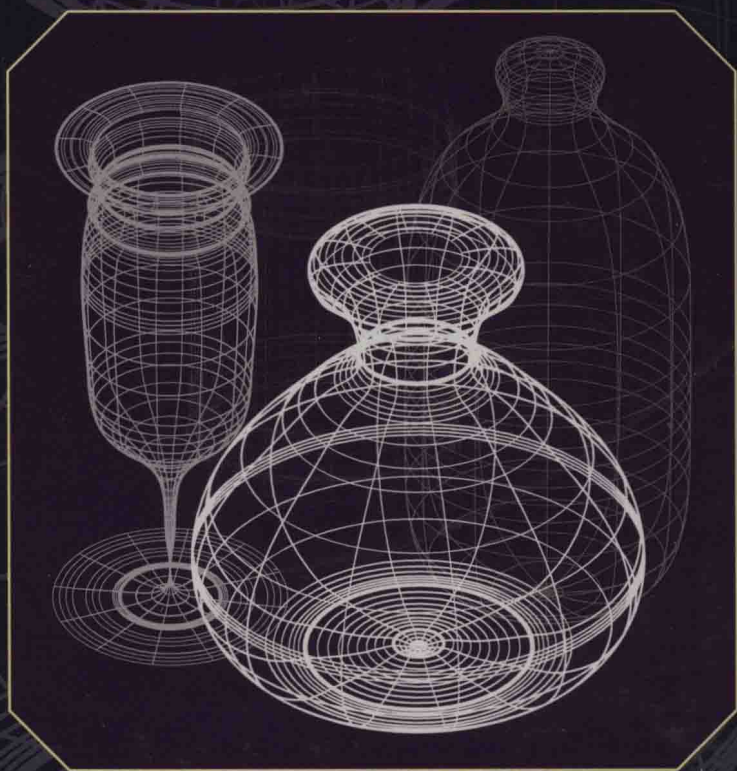


INDUSTRIAL DESIGN ENGINEERING

INVENTIVE PROBLEM SOLVING



JOHN X. WANG



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Industrial Design Engineering

Inventive Problem Solving

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Industrial Design Engineering

Inventive Problem Solving

*To the beautiful Sonny Wang Kindergarten
where engineering dreams start*

Preface

Industrial engineering deals with the optimization of complex processes or systems. This engineering discipline has been driving the development, improvement, implementation, and evaluation of integrated systems. Forging the mathematical, physical, and social sciences together with the principles and methods of engineering design, industrial engineering has been applied to specify, predict, and evaluate the results to be obtained from such systems or processes. As an interdisciplinary engineering, its underlying concepts overlap considerably with business-oriented disciplines such as operations research and risk engineering.

Industrial design is a field with a large and extensive presence in our nation's manufacturing and services industries, as documented by the national datasets that provide the basis for this report. Designers are prolifically inventing new products, processes, and systems that have a profound impact on our economy and civil society. The National Endowment for the Arts (NEA) Design Program has been tracking numerous trends in the field of design, from the growing movement of design thinking to social impact design. Although this report brings together, for the first time, analytical perspectives regarding federal data on industrial design, it cannot be all-encompassing. This preface has benefited from conversations with some of the nation's leading designers, design curators, and design firms to convey information not captured by the report itself.

Industrial engineers are generally considered those professional individuals that develop the concepts for manufactured products such as cars, home appliances, and toys. How, nowadays, industrial designers often find themselves in a variety of roles and functions far beyond the development of manufactured products is summarized below:

- Rather than for manufacturers only, industrial engineers are working on projects for a variety of organizations, from government entities to private enterprises.
- The idea to utilize the design process as a way to analyze and innovate has dramatically changed the landscape of how industrial engineers work. For example, an industrial engineer might not

only design a radiation therapy machine for a hospital, but also the patient's interactive experience and touch points with medical staff in the emergency room.

- Similarly, industrial designers might work with retail merchandisers to reorganize store floor plans and re-imagine the in-store experience for potential customers.

Here, industrial designers are not just designing products, but designing user experiences, processes, and systems by applying the creative approach of what is described as “poetic design thinking,” which enables industrial designers to work on diverse teams to solve these more complex challenges. This new book will present these new thinking paradigms systematically. Poetic design thinking is a tool to inspire innovation and influence systems change; industrial engineers are creative professionals who are doing just that.

John X. Wang

*Featured Author and Poet
Grand Rapids, Michigan*

Author



John X. Wang earned a PhD in reliability engineering from the University of Maryland, College Park, Maryland, in 1995. He was then with GE Transportation as an Engineering Six Sigma Black Belt, leading propulsion systems reliability and Design for Six Sigma (DFSS) projects while teaching GE-Gannon University's Graduate Co-Op programs and National Technological University professional short course, and serving as a member of the IEEE Reliability Society Risk Management Committee. Dr. Wang has worked as a Corporate Master Black Belt at Visteon Corporation, Reliability Engineering Manager

at Whirlpool Corporation, E6 Reliability Engineer at Panduit Corp., and Principal Systems Engineer at Rockwell Collins. In 2009, he received an Individual Achievement Award when working as a Principal Systems Engineer at Raytheon Company. He joined GE Aviation Systems in 2010, where he was awarded the distinguished title of Principal Engineer—Reliability (CTH—Controlled Title Holder) in 2013.

As a Certified Reliability Engineer certified by the American Society for Quality, Dr. Wang has authored/co-authored numerous books and papers on reliability engineering, risk engineering, engineering decision making under uncertainty, robust design and Six Sigma, Lean manufacturing, and green electronics manufacturing. He has been affiliated with Austrian Aerospace Agency/European Space Agency, Vienna University of Technology, Swiss Federal Institute of Technology in Zurich, Paul Scherrer Institute in Switzerland, and Tsinghua University in China.

Having presented various professional short courses and seminars, Dr. Wang has performed joint research with the Delft University of Technology in the Netherlands and the Norwegian Institute of Technology.

Since his knowledge, expertise, and scientific results are well known internationally, Dr. Wang has been invited to present at various national and international engineering events.

As a highly accomplished inventor of various industrial designs and patent applications, Dr. Wang serves as an editor at Nano Research and Applications and is a member of BAOJ Nanotechnology Editorial Board.

Dr. Wang, a CRC Press Featured Author, has been a Top Contributor of LinkedIn's Poetry Editors & Poets group. Dr. Wang has contributed to the discussions including:

- Writing a sonnet is notoriously difficult due to the strict pentameter and rhyming pattern; does anyone prefer/enjoy writing this form of poetry?
- Do you proceed by images or by words when you write?

Connections

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- LinkedIn: <http://www.linkedin.com/pub/john-wang/3/2b7/140>
- Dr. John Wang's Amazon Author Central Profile: <http://www.amazon.co.uk/-/e/B001H6WIPG>

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