important book: Includes a proven framework with case studies to different dimensions of practice, including domain, system type, and system maturity Contains the needed tools and methods in order to integrate human concerns within systems Encourages the use of Human Systems Engineering throughout the design process Provides examples that cross traditional system engineering sectors and identifies a diverse set of human engineering practices Written for systems engineers, human factors engineers, and HSI practitioners, A Framework of Human Systems Engineering: Applications and Case Studies provides the information needed for the better integration of human and systems and early resolution of issues based on human constraints and limitations.

An argument that understanding healthcare delivery as a complex adaptive system will help us design a system that yields better health outcomes. Breakthroughs in medical science, innovations in medical technologies, and improvements in clinical practices occur today at an increasingly rapid rate. Yet because of a fragmented healthcare delivery system, many Americans are unable to benefit from these developments. How can we design a system that can provide high-quality, affordable healthcare for everyone? In this book, William Rouse and Nicoleta Serban introduce concepts, principles, models, and methods for understanding, and improving, healthcare delivery. Approaching the topic from the perspectives of engineering and statistics, they argue that understanding healthcare delivery as a complex adaptive system will help us design a system that is more efficient, effective, and equitable. The authors use multilevel simulation models as a quantitative tool for evaluating alternate ways of organizing healthcare delivery. They employ this approach, for example, in their discussions of affordability, a prevention and wellness program, chronic disease management, and primary care accessibility for children in the Medicaid program. They also consider possible benefits from a range of technologies, including electronic health records and telemedicine; data mining as an alternative to randomized trials; conceptual and analytical methodologies that address the complexity of the healthcare system; and how these principles, models, and methods can enable transformational change.

Decision Making in Systems Engineering and Management

Crossing the Global Quality Chasm

A Look at the Future: Workshop Summary

A Framework of Human Systems Engineering

Improving Health Care Worldwide

Big Data, Novel Technologies, and Modern Systems Engineering

How Google Runs Production Systems

The rapid evolution of technical capabilities in the systems engineering (SE) community requires constant clarification of how to answer the following questions: What is Systems Architecture? How does it relate to Systems Engineering? What is the role of a Systems Architect? How should Systems Architecture be practiced? A perpetual reassessment of concepts and practices is taking place a SE community. Architecture and Principles of Systems Engineering addresses these integral issues and prepares you for changes that will be occurring for years to come. With their simplified discussion of SE, the authors avoid an overly broad analysis of concepts and terminology. Applying their substantial experience in the academic, government, and commercial R&D sectors, this book is organized into three parts: Architecture and Principles of Systems Engineering, Architecture and Design, and Architecture and Systems Engineering. Architecture and Principles of Systems Engineering Modeling Languages, Frameworks, and Graphical Tools Using Architecture Models in Systems Analysis and Design Aerospace and Defense Systems Engineering Describing ways to improve methods of reasoning and thinking about architecture and systems, the text integrates concepts, standards, and terminologies that embody emerging model-based approaches to systems engineering, science, and mathematics. With an emphasis on maintaining conceptual integrity in system design, this text describes succinct practical approaches that can be applied to the vast array of issues that readers must resolve on a regular basis. An exploration of the important questions above, this book presents the authors’ invaluable experience and insights regarding the through the power of model-based approaches to architecture and systems engineering.

Health Care Systems EngineeringHCSE, Florence, Italy, May 2017Springer

In 2015, building on the advances of the Millennium Development Goals, the United Nations adopted Sustainable Development Goals that include an explicit commitment to achieve universal health coverage by 2030. However, enormous gaps remain between what is achievable in human health and where global health stands today, and progress has been both incomplete and unevenly distributed. A comprehensive effort is needed to improve the quality of health care services globally. Crossing the Global Quality Chasm: Improving Health Care Worldwide focuses on one particular shortfall in health care affecting global populations: defects in the quality of care. This study reviews the available evidence on the quality of care worldwide and makes recommendations to improve health care quality and therapeutic services, with a focus in low-resource areas. Crossing the Global Quality Chasm emphasizes the organization and delivery of safe and effective care at the patient/provider interface. This study explores issues of access to services and commodities, effectiveness, safety, efficiency, and equity. Focusing on front line service delivery that can directly impact health outcomes for individual patients, this guide for key stakeholders, governments, donors, health systems, and others involved in health care.

This book presents the proceedings of the Fourth International Conference on Health Care Systems Engineering (HCSE 2019), which took place in Montreal, Canada, from May 30 to June 1, 2019. The event took place in the mother and child university hospital CHU Sainte-Justine in Montréal, and each session was co-chaired by a discussant coming from the clinical practice. The conference offered a unique opportunity to discuss operations management issues in health care delivery systems, and to share new ideas, methods and technologies for improving the operation of health care organizations. Focusing on applications of systems engineering, optimization and statistics to improve health care delivery and health systems, the book covers topics relating to a broad spectrum of concrete problems that pose challenges for researchers and practitioners alike: hospital drug logistics, operating theatre management, blood donation, home care services, modeling, simulation, process mining and data mining in patient care and health care organizations.

Understanding and Managing the Complexity of Healthcare

Engineering the System of Healthcare Delivery

A New Engineering/Health Care Partnership

A Step-By-Step Process for Managing Workflow and Care Improvement Projects

Site Reliability Engineering

Clinical Engineering Handbook

Simulation Engineering

Can technology and innovation transform world health? Connecting undergraduate students with global problems, Rebecca Richards-Kortum examines the interplay between biomedical technology design and the medical, regulatory, economic, social and ethical issues surrounding global health. Driven by case studies, including cancer screening, imaging technologies, implantable devices and vaccines, students learn how the complexities and variation across the globe affect the design of devices and therapies. A wealth of learning features, including classroom activities, project assignments, homework problems and weblinks within the book and online, provide a full teaching package. For visionary general science and biomedical engineering courses, this book will inspire students to engage in solving global issues that face us all.

Clinical Engineering Handbook, Second Edition, covers modern clinical engineering topics, giving experienced professionals the necessary skills and knowledge for this fast-evolving field. Featuring insights from leading international experts, this book presents traditional practices, such as healthcare technology management, medical device service, and technology application. In addition, readers will find valuable information on the newest research and groundbreaking developments in clinical engineering, such as health technology assessment, disaster preparedness, decision support systems, mobile medicine, and prospects and guidelines on the future of clinical engineering. As the biomedical engineering field expands throughout the world, clinical engineers play an increasingly important role as translators between the medical, engineering and business professions. In addition, they influence procedures and policies at research facilities, universities, and in private and government agencies. This book explores their current and continuing reach and its importance. Presents a definitive, comprehensive, and up-to-date resource on clinical engineering Written by worldwide experts with ties to IFMBE, IUPESM, Global CE Advisory Board, IEEE, ACCE, and more Includes coverage of new topics, such as Health Technology Assessment (HTA), Decision Support Systems (DSS), Mobile Apps, Success Stories in Clinical Engineering, and Human Factors Engineering

An up-to-date guide for using massive amounts of data and novel technologies to design, build, and maintain better systems engineering Systems Engineering in the Fourth Industrial Revolution: Big Data, Novel Technologies, and Modern Systems Engineering offers a guide to the recent changes in systems engineering prompted by the current challenging and innovative industrial environment called the Fourth Industrial Revolution—INDUSTRY 4.0. This book contains advanced models, innovative practices, and state-of-the-art research findings on systems engineering. The contributors, an international panel of experts on the topic, explore the key elements in systems engineering that have shifted towards data collection and analytics, available and used in the design and development of systems and also in the later life-cycle stages of use and retirement. The contributors address the issues in a system in which the system involves data in its operation, contrasting with earlier approaches in which data, models, and algorithms were less involved in the function of the system. The book covers a wide range of topics including five systems engineering domains: systems engineering and systems thinking; systems software and process engineering; the digital factory; reliability and maintainability modeling and analytics; and organizational aspects of systems engineering. This important resource: Presents new and advanced approaches, methodologies, and tools for designing, testing, deploying, and maintaining advanced complex systems Explores effective evidence-based risk management practices Describes an integrated approach to safety, reliability, and cyber security based on system theory Discusses entrepreneurship as a multidisciplinary system Emphasizes technical merits of systems engineering concepts by providing technical models Written for systems engineers, Systems Engineering in the Fourth Industrial Revolution offers an up-to-date resource that contains the best practices and most recent research on the topic of systems engineering.

Apply engineering and design principles to revitalize the healthcare delivery system Healthcare Systems Engineering is the first engineering book to cover this emerging field, offering comprehensive coverage of the healthcare system, healthcare delivery, and healthcare systems modeling. Written by leading industrial

engineering authorities and a medical doctor specializing in healthcare delivery systems, this book provides a well-rounded resource for readers of a variety of backgrounds. Examples, case studies, and thoughtful learning activities are used to thoroughly explain the concepts presented, including healthcare systems, delivery, quantification, and design. You'll learn how to approach the healthcare industry as a complex system, and apply relevant design and engineering principles and processes to advance improvements. Written with an eye toward practicality, this book is designed to maximize your understanding and help you quickly apply toward solutions for a variety of healthcare challenges. Healthcare systems engineering is a new and complex interdisciplinary field that has emerged to address the myriad challenges facing the healthcare industry in the wake of reform. This book functions as both an introduction and a reference, giving you the knowledge you need to move toward better healthcare delivery. Understand the healthcare delivery context Use appropriate statistical and quantitative models Improve existing systems and design new ones Apply systems engineering to a variety of healthcare contexts Healthcare systems engineering overlaps with industrial engineering, operations research, and management science, uniting the principles and practices of these fields together in pursuit of optimal healthcare operations. Although collaboration is focused on practitioners, professionals in information technology, policy and administration, public health, and law all play crucial roles in revamping health care systems. Healthcare Systems Engineering is a complete and authoritative reference for stakeholders in any field.

Engineering a Learning Healthcare System

Leading Change, Advancing Health

Innovations for the 21st Century

Transforming Health Care Scheduling and Access

Health Care Systems, Technology and Techniques

Systems Engineering: Principles And Practice

It has been almost 20 years since the Institute of Medicine released the seminal report titled, Crossing the Quality Chasm. In it, the IoM identified six domains of care quality (safe, timely, effective, efficient, equitable, and patient-centric) and noted a huge gap between the current state and the desired state. Although this report received a great deal of attention, sadly there has been little progress in these areas. In the U.S., healthcare still has huge disparities, is inefficient, and is fragmented with delays in care that are often unsafe. Most U.S. citizens are expected to suffer from a diagnostic error sometime during their lifetime, not receive a large fraction of recommended care, and pay for one of the most expensive systems in the world. Much has been written about quality improvement over the years but many prominent quality and safety experts. Yet progress has been slow. Some have called on the healthcare professions to look outside of healthcare to other industries using examples in nuclear power and airlines for safety, the hotel and entertainment industry for a 'customer' focus, and the automotive industry, particularly Toyota for efficiency (Lean). This book by Dr. Oppenheim on lean healthcare systems engineering (LHSE) is a fresh approach that brings forth concepts that systems engineers have used in huge national defense projects. What's unique in this book is that these powerful system engineering tools are modified to be able to address smaller sized healthcare problems that still involve similar problems in fragmentation and poor communication and coordination. This book is an invaluable reference for a new powerful process named Lean Healthcare Systems Engineering (LHSE) for managing workflow and care improvement projects in all clinical environments. The book applies to ambulatory clinics and hospitals of all types including operating rooms, emergency departments, and ancillary departments, clinical and imaging laboratories, pharmacies, and population health. The book presents a generic rigorous but not mathematical step-by-step process of integrated healthcare, systems engineering and Lean. The book also contains the first major product created with the LHSE process, namely tabularized summaries of representative projects in healthcare delivery applications, called Lean Enablers for Healthcare Projects. Each full-page enabler table lists the challenges and wastes, powerful improvement goals, risks, and expected benefits, and some useful descriptions of the healthcare system of interest. The book provides user-friendly solutions to major problems in healthcare delivery operations in all clinical environments, addressing fragmentation, wastes, wrong incentives, ad-hoc and stove-piped management, lack of optimized processes, hierarchy gradient, lack of systems thinking, "blaming and shaming culture", burnout of providers and many others.

This book is based on class notes for a course in the MS program in Systems Engineering at Johns Hopkins University. The program was a cooperative effort between senior systems engineers from the Johns Hopkins University Applied Physics Laboratory and the Westinghouse Electric Company. The authors were part of the curriculum design team as well as members of the faculty.

This book provides a guide for systems engineering modeling and design. It focuses on the design life cycle with tools and application-based examples of how to design a system, focusing on incorporating systems principles and tools to ensure system integration. It provides product-based and service system examples to understand the models, tools, and activities to be applied to design and implement a system. The first section explains systems principles, models, and architecture for systems engineering, lifecycle models, and the systems architecture. Further sections explain systems design, development, and deployment life cycle with applications and tools and advanced systems engineering topics. Features: Focuses on model-based systems engineering and describes the architecture of the systems design models. Uses real-world examples to corroborate different and disparate systems engineering activities. Describes and applies the Vee systems engineering design methodology, with cohesive examples and applications of designing systems. Discusses culture change and the skills people need to design and integrate systems. Shows detailed and cohesive examples of the systems engineering tools throughout the systems engineering life cycle. This book is aimed at graduate students and researchers in systems engineering, modeling and simulation, any major engineering discipline, industrial engineering, and technology.