A SYSTEMS ENGINEERING PARTIALLY ANNOTATED BIBLIOGRAPHY AND RESOURCES LIST

Prepared by the Naval Surface Warfare Center Dahlgren Division's Systems Engineering Focus Team -- June 1997

Introduction and Acknowledgments

In support of NSWCDD's Systems Engineering Focus Team goals, the accompanying bibliography and resources list have been compiled. It is hoped that the information provided contributes to the promotion of sound systems engineering practices through the familiarization with the experiences of other practitioners.

This bibliography is a compilation of bibliographies found in System Engineering sites in the World Wide Web and reference lists provided by SEFT members. In particular the following contributors are acknowledged: George J. Chambers (INCOSE member), Edwin Dean (NASA), Carolyn Kotlas (Institute for Academic Technology), M. Johnna Shamp (consultant in TQM/OD), and David E. McConnell (NSWCDD).

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PARTIALLY ANNOTATED SYSTEMS ENGINEERING BIBLIOGRAPHY, RESOURCES LIST AND RELATED INFORMATION

General Information

What is Systems Engineering?

MIL-STD-499B
"Systems engineering is an interdisciplinary approach to evolve and verify an integrated and optimally balanced set of product designs that satisfy user needs and provide information for management decision making."

MIL-STD-499A Systems Engineering
"...the application of scientific and engineering efforts to

- transform an operational need into a description of system performance parameters and a system configuration through the use of an iterative process of definition, synthesis, analysis, design, test, and evaluation;
- integrate related technical parameters and ensure compatibility of all physical, functional, and program interfaces in a manner that optimizes the total system definition and design;
- integrate reliability, maintainability, safety, survivability, human engineering, and other such factors into the total engineering effort to meet cost, schedule, supportability, and technical performance objectives."

DSMC Systems Engineering Management Guide, January 1990, pg 1-2. "...is the management function which controls the total system development effort for the purpose of achieving an optimum balance of all system elements. It is a process which transform an operational need into a description of system parameters and integrates those parameters to optimize the overall system effectiveness."

IBM Federal Systems Company definition used as the basis for decision, internal SE practices and education: “The iterative controlled process in which users needs are understood and evolved, through incremental development of requirements specifications and system design, to an operational system.”

Joe DeFoe and Jim McAuley; November 1991: “The processing of building real things to solve real problems within technological, environmental, economic, legal, ethical, cultural, and institutional constraints.”

Computer Aided Systems Engineering, Howard Eisner, Prentice Hall, 1988, pg 17. “...an iterative process of top-down synthesis, development, and operation of a real-world system that satisfies, in a near-optimal manner, the full range of requirements for the system.”

Field Manual: System Engineering, FM 770-78 Headquarters, Department of the Army, April 1979, pg 1-2. Summary definition in the introduction of the manual. “The transforming of an operational need into a description of system performance parameters and a system configuration.”

“Fundamental of Systems Engineering at NASA,” *INCOSE/ASEM Proceedings*, October 1991, Robert G. Chamberlain and Robert Shishko, Ph.D., pg 23. “...is a robust approach to the design and creation of systems to accomplish desired ends.”

P.M’Pherson, “Systems engineering: A proposed definition,” *IEE Proce*., Vol. 133, pp. 330-331, Sep. 1986: “...is a hybrid methodology that combines policy analysis, design and management. It aims to ensure that a complex man-made system, selected from the range of options on offer, is the most likely to satisfy the owner’s objectives in the context of long-term future operational or market environments.”

Related General Information

<u>The System Engineer's Job</u>

Braid described the systems engineer's job as “understand[ing] in some detail what needs to be done, to know what it is feasible to do, and to know when to do it."

In 1965, Hino stated that: “It is essential that the [system] engineer, like the general medical practitioner, has an adequate and comprehensive professional background and can readily understand and apply the techniques that are presented. He simply needs guidance to the solution of a particular type of problem.”

Sage amplified Hino's assumption when he observed that, "the systems engineer must, above all, be capable of facilitation and communication of knowledge between the diverse group of professionals involved in the wide scope of [system engineering]."

Military Standard 499B: An Overview

This section presents a brief overview of Appendix A of MIL-STD-499B which will assist systems engineers in evaluating the materials contained in this bibliography. According to 499B, the system engineering process is a

"... logical sequence of activities and decisions transforming an operational need into a description of system performance parameters and a preferred system configuration."

This process consists of nine phases:

1. mission requirements analysis,
2. functional analysis,
3. allocation,
4. synthesis,
5. logistic engineering, including
   - logistics support analysis,
   - maintenance engineering analysis,
   - repair level analysis, and
   - logistic support modeling,
6. life cycle cost analysis,
7. optimization, including
   - trade-off studies,
   - system/cost effectiveness analysis, and
   - effectiveness analysis modeling,
8. production engineering analysis, and
9. generation of specifications.

Bibliography

Activity Based Cost

Berlant, D., R. Browning and G. Foster (1990). "How Hewlett-Packard Gets Numbers It Can Trust," Harvard Business Review, January-February, pp. 178- 82.

Bonsack, R. A. (1991). "Does Activity-Based Costing Replace Standard Costing?", Journal of Cost Management, Winter, pp. 46-47.

Burk, K. B. and D. W. Webster (1994). Activity Based Costing & Performance, American Management Systems, Inc., Fairfax, VA.

Cokins, G., A. Stratton, and J. Helbling (1993). An ABC Manager's Primer, Institute of Management Accountants, Montvale, NJ, USA.

Cooper, R. (1990). "Elements of Activity-Based Costing," in Brinker, B. J., ed., Emerging Practices in Cost Management, Warren, Gorham, & Lamont, Boston MA.

Cooper, R. (1992). "How Activity-Based Cost Systems Help Managers Implement New Strategic Directions," Advances in Management Accounting, Vol. 1, pp. 81-95.

Cooper, R. and R. S. Kaplan (1988). "Measure Costs Right: Make the Right Decisions," Harvard Business Review, September/October, pp. 96-103.

Cooper, R. and R. S. Kaplan (1992). "Activity-Based Systems: Measuring the Costs of Resource Usage," Accounting Horizons, September, pp. 1-13.

Hardy, J. W. and E. D. Hubbard (1992). "ABC: Revisiting the Basics," CMA Magazine, November, pp. 24-28.

Hronec, S. M. (1990). "How a Controller Communicates the Change to ABC," Corporate Controller, September-October, pp. 5-7.

Innes, J. and F. Mitchell (1992). "A Review of Activity-Based Costing Practice," in Drury, C., ed., Management Accounting Handbook, Butterworth Heinemann.

Innes, J., F. Mitchell, and T. Yoshikawa (1994). Activity Costing for Engineers, Research Studies Press LTD., Taunton, Somerset, England.

Kaplan, R. S. (1988). "One Cost System Isn't Enough," Harvard Business Review, January-February, pp. 61-66.

Kaplan, R. S. (1989). "Management Accounting for Advanced Technology Environments," Science, Vol. 245, 25 August, pp. 819-823.

Menzano, R. J. (1991). "Activity-Based Costing for Information Systems," Journal of Cost Management, Spring, pp. 35-39.

O'Guin, M. C. (1991). The Complete Guide to Activity-Based Costing, Prentice-Hall, Englewood Cliffs NJ.

Partovi, F. Y. (1991). "An Analytic Hierarchy Approach to Activity-Based Costing," International Journal of Production Economics, 22, pp. 151-161.

Raffish, N. (1991). "How Much Does That Product Really Co$t?," Management Accounting, March, pp. 36-39.

Scott, P. and M. Morrow (1991). "Activity-Based Costing and Make-or-Buy Decisions," Journal of Cost Management, Winter, pp. 48-51.

Sharman, P. (1992). "A Practical Look at Activity-Based Costing," CMA Magazine, February, pp. 8-11.

Sharp, D. and L. F. Christensen (1991). "A New View of Activity-Based Costing: What Costs Would Be Eliminated If a Product Weren't Made," Management Accounting, September, pp. 32-34.

Tippett, D. D. (1993). "Activity-Based Costing: A Manufacturing Management Decision-Making Aid," Engineering Management Journal, Vol. 5, No. 2, June, pp. 37-42.

Turney, P. B. B. (1989). "Using Activity-Based Costing to Achieve Manufacturing Excellence," Journal of Cost Management, Summer, pp. 23-31.

Turney, P. B. B. (1989). "Activity-Based Costing: A Tool for Manufacturing Excellence," Target, Summer, pp. 13-19.

Turney, P. B. B. (1991). "How Activity-Based Costing Helps Reduce Cost," Journal of Cost Management, Winter, pp. 29-35.

Turney, P. B. B. (1992). "Activity-Based Management," Management Accounting, Vol. 73, No. 7, January, pp. 20-25.

Turney, P. B. B. (1992). "What an Activity-Based Cost Model Looks Like," Journal of Cost Management, Winter, pp. 54-60.

Tyson, T. (1991). "The Use of Bar Coding in Activity-Based Costing," Journal of Cost Management, Winter, pp. 52-56.

Webster, D. W. (1991). "Activity-Based Costing Facilitates Concurrent Engineering," Concurrent Engineering, November/December.

Weisman, D. L. (1991). "How Cost Allocation Systems Can Lead Managers Astray," Journal of Cost Management, Spring, pp. 4-10.

Yoshikawa, T., J. Innes, and F. Mitchell (1994). "Functional Analysis of Activity-Based Cost Information," Journal of Cost Management, Spring, pp. 40-48.

Analysis

T. De Marco, Structured Systems Analysis and System Specification. New York: Yourdon, 1979. is the definitive work describing a methodology for preparing data-intensive system specifications.

J. F. Funaro and J. D. Fletcher, "Front-end analysis for emerging systems," Defense Manag. J., vol. 16, pp. 33-37 fourth quarter 1980 provides an explanation of why front-end analysis should be an active contributor to the systems engineering process.

M. F. Connor, "SADT: Structured analysis and design technique introduction," in Engineering Conference Record. New York: IEEE Press, 1980, pp. 138-143 presents a discussion of some problems common to large-scale computer-based systems development efforts. Although the solutions presented are for one specific methodology, SADT, the concepts are equally applicable to other methodologies.

G. R. Mosard, "Setting objectives and developing alternatives in 'hard' systems analysis (implications for 'soft' systems analysis)," J. Appl. Syst. Anal., vol. 11, pp. 47-56, 1984 presents a model for setting objectives and developing alternatives. Managerial techniques which can aid in the various analysis tasks required by MIL-STD-499B are described and their use demonstrated. This article builds on the concepts presented by Mosard in entry A-5.

G. R. Mosard, "A generalized framework and methodology for systems analysis." IEEE Tram. Eng. Manag., vol. EM-29, pp. 81-87, Aug. 1982 provides systems engineers with a comprehensive understanding of the systems analysis process. Such an understanding is essential for conducting system engineering, Phase 1 MIL-STD-499B.

J. K. O' Keefe, "An introduction to systems analysis." J. Ind. Eng., pp. 163-167, July-Aug. 1964
is still valid in content and intent despite being over 20 years old. It describes the qualitative and quantitative aspects of systems analysis, giving special attention to external requirements, sectionalization, and internal systemization. Two conceptual tools--the design flowchart and the system network diagram--are described.

Quade, E. S., and W. I. Boucher (Eds.). Systems Analysis and Policy Planning. New York: American Elsevier Pub. Co., 1970

Rudwick, B. H., Systems Analysis for Effective Planning: Principles and Cases. New York: John Wiley, 1969

M. Safiuddin, "Systems analysis: What it is, how to use it," Machine Design, vol. 45, pp. 92-98, Jan. 11, 1973, and pp. 90-96, Jan. 25, 1973 argues that systems analysis can be best understood by relating it to control theory. In Part 1, Safiuddin describes the model-building process and several types of models, including mathematical, graphical, computer, and physical models. In Part 2, he shows how control theory can be used to analyze any system.

Benchmarking

Balm, G. J. (1992). Benchmarking: A Practitioner's Guide for Becoming and Staying Best of the Best. Schaumberg: QPMA. Balm works for IBM. This is a basic book on starting benchmarking in an organization. Quick reading, but good.

Brassard, Michael. (1988). The Memory Jogger: A Pocket Guide of Tools for Continuous Improvement. Methuen, MA: GOAL/QPC.

Brassard, Michael. (1989). The Memory Jogger Plus+: The 7 Management and Planning Tools. Methuen, MA: GOAL/QPC.

Brassard, Michael, and Diane Ritter. (1994). The Memory Jogger II. Methuen, MA: GOAL/QPC.

Camp, Robert C. (1989). Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance. Milwaukee: ASQC Press. Inspired by the Xerox approach to benchmarking, this book is the basic text for many approaches to improvement through searching for the "best in class." The book outlines a ten step plan to organizational benchmarking, and is academic in nature. A great initial primer.

Camp, Robert C. (1995). Business Process Benchmarking: Finding and Implementing Best Practices. Milwaukee: ASQC Press.

Champy, James. (1995). Reengineering Management: The Mandate for New Leadership. New York: Harper Business.

Codling, Sylvia. (1992). Best Practices Benchmarking" The Management Guide to Successful Implementation. Beds, U.K.: Industrial Newsletters.

Deming, W. Edwards. (1986). Out of the Crisis. Cambridge, MA: Massachusetts Institute of Technology.

Emory, C. William. (1985). Business Research Methods. Homewood: Irwin. Executive Learning, Inc. (1993). Continual Improvement Handbook: A Quick Reference Guide for Tools &

Concepts. Brentwood: Executive Learning, Inc.

Fuld, L. M. (1985). Competitor Intelligence: How to Get It, How to Use It. New York: John F. Wiley.

Gaucher, Ellen J. and Coffey, Richard. (1993). Total Quality in Healthcare: From Theory to Practice. San Francisco: Jossey-Bass.

Gaucher, Ellen J. and Coffey, Richard. (1990). Transforming Healthcare Organizations: How to Achieve and Sustain Organizational Excellence. San Francisco: Jossey-Bass.

Gift, Robert G. and Mosel, Doug. (1994). Benchmarking in Health Care: A Collaborative Approach. Chicago: American Hospital Publishing.

Haim, Alexander. (1992). Closing the Quality Gap: Lessons Learned from America's Leading Companies. Englewood Cliffs: Prentice Hall.

Hammer, Michael and Champy, Richard. (1993). Reengineering the Corporation. New York: Harper.

Harrington, H. James. (1991). Business Process Improvement. New York: McGraw-Hill.

Harrington, H. James. (1996). The Complete Benchmarking Implementation Guide: Total Benchmarking Management. New York: McGraw-Hill.

Harrington, H. James. (1996). High Performance Benchmarking. New York: McGraw-Hill.

Hopper, John A. (1992). Borrowing from the Best: How to Benchmark World-Class People Practices. Beaverton: HR Effectiveness.

Hutton, David W. (1994). The Change Agents Handbook: A Survival Guide for Quality Improvement Champions. Milwaukee: ASQC Press.

Johnson, Richard. (1993). TQM: Leadership for the Quality Transformation. Milwaukee: ASQC Quality Press.

Joiner, Brian. (1994). Fourth Generation Management. New York: McGraw-Hill

Juran, Joseph M. (1964). Managerial Breakthrough. New York: McGraw-Hill.

Karlof, Bengt and Ostblom, Svante. (1993). Benchmarking: A Signpost to Excellence in Quality and Productivity. New York: John Wiley & Sons.

Katzenbach, Jon R. and the RCL Team. (1995). Real Change Leaders: How You Can Create Growth and High Performance at Your Company. New York: Times Business.

Kelada, Joseph N. (1996). Integrating Reengineering with Total Quality. Milwaukee: ASQC Quality Press.

King, Bob. (1989). Better Designs in Half the Time: Implementing Quality Function Deployment (QFD) in America. Methuen: GOAL/QPC.

Kouzes, James M. and Posner, Barry Z. (1995). The Leadership Challenge: How to Keep Getting Extraordinary Things Done in Organizations. San Francisco: Jossey-Bass.

Leebov, Wendy, and Gail Scott. (1990). Health Care Managers in Transition: Shifting Roles and Changing Organizations. San Francisco: Jossey-Bass.

Leibfried, Kathleen and McNair, Carol (1992). Benchmarking: A Tool for Continuous Improvement. New York: Harper Collins. McNair is a professor at Babson College and Leibfried is a consultant with Coopers and Lybrand. Their book is basic in its approach and is not so private-sector oriented. There is a good discussion in it about legal issues.

McNair, Carol. (1992). Benchmarking: Adding Distinctive Value to Every Aspect of Your Business. New York: HarperBusiness.

McCloskey, L. and Collett, D. (1993). TQM: A Basic Text. Methuen: GOAL/QPC.

Mellum, Mara and Collett, Casey. (1995). Breakthrough Leadership: A Guide to Hoshin Planning. Methuen: AHA and GOAL/QPC.

Parker, Glenn M. (1990). Team Players and Teamwork: The New Competitive Business Strategy. San Francisco: Jossey-Bass.

Peters, T. J. and Waterman, R. H., Jr. (1982). In Search of Excellence. New York: Harper & Row.

Plsek, P.,E., Onnias, A., and Early, J.F. Quality Improvement Tools. Wilton, CT: Juran Institute.

Rees, Fran. (1991). How to Lead Work Teams: Facilitation Skills. San Diego: Pfeiffer.

Robbins, Harvey and Finley, Michael. (1995). Why Teams Don't Work: What Went Wrong and How to Make It Right. Princeton: Peterson's/Pacesetter Books.

Scholtes, Peter. (1988). The Team Handbook. Madison, WI: Joiner and Associates

Senge, Peter. (1990). The Fifth Discipline. New York: Doubleday.

Senge, Peter. (1994). The Fifth Discipline Fieldbook. New York: Doubleday.

Sloan, Daniel M. (1994). How to Lower Health Care Costs by Improving Health Care Quality: Results Based Continuous Quality Improvement. Milwaukee, WI: ASQC Press.

Spendolini, Michael J. (1992). The Benchmarking Book. New York: AMACOM. Authored by the Xerox executive who helped start his company's approach, this book is "a distillation of how the best benchmarking programs in the United States are run." Filled with war stories, this is a good source of "lessons learned." (quotes from the book jacket)

Uhlfelder, Helene F. (1995). The Advanced Team Guide: Tools, Techniques, and Tips for Experienced Teams. Atlanta: Miller Howard.

VHA, Inc. (1992). The Benchmarking Process: An Approach for Improving Quality, Cost and Clinical Performance. Irving: VHA, Inc.

Walton, Mary. (1990). Deming Management at Work: Six Successful Companies That Use the Quality Principles of the World-Famous W. Edwards Deming. New York: Putnam.

Watson, Gregory H. (1992). The Benchmarking Workbook: Adapting Best Practices for Performance Improvement. Cambridge: Productivity Press.

Watson, Gregory H. (1993). Strategic Benchmarking: How to Rate Your Company's Performance Against the World's Best. Cambridge: Productivity Press. Originally from Xerox, Watson was Assistant Director of the

International Benchmarking Clearinghouse. He now runs his own consulting office. This books tells us what benchmarking is and where it is going.

Wheeler, Donald J. (1994). Understanding Variation: Managing Chaos. Chicago: SPC Press.

Whiteley, Richard. (1991). The Customer-Driven Company. New York: Addison-Wesley.

Complexity

D. J. Campbell, "Task complexity: A Review and analysis," Academy of Management Review, vol. 13, no. 1, 40-52. 1988

R. C. Conant, "Detecting subsystems of a complex system," IEEE Trans. Syst., Man. Cybern., pp. 550-553, Sept. 1972 presents a methodology whereby complex systems can be decomposed into "weakly connected subsystems." This decomposition allows systems engineers "to more readily understand the system by lowering its apparent complexity."

R. L. Flood and E. R. Carson. Dealing With Complexity. New York:Plenum, 1988

D. Sahal, "System complexity: Its conception and measurement in the design of engineering systems," IEEE Trans. Syst., Man, Cybern., pp. 440-445, June 1976 is a theoretical discussion of system complexity which will give system engineers a good understanding of the need to perform a comprehensive functional decomposition as part of the design process for large-scale systems.

T. C. Taylor, "Perspectives on some problems of concept selection, management and complexity in military systems development," Naval War College Rev., vol. 34, pp. 55-65, Sept./Oct. 1981 argues that early thinking in systems planning is necessary to ensure that technology does not drive requirements or, if it does, that systems designers know what they are doing.

Concurrent Engineering

Anon. (1989). Proceedings of the First National Symposium on Concurrent Engineering, Morgantown, WV, USA, 23-24 May.

Anon. (1990a). Proceedings of the Second National Symposium on Concurrent Engineering, Morgantown, WV, USA, 7-9 February.

Anon. (1990b). "A Smarter Way to Manufacture," Business Week, 30 April, pp. 110-117.

Anon. (1991). Proceedings of the CALS & CE Washington 91 Conference and Exposition, The Society for Computer-Aided Engineering, #.

Anon. (1991). "Concurrent Engineering: Special Report," IEEE Spectrum, July, pp. 22-37.

Carter D. E., and B. S. Baker. CE Concurrent Engineering: The Product Development Environment for the 1900s. New York: Addison-Wesley.

Clausing, D. (1991). "Concurrent Engineering," Design and Productivity International Conference, Honolulu, HI, USA, 6-8 Feb.

Gerwin, D. and G. Susman (1996). "Special Issue on Concurrent Engineering," IEEE Transactions on Engineering Management, Vol. 43, No. 2, May, pp. 118-123.

Gu, P. and A. Kusiak, ed. (1993). Concurrent Engineering: Methodology and Applications, Elsevier, Amsterdam, The Netherlands.

Hall, D. (1989). Applications of Concurrent Engineering to Mechanical Systems Design, CALS Industry Steering Group, Washington, DC, USA, 16 June, CALS TR 002.

Harris, E. D., T. Koshy, and R. L. Anderson (1992). "Concurrent Engineering and Total Quality Management: The Need for a Seamless Marriage," Engineering Management Journal, Vol. 4, No. 2, June, pp. 3-8.

Hartley, J. R. (1992). Concurrent Engineering: Shortening Lead Times, Raising Quality, and Lowering Costs, Productivity Press, Cambridge, MA, USA.

Jagannathan, V., K. J. Cleetus, R. Kannan, A. S. Matsumoto, and J. W. Lewis (1991). "Computer Support for Concurrent Engineering: Four Strategic Initiatives," Concurrent Engineering,
September/October, pp. 14-30.

Kouzes, R. T., J. D. Myers, and W. A. Wulf (1996). "Collaboratories: Doing Science on the Internet," Computer, August, pp. 40-46.

Lake, J. (1992). "Implementation of Multi-Disciplinary Teaming," Engineering Management Journal, Vol. 4, No. 2, June, pp. 9-13.

Lee, D. M. S. (1992). "Management of Concurrent Engineering: Organizational Concepts and a Framework of Analysis," Engineering Management Journal, Vol. 4, No. 2, June, pp. 15-25.

Linton, L. R. et. al. (1991). First Principles of Concurrent Engineering: A Competitive Strategy for Electronic Product Development, CALS /Concurrent Engineering Task Group for Electronic Systems, CALS TR 005.

Markowitz, M. C. (1991). "Concurrent Engineering Journey Start with the First Step," EDN, July 18, pp. 110-114.

Mayer, J. H. (1993). "Concurrent Engineering Comes to the Military," Military & Aerospace Electronics, July 19, pp. 29-30.

Merino, D. N. and A. Depaoli (1992). "An Annotated Bibliography on Concurrent-Engineering-Related Topics," Engineering Management Journal, Vol. 4, No. 2, June, pp. 39-43.

Murray, C. J. (1991). Design News, July 8, pp. 54-58.

Parsaei, H. R. and W. G. Sullivan (1993). Concurrent Engineering: Contemporary Issues and Modern Design Tools, Chapman and Hall, London, England.

Pennell, J. P. and M. G. Slusarczuk (1989). An Annotated Reading List for Concurrent Engineering, Institute for Defense Analyses, Alexandria VA, IDA Report D-571.

Pennell, J. P., R. I. Winner, H. E. Bertrand, and M. M. G. Slusarezuk (1989). "Concurrent Engineering: An Overview for Autotescon," Proceedings of the IEEE Autotescon, Philadelphia, PA, USA, September.

Trygg, L. (1993). "Concurrent Engineering Practices in Selected Swedish Companies: A Movement or an Activity of the Few?" Journal of Product Innovation Management, Vol. 10, No. 5, pp. 403-415.

Wilson, C. C. (1991). "Potential Pitfalls of Concurrent Engineering: How to Avoid the Risks," Concurrent Engineering, Vol. 1, No. 1, January/February.

Winner, R. I., J. P. Pennell, H. E. Bertrand, and M. M. G. Slusarezuk (1988). The Role of Concurrent Engineering in Weapons System Acquisition, Institute for Defense Analyses, Alexandria, VA, USA, IDA Report R-338.

Wood, J. D. and R. I. Winner (1990). The Relationship Between CALS and Concurrent Engineering, Institute for Defense Analyses, VA, USA, IDA Report P-2306.

Configuration Management

Hancock, D. C. and D. A. Lowrie (1990). "Integrated Information Systems in Support of Configuration Management," Proceedings of the American Power Conference, Vol. 52, Chicago IL, 29 April, pp. 921-926.

Hancock, L. R. (1993). "Enhancing Operability and Reliability Through Configuration Management," Proceedings of the Second ASME/JSME Nuclear Engineering Conference, Vol. 2, San Francisco CA, 21-24 March, pp. 707-709.

Samaras, T. T. and F. L. Czerwinski (1971). Fundamentals of Configuration Management, Wiley-Interscience, New York NY.

So, T., V. Jagannathan, and R. S. Raman (1992). "The Role of Configuration Management Systems in a Concurrent Engineering Environment," ASME Winter Annual Meeting, Anaheim CA, 8-13
November, 92-WA/EDB-2.

Customer Issues

Barnard, W. and T. F. Wallace (1994). The Innovation Edge: Creating Breakthroughs Using the Voice of the Customer, Oliver Wight Publications Inc, Essex Junction, VT, USA.

Bagozzi, R. P., ed. (1994). Principles of Marketing Research, Blackwell Business, Cambridge, MA, USA.

Bagozzi, R. P., ed. (1995). Advanced Methods of Marketing Research, Blackwell Business, Cambridge, MA, USA.

Clancy, K. J. and R. S. Shulman (1992). "It's Better to Fly a New Product Simulator Than Crash the Real Thing," Planning Review, July-August, pp. 10-17.

Fontenot, G., R. Behara, and A. Gresham (1994). "Six Sigma in Customer Satisfaction," Quality Progress, Vol. 27, No. 12, December, pp. 73-76.

Griffin, A. and J. R. Hauser (1992). The Voice of the Customer, working paper, Report No. 92-106, March, Marketing Science Institute, Cambridge, MA, USA.

Griffin, A. and J. R. Hauser (1993). "The Voice of the Customer," Marketing Science, Vol. 12., No. 1, Winter, pp. 1-27.

Gustafsson, A. (1993). QFD and Conjoint Analysis: The Key to Customer Oriented Products, Linkšping Studies in Science and Technology Thesis No. 393, Linköping University, Linköping, Sweden.

Gustafsson, A. and N. Gustafsson (1994). "Exceeding Customer Expectations," The Sixth Symposium on Quality Function Deployment, Novi, MI, USA, Appendix B.

Hauser, J. R., D. I. Simester, and B. Wernerfelt (1994). "Customer Satisfaction Incentives," Marketing Science, Vol. 13, No. 4, Fall, pp. 327-350.

Johnson, R. M. (1974). "Trade-Off Analysis of Consumer Values," Journal of Marketing Research, Vol. XI, May, pp. 121-7.

Jöreskog, K. G. and D. Sörbom (1989). LISREL 7: A Guide to the Program and Applications, 2nd. ed., SPSS Inc, Chicago, IL, USA.

Klein, R. L. (1990). "New Technologies for Listening to the Voice of the Customer," Transactions of The Second Symposium on Quality Function Deployment, Novi, MI, USA, June 18-19, pp. 197-203.

Kristensen, K., G. K. Kanji, and J. J. Dahlgaard (1992). "On Measurement of Customer Satisfaction," Total Quality Management, Vol. 3, No. 2, pp. 123-128.

Massnick, F. (1996). "Consult Your Customers Before Making Plans," Quality Progress, November, pp. 95-97.

Mazur, G. (1991). "Getting the Voice of the Customer," Transactions of the Third Symposium on Quality Function Deployment, Novi, MI, USA, 24-25 June, pp. 85-92.

Mazur, G. (1991). "Voice of the Customer Analysis and Other Recent QFD Technology," Transactions of the Third Symposium on Quality Function Deployment, Novi, MI, USA, 24-25 June, pp. 285-298.

Mazur, G. (1992). "Voice of the Customer Table: A Tutorial," Transactions of the Fourth Symposium on Quality Function Deployment, Novi, MI, USA, 15-16 June, pp. 105-111.

Mazur, G., J. Terninko, and R. Zultner (1994). "Voice of the Customer Analysis Tutorial," presented at the Sixth Symposium on Quality Function Deployment, Novi, MI, USA, 12 June.

Mazur, G., J. Terninko, and R. Zultner (1995). "Voice of the Customer Analysis Tutorial," presented at the Seventh Symposium on Quality Function Deployment, Novi, MI, USA, 11 June.

Parasuraman, A., V. A. Zeithaml and L. L. Berry (1985). "A Conceptual Model of Service Quality and its Implications for Future Research," Journal of Marketing, Vol. 49, Fall, pp. 41-50.

Parasuraman, A., V. A. Zeithaml and L. L. Berry (1988). "SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality," Journal of Retailing, Vol. 64, No. 1, Spring, pp. 12-40.

Prince, M. (1992). "Choosing Simulated Test Marketing Systems," Marketing Research, September, pp.14-16.

Stewart, D. W. and P. N. Shamdasani (1990). Focus Groups: Theory and Practice, Applied Social Research Methods Series, Vol. 20, Sage Publications, Newbury Park, CA, USA.

Zultner, R. E. (1991). "Before the House: The Voices of the Customers in QFD," Transactions of the Third Symposium on Quality Function Deployment, Novi MI, 24-25 June, pp. 451-464.

Decision Theory

J. M. Bocker and M. C. Bryson. "Decision analysis in project management: An overview," IEEE Tram. Eng. Manag., vol. EM-32, pp. 3-9 Feb. 1985 provides an overview of decision analysis and discussions of various fields which encompass decision theory or with which it interacts. A list of 96 additional references is also provided.

R. A. Howard, "`The foundations of decision analysis," IEEE Trans. Syst. Sci. Cybern., vol. SSC-4, pp. 211-219, Sept. 1968 provides system engineers with additional theoretical background that can be added to the tutorial data presented by North below.

D. W. North, "A tutorial introduction to decision theory," IEEE Tram. Syst. Sci. Cybern., vol. SSC-4, pp. 200-210, Sept. 1968, since system engineers must make many decisions during the design process, provides a firm foundation for under-standing how good decision can be made.

Design

W. G. Beazley, "Terminal products of design," Proc. Int. Conf. Cybernetics and Society, 1979, pp. 834-839 defines the terminal products of design as being problem statements. These problem statements can terminate in one of three mutually exclusive states: successful, impossible, or infeasible. These states and their implications on design are described.

R. Bernard, "Overlooking the obvious," IEEE Spectrum, vol. 18, pp. 85-89, Oct. 1981 argues that even if manufacturers have methods for filtering potential failure mechanisms, whether obvious or obscure, in the design and testing stages of products, some errors get overlooked. The author cites several examples and provides recommendations for avoiding similar errors (see also entry G-12 [Missing?]).

S. Blandford and R. P. Hope, "Systematic methods for the problem solving process with particular reference to design," Proc. Inst. Elec. Eng., vol. 132, pt. A, pp. 199-212, July 1985. presents a model for describing the relationship of the various stages of human activity within the process of solving a system problem.

Chow, W. W. Cost Reduction in Product Design. New York: Van Nostrand Reinhold Co., 1978.

C. W. Churchman, "Philosophical speculations on system design," Omega, Int. J. Management Sci., vol. 2, pp. 451-465, 1974 helps system engineers develop "an affinity for the systems point of view" [source] through philosophical speculations on systems design.

M. E. Connelly, "System design," in Handbook of Automation, Computation and Control. S. Ramo, E. M. Grabble, and D. E. Woolridge (eds.), Section III. New York: John Wiley, 1961.

A. J. Feduccia "System design for reliability and maintainability," Air Force J. Logistics, pp. 25-29, Spring 1984 identifies decisions that are made, knowingly or not and willingly or not, that impact the lifetime reliability, maintainability, and logistics readiness of systems; determines the possible effects of such decisions on systems; and introduces some technological advances in reliability and maintainability engineering which the decision maker can use to make an informed choice.

J. S. Gansler and G. W. Sutherland, "A design to cost overview," Defense Manag. pp. 2-7, Sept. 1974
provides a succinct introduction to the concept of designing to cost.

A. Giddings, "Compromise is bad design," Naval Engineers Journal, November, 77-78. 1986.

W. Hammer, "Designing a safe system," Machine Design, pp. 92-97, Sept. 3, 1970 describes a methodology for performing hazard analysis during system design and offers various accident prevention methods.

H. Katzan, Jr., Systems Design and Documentation. New York: Van Nostrand Reinhold, 1976 introduces a technique for describing a system in terms of its inputs, constituent processes, and Outputs. It also provides a basic background essential to the understanding of structured design techniques.

C. J. Koomen, "The entropy of design: A study on the meaning of creativity," IEEE Tram. Syst., Man, Cybern., vol. SMC-15, pp. 16-30, Jan./Feb. 1985 intends "to improve the methods and techniques for the design of complex systems by formalizing the basic mechanisms and incorporating the acquired knowledge into these mechanisms."

D. J. Leech, Management of Engineering Design. New York: Wiley, 1972 describes principles of good engineering design, as measured in terms of economic viability and technical innovation, appreciation of which is essential to the successful design of systems. This basic text is highly recommended for those beginning their careers as systems engineers.

E. Lurcott, "F2D2 (functional flow diagrams and descriptions), a system management tool," Defense Syst. Manag. Rev., vol. 1, pp. 19-28, Autumn 1977 describes a system engineering management tool useful for coordinating the interplay between system engineers and engineering specialists. The tool also simplifies the attainment of a balanced system design in which each major design is based upon the proper coordination of system variables, including facilities, equipment, computer programs, personnel, training,
testing, and intrasystem interfaces.

Maddox, M., and D. Allen, "What have you done to my interface?" Ergonomics in Design, January 1993, pp. 12-19.

J. Malouin, and M. Landry, "The mirage of universal methods in systems design," J. Appl. Syst. Anal., vol. 10, pp. 47-62, 1983 argues that many published design methodologies have limited applicability to situations other than those that such methodologies were originally intended to solve. The authors believe that a choice of a design methodology can be made rationally and systematically. They present a framework intended to help in the judicious and enlightened choice of a design method.

A. H. Masso; and D. F. I. Rudd;. "The synthesis of system design: [Part] II, Heuristic structuring," AlChE J., vol. 15, no. 1, pp. 10-17, January 1969.

D. D. Meredith, K. W. Wong, R. W. Woodhead, and R. H. Wortman. Design and Planning of Engineering Systems, 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, 1985 is one of the newest texts to present the major principles and methods employed in system planning and design.

P. K. M'Pherson, "A framework for systems engineering design," Radio Electron. Eng., vol. 51, pp. 59-93, Feb. 1981 views the system engineering design process from a slightly different perspective than most American writers. This difference in prospective, M'Pherson's easy writing style, and breadth of coverage make this a "must read" paper.

G. Nadler, "Systems methodology and design," in Proc IEEE Int. Conf. Systems, Man, and Cybernetics, 1984, pp 427-437 (also in IEEE Tram. Syst., Man, Cybern., vol. SMC-15, pp. 685-697, Nov/Dec 1985) first reviews the problems faced by today's economy and relates them to engineering problem solving and design. He then compares traditional and modern ways of handling design problems. This is followed by a review of different traditional sciences as a possible basis for a unified system methodology and design and the implications of such sciences for system design.

G. Nadler, "An investigation of design methodology, Management Sci., vol. 13, pp. B642-B655, June 1967 compares the purpose and methodologies of research and of designing. He argues that, while their purposes are different, the methodologies then in use were the same. This paper provides the background required to appreciate the other papers in this section.

D. A. Norman. The Design of Everyday Things. New York: Doubleday, 1988.

J. G. Peterson, G. Nadler, and M. Chignell, "Perspectives on design: Problems, processes, and purposes," in Proceedings of the 1987 IEEE International Conference on Systems Man and Cybernetics. New York: IEEE, 980-984, 1987.

V. Riley, "FAIT: A systematic methodology for identifying system design issues and tradeoffs," in Proceedings, IEEE, 1036-1038, 1989.

W. B. Rouse and K. R. Boff. System Design: Behavioral Perspectives on Designers, Tools, and Organizations. New York: North-Holland, 1987.

A. M. Ruskin, J. B. Carraway, and M. J. Singer, "Developing one-of-a-kind systems systematically," in Proceedings, 1989 IEEE 2nd International Conference, 28-38, 1989.

M. G. Ryschkewitsch,. The NASA Mission Design Process: An Engineering Guide to the Conceptual Design, Mission Analysis, and Definition Phases. NASA Engineering Management Council, December 22, 1992.

A. P. Sage, "A methodology for system design," in IEEE Systems/Man/Cybernetics Conf. Proc., 1980, pp. 272-277 presents a normative model of the design process. The model presented consists of a five-phase iterative methodology. Sage claims that the approach is sufficiently robust so that it can
be adapted to a variety of system design situations.

_____ (Author missing). System Design for Human Interaction. New York: IEEE Press, 1987.

K. K. Schwarz, "The many facets of engineering design, Proc. Inst. Elec. Eng., Part A, vol. 130, pp. 196-201, June 1983 describes how the combination of many different disciplines contribute to the production of engineering "goods." He presents some of the difficulties with and differences between
conceptual and physical designs.

T. B. Sheridan, "Designing complex technology: Understanding it as of, by, and for people," Technological Forecasting and Social Change, 36, 89-97,1989.

L. Smith, "Hierarchical design structures simplify system development," EDN, vol. 28, pp. 165-167, Sept. 15, 1983 relates the structured, hierarchical design techniques of software engineering to the design and management of complex electronic systems.

B. C. Steward, "Design process analysis modeling--An approach for improving the system design process," in Proc. 1978 IEEE Int. Conf. Cybernetics and Society, 1978, pp. 3-7 presents a discussion of some problems impacting the development of large-scale data-intensive systems. Procedures for resolving these problems are presented. Steward's efforts will aid systems engineers to "fill-in-the-holes" in more comprehensive texts such as those by DeMarco or by Katzan.

D. V. Steward, "The design structure system: A method managing the design of complex systems," IEEE Tram. Eng. Manag., vol. EM-28, pp. 71-74, Aug. 1981 discusses a "matrix" methodology for ordering the tasks of system design. According to Steward, the matrix can assist in organizing the design of a system, developing an effective engineering plan, showing where estimates are required, and analyzing the flow of information that occurs during the design work.

L. J. Van Poolen, "A philosophical perspective of technological design, " Inter. J. Engineering Education, 319-329,

W. Visser, "More or less following a plan during design: Opportunistic deviations in specification," Inter. J. Man-Machine Studies, vol. 33, 247-278, 1990.

Architecture Heuristics

F. P. Brooks, "Architectural philosophy," in Planning a Computer System. W. Bucholz (ed.), New York: McGraw-Hill, 5-16, 1962.

D. N. Chorafas. Systems Architecture & Systems Design. New York: McGraw-Hill, 1989.

F. Ferguson. Architecture, Cities and the Systems Approach. New York: Braziller, 1975.

R. Groner, M. Groner, and W. F. Bischof. Methods of Heuristics. Hillsdale, NJ: Lawrence Erlbaum Associates, 1983.

E. Rechtin. Systems Architecting: Creating and Building Complex Systems. New York: Prentice-Hall, 1991.

D. G. Reinersten. "Use product architecture to slash design time," Electronic Design, December 3, 1992, pp. 59-62.

Effectiveness (Cost/System)

B. S. Blanchard, "Cost effectiveness, system effectiveness, integrated logistic support, and maintainability," IEEE Tram. Rel., vol. R-16, pp. 117-126, Dec. 1967 presents a comprehensive discussion of cost effectiveness, system effectiveness, integrated logistic support (ILS), and maintainability. This basic background will assist system engineers in carrying out system engineering, Phase 5.

J. S. Byrnes and R. A. Angell, "The dependency model: A tool for calculating system effectiveness," IEEE Tram. Rel., vol. R-34, pp. 17-23, Apr. 1985 presents a mathematically unsophisticated but useful and practical tool for measuring the effectiveness (reliability, availability, maintainability, efficiency, etc.) of a complex system.

R. A. Erickson. Measures of Effectiveness in Systems Analysis and Human Factors. China Lake, CA: Naval Weapons Center, Sept. 1986.

D. S. Fields, "Cost/effectiveness analysis: Its tasks and their relationships," Operations Res., vol. 14, pp. 515-527, May 1966 discusses the nature of the major tasks involved in cost/effectiveness analysis and how they are interrelated.

D. H. Heaton, "System/cost effectiveness analysis in the system engineering process," Defense Ind. Bull., pp. 34-37, July 1969 specifically relates system/cost effectiveness analysis to the system engineering process.

S. Laut, "Subsystem optimization effectiveness improvement by the option trade-off Analysis process," IEEE Tram. Syst. Sci. Cybern., vol. SSC-4, pp. 133-137, July 1968 provides explanations of effectiveness attributes and tradeoff analysis which contain basic information essential for understanding system engineering, Phase 7.

R. W. Pike. Optimization for Engineering Systems. New York: Van Nostrand Reinhold, 1986.

K. N. Sargent, "Insight into SEEing: A discussion of the philosophy underlying systems effectiveness engineering," IEEE Tram. Aerosp. Electron. Syst., vol. AES-2, pp. 506-510, Sept.1966 provides some historical insights into systems effectiveness engineering. He compares and contrasts several extant models and introduces the equation E = ADC, where E is the quantitative measure of the achievement of requirements, A is availability, D is dependability, and C is capability.

D. C. S. Shearn, "Approaches to achieving cost effectiveness," Proc. Inst. Elec. Eng., Part A, vol. 129, pp. 269-273, June 1982 explains the various ways in which the term "cost effectiveness" is used. These explanations can form a firm foundation for the study of cost effectiveness in systems engineering and also

provide a benchmark for comparing other writings.

C. M. Slemaker, The Principles & Practice of Cost Schedule Control Systems, Princeton, NJ: Petrocelli Books, 1985.

F. A. Tillman, C. L. Hwang, and W. Kuo, "System effectiveness models; An annotated bibliography," IEEE Tram. Rel., pp. 295-304, Oct. 1980 provides a source of in-depth information for studying the concept of system effectiveness.

Evaluation (Cost/Performance)

G. W. Barton, Jr., "System evaluation," ASTM Standardization News, vol. 4, pp. 14-17, 17-18, May 1976 presents a system evaluation methodology that consists of three questions: "Does the system meet the need?" "Does it have unused potential?" "Is there any way to do it better next time?"

R. F. Erlandson, "System evaluation methodologies: Combined multidimensional scaling and ordering techniques," IEEE Tram. Syst., Man, Cybern., vol. SMC-8, pp. 421-432, June 1978 describes a methodology for evaluating alternative systems for future use. The multidimensional scaling technique introduced was used to determine the interrelationships between system attributes. These attributes are 1) system structure (from stable to dynamic), 2) system functions or service (service done on a system versus service performed by the system), 3) human-system interactions (human-system versus system-system interaction), and 4) system control. An understanding of the concepts described will aid system engineers in performing the functional allocation task (system engineering, Phase 2).

D. H. Hamburger, "Accurately estimate your project's cost," EDN, pp. 217-221, Sept. 2, 1981 provides useful guides for setting up a project cost estimating system.

J. D. Hessman and V. C. Thomas, "A time of great testing," Sea Power, pp. 30-37, Mar. 1985
explains that the design and development of engineered systems is not complete until after successful operational testing. This interview with the commander of the Navy's Operational Test and Evaluation Force provides insight into the current state-of-the-art of operational testing.

L. Wilkerson, and A. Paul, "Every system should have one: A collection of properties which can be used as a criterion for evaluating the quality of a system," Inform. Process. Manag., vol.21, pp. 45-49, 1985
provides a comprehensive summary of what properties a system should possess. A means is provided to identify systems and measure them against a checklist.

Functional Allocation

M. V. Hemenway, "Functional analysis of weapon systems," Logistics Spectrum, vol. 23, no. 2,19-23, Summer 989.

E. Lurcott, "F2D2 (functional flow diagrams and descriptions), a system management tool," Defense Syst. Manag. Rev., vol. 1, pp. 19-28, Autumn 1977 See entry D-Lurcott.

H. E. Price, "The allocation of functions in systems," Human Factors, vol. 27, pp. 33-45, Feb. 1985
presents the best readily available information to aid system engineers in performing system engineering, Phase 3.

E. J. Wittry; Functional Analysis: Simplify Before Automating. New York: Van Nostrand Reinhold, 1991.

General Readings

M. Alford, "Structuring the dialog between system and software engineers," in Proc. 15th Southeastern Symp. System Theory, 1983, pp. 348-351 presents an approach for performing the iterative process of system design in terms of a structured dialog between systems and component engineers.

T. H. Athey, Systematic Systems Approach: An Integrated Method for Solving Systems Problems. Englewood Cliffs, NJ: Prentice-Hall, 1982 presents an integrated methodology for solving complex systems problems. This methodology is based on the "universal aspects of systems" and will aid system engineers in developing their problem-solving abilities.

N. R. Augustine, Augustine's Laws. New York: Amer. Inst. Aeronaut. Astronaut., 1983 sets forth "laws" which are "dedicated to the proposition that, with a better understanding of the history of past programs, one need only selectively repeat history in the future." In addition to providing valuable insight into problems encountered in previous system development efforts, this book is highly entertaining.

J. A. Baird, "How can systems engineers do systems engineering?" IEEE Tram. Aerosp. Electron. Syst., pp. 405-407, Mar. 1971 asks three questions: "What is expected of systems engineers?" "What is not expected of systems engineers?" and "What jobs can systems engineers do and what can't they do?" One of
the first steps in the system engineering process is to define the boundaries of the proposed system. Baird attempts to do this for systems engineers.

J. S. Baumgartner, Systems Management. Washington, DC: Bureau of National Affairs, 1979 is a collection of writings providing insight into the broad spectrum of systems management. An appreciation for the problems facing system engineering managers will help system engineers in their day-to-day design activities.

W. R. Beam. Command, Control and Communications Systems Engineering. New York: McGraw-Hill, 1989.

J. A. Bent, Applied Cost and Schedule Control. New York: Marcel Dekker, 1982 has a practical approach that will assist system engineers with limited background in cost and schedule control techniques to develop the required understanding of these essential concerns.

B. S. Blanchard and W. J. Fabrycky; Systems Engineering and Analysis. Englewood Cliffs, NJ: Prentice-Hall, 1981.

F. P. Brooks, Jr. The Mythical Man Month. New York: Addison-Wesley, 1982.

G. J. Chambers, "What is a systems engineer?" IEEE Tram. Syst., Man, Cybern., vol. SMC-15, pp. 517-521, July/Aug. 1985 presents an explanation of the functions typically performed by systems engineers in the military-industrial environment of the 1980's. The knowledge, skills, and abilities required are examined and means for acquiring these are described.

P. Checkland. Systems Thinking, Systems Practice. New York: John Wiley & Sons, 1981.

C. W. Churchman. The Design of Inquiring Systems. New York: Basic Books, 1971.

K. B. De Greene, "Large technology-based systems and the need for paradigm shift," Technological Forecasting and Social Change, vol. 39, 349-362, 1991.

F. E. Emery (ed.). Systems Thinking (vols. 1 & 2). New York: Penquin Books, 1981.

M. Gupta, "Preparation of a technical bibliography," IEEE Trans Prof. Commun., vol. PC-16, pp. 7-10, Mar. 1973.

Hall, M. N. (1993). "Reducing Long term System Cost by Expanding the Role of the Systems Engineer," Proceedings of the 1993 International Symposium on Technology and Society, IEEE, 23-23 October, Washington DC, pp. 151-155.

R. W. House, "A morphology of technical innovation as a process," in Proc. Int. Conf. Cybernetics and Society, 1979 presents a comprehensive review of the elements of the technological innovation process. This morphology can help system engineers to diagnose or prevent problems in the technological innovation process.

G. J. Klir; Architecture of System Problem Solving. New York: Plenum Press, 1985.

H. Ledgard, "Programmers: The amateur vs. the professional," Abacus, vol. 2, pp. 29-35, Summer 1985 provides valuable insights for system engineers who must interact with computer programmers for the first time.

T. Levitt, "Creativity is not enough," Harvard Business Rev., vol. 41, pp. 72-83, May/June 1963 is addressed to business managers but offers valuable advice to system engineers. It stresses the need "to distinguish between the relatively easy process of being creative in the abstract and the infinitely more difficult process of being innovationist in the concrete."

B. W. Mar, and R. N. Palmer. "Does civil engineering need system engineering?" J. of Professional Issues in Engineering, vol. 115, no. 1, 45-52, January 1989.

L. L. McLaughlin, "Multiple cooperating for systems engineering," in Proceedings, IEEE 1989 International Conference on Systems Engineering, 191-195, 1989.

Open Systems Group; Systems Behavior (3rd. ed.). New York: Harper & Row, 1981.

J. D. Palmer, "Large scale systems: Systems, man, and cybernetics overview," IEEE Tram. Automat. Contr., vol. AC-28, pp. 653-659, June 1983 is an overview of some of the major areas of activity in the field of large-scale systems and provides an excellent model for the development of a system engineer's learning plan. Forty-four references are provided in six areas: general, input-output-economic models, public system methodologies, imperative structural modeling, transportation systems, and man-machine systems.

H. Petrosk, To Engineer is Human: The Role of Failure in Successful Design. New York: St. Martin's Press, 1985 explains how dramatic engineering failure can occur and presents examples of such failures from throughout the history of man-made structures and systems. The Preface states that "to understand what engineering is and what engineers do is to understand how failures can happen and how they can contribute more than successes to advance - technology."

R. M. Pirsig, Zen and the Art of Motorcycle Maintenance. New York: Bantam, 1974 is a quality book about quality. A true appreciation for the values advanced by Pirsig would help system engineers in their efforts to design quality into new systems.

W. R. Rouse; and K. R. Boff. System Design: Behavioral Perspectives on Designers, Tools, and Organizations. New York: North-Holland, 1987.

A. P. Sage, Methodology for Large-Scale Systems. New York: McGraw-Hill, 1977 presents methodologies pertinent to the solution of complex technological and societal systems engineering problems.

H. Simon, The Sciences of the Artificial, 2nd ed. Cambridge, MA: MIT Press, 1981 concerns the thesis that systems (and other phenomena) are "artificial" in that "they are as they are only because of being molded, by goals or purposes, to [their] environment." An understanding of the concepts presented will help system engineers to develop an understanding for the "science of design."

S. E. Stephanou, Ed., The System Approach to Societal Problems. Malibu, CA: Daniel Spencer Publishers, 1982, pp. 8-12.

T. C. Taylor (see entry B-Taylor).

G. Vickers. Human Systems are Different. New York: Harper & Row, 1983.

B. Wilson, Systems: Concepts, Methodologies, and Application. New York: Wiley, 1984 attempts to develop and clarify the concept of systems. It addresses the transfer of intellectual ideas, problem solving, and the relationship between theory and practice.

Government Documents

[Note: To verify currency of standards, visit the Defense Standardization Program Home Page at: http://www.acq.osd.mil/es/std/stdhome.html]

<u>Department Of Defense Directives</u>

DoDD 4005.1, DoD Industrial Preparedness

DoDD 4105.62, Selection of Contractual Sources for Major Defense Systems

DoDD 4120.3, Defense Standardization and Specification Program

DoDD 4120.18, Use of Metric System of Measurement

DoDD 4245.3, Design to Cost

DoDD 4245.6, Defense Production Management

DoDD 4245.7, Transition from Development to Production

DoDD 5000.1, Major System Acquisitions

DoDD 5000.3, Test and Evaluation

DoDD 5000.4, OSD Cost Analysis Improvement Group

DoDD 5000.29, Management of Computer Resources in Major Defense Systems

DoDD 5000.39, Acquisition and Management of Integrated Logistic Support for Systems and Equipment

DoDD 5000.40, Reliability and Maintainability

DoDD 5000.43, Acquisition Streamlining

DoDD 5010.19, Configuration Management

DoDD 5010.20, Work Breakdown Structures for Defense Materiel Items

DoDD 5141.2, Director of Operational Test and Evaluation

Department Of Defense Instructions

DoDI 4120.20, Development and Use of Non Government Specifications and Standards

DoDI 5000.2, Major System Acquisition Procedures

DoDI 5000.33, Uniform Budget/Cost Terms and Definitions

DoDI 5000.38, Production Readiness Reviews

DoDI 7000.2, Performance Measurement for Selected Acquisitions

Department Of Defense Guides/Manuals

DoD Guide to Integrated Product and Process Development, Version 1.0, Office of the Under Secretary of Defense (Acquisitions and Technology), February 5, 1996.

DoD Guide LCC-1, Life Cycle Costing

DoD Guide LCC-2, Life Cycle Costing Casebook

DoD Guide LCC-3, Life Cycle Costing for Systems

DoD 4120.3-M, Defense Standardization Manual

DoD 4245.7-M, Transition from Development to Production

DoD 5000.3-M-1, Test and Evaluation Master Plan Guidelines

DoD 5000.3-M-2, The Department of Defense Foreign Weapons Evaluation Program

DoD 5000.3-M-3, Software Test and Evaluation Manual

DoD 5000.3-M-4, Joint Test and Evaluation Procedures Manual

DoD 5000.3-M5, Procedures Manual - Improving Test and Evaluation Effectiveness in Support of the Major Weapon Systems Decision Process

Department Of Defense Standards

DoD-D-1000B, Drawings, Engineering, and Associated Lists

DoD-STD-100C, Engineering Drawing Practices

DoD-STD-480A, Configuration Control - Engineering Changes, Deviations, and Waivers

DoD-STD-963, Data Item Descriptions (DID), Preparation of

DoD-STD-2167, Defense System Software Development

DoD-STD-2168, Software Quality Evaluation

Military Standards

MIL-STD-130F, Identification Marking of U.S. Military Property

MIL-STD-470A, Maintainability Program for Systems and Equipment

MIL-STD-471B, Maintainability Demonstration/Evaluation

MIL-STD-481A, Configuration Control Engineering Changes, Deviations, and Waivers (Short Form)

MIL-STD-482A, Configuration Status Accounting Data Elements and Related Features

MIL-STD-483A, Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs

MIL-STD-490B, Specification Practices

MIL-STD-499B, Systems Engineering (Draft)

MIL-STD-756B, Reliability Modeling and Prediction

MIL-STD-785B, Reliability Program for Systems and Equipment

MIL-STD-881A, Work Breakdown Structures for Defense Materiel Items

MIL-STD-13881A, Logistic Support Analysis

MIL-STD-13882A, Logistic Support Analysis Record

MIL-STD-1456, Contractor Configuration Management Plans

MIL-STD-1528, Production Management

MIL-STD-1535, Supplier Quality Assurance Program Requirements

MIL-STD-1662A, Ordnance Alteration (ORDALT) Instructions, Preparation of

Military Handbooks

MIL-HDBK-189, Reliability Growth Management

DoD-HDBK-248, Guidance for Application and Tailoring of Requirements for Defense Materiel Acquisitions

MIL-HDBK-259, Life Cycle Cost in Navy Acquisitions

DoD-HDBK-287, Defense System Software Development Handbook

MIL-HDBK-472, Maintainability Prediction

Other Military Documents

MIL-N-7513F, Nomenclature Assignment, Contractor's Method for Obtaining

MIL-Q-9858A, Quality Program Requirements

MIL-S-83490, Specifications, Types and Forms

Army Documents

Department of the Army. System Engineering. Field Manual 770-78. Washington, D.C.: Author, 1979.

Army Force Planning Handbook TTO-ORT-03-776B-V3, "Life Cycle Costing," Joint Tactical Communication

AR 70-10, Test and Evaluation During Development and Acquisition of Material

AR 70-37, Configuration Management

AR 70-64, Design to Cost

AR 71-3, User Testing

AR 702-3, Army Materiel Systems Reliability, Availability, and Maintainability

DAP 11-2, Research and Development Cost Guide for Army Materiel Systems

DAP 11-3, Investment Cost Guide for Army Materiel Systems

DAP 11-4, Operating and Support Cost Guide for Army Materiel Systems

DAP 11-5, Standard for Presentation and Documentation of Life Cycle Cost Estimates

Air Force Documents

AFR 65-3, Configuration Management

AFR 80-14, Test and Evaluation

AFR 800-11, Life Cycle Costing

AFR 800-17

AFR 800-18, Air Force R&M Program

FSC/AFLC Joint Command Working Group on LCC, Life Cycle Cost Procurement Guide

AFSCM 173-4

AFSCN 84-3, Production Management

AFSCP 57-2, Modification Management

AFSCP 800-7, Configuration Management

AFSCR 84-2, Production Readiness Reviews

Department of the Air Force, Software Technology Support Center, *Guidelines for Successful Acquisition and Management of Software Intensive Systems: Weapons Systems, Command and Control Systems, Management Information Systems*; Vols. 1 and 2, September 1994.

Navy Documents

NAVFAC P-422, Economic Analysis Handbook

NAVMATINST 3960.7A, Test and Evaluation of Ship Acquisitions

NAVELXINST 4130.1, Configuration Management

NAVMATINST 5200.11A

NAVSEA 0900-LP-095-2010, TSTP/SP Ship Construction Tests and Trials Manual

NAVSEAINST 4720.3, Fleet Modernization Program (FMP), Plans and Procedures for

ONAS P 4855-X, Engineering Risk Assessment

OPNAVINST 3960. l0B, Test and Evaluation

OPNAVINST 4720.2E, Fleet Modernization Program (FMP), Policy for

SECNAV 4200.32, Design to Cost

SECNAVINST 4130, Navy Configuration Management Manual

SECNAVINST 4210.6, Acquisition Policy

Marine Corps Documents

MCO 4130.1A, Configuration Management

MCO 5000.11A, Testing and Evaluation of Systems and Equipment for Marine Corps

Other Government Documents

DARCOM P700-6, NAVMAT P5242, AFLC/AFSCP 800-19, Joint Design to Cost Guide--Life Cycle Cost as a Design Parameter

DEPSECDEF Memorandum of January 11, 1984; Improving Contract Requirements

DEPSECDEF Memorandum of June 3, 1985; Acquisition Streamlining

DEPSECDEF Memorandum of December 4, 1985; Reducing Over-Specified and Non-Cost-Effective Acquisition Requirements

DEPSECDEF Memorandum of December 5, 1985; Eliminating Non-Cost-Effective Contract Requirements

DSMC, DoD Manufacturing Handbook for Program Managers, July 1984

DSMC, Embedded Computer Resources Guide, May 1986 DSMC, Integrated Logistic Support Guide, May 1986

DSMC, Program Manager's Notebook

DSMC, DoD Test and Evaluation Handbook

NAVSO P 6071, "Best Practices: How to Avoid Surprises in the World's Most Complicated Technical Process."

OFPP Pamphlet No. 1, Major System Acquisitions, A Discussion of the Application of OMB Circular No. A-109

OMB Circular A-76, Supplement 1, Cost Comparison Handbook OMB Circular A-109, Major System Acquisitions

Data Item Descriptions

DI-A-3029, Agenda - Design Reviews, Configuration Audits and Demonstrations

DI-CMAN-80008, System/Segment Specification

DI-E-3118, Minutes of Formal Reviews, Inspections and Audits

DI-E-5423, Design Review Data Package

DI-E-30141, Interface Specification

DI-F-30203, Design to Cost/Life Cycle Cost Reports

DI-MCCR-80025, Software Requirements Specification

DI-MCCR-80026, Interface Requirements Specifications

DI-P-3460, Production Plan

DI-S-3607/SI291, Schematic Block Diagrams (USAF)

DI-S-3604/SI261, Functional Flow Diagrams (USAF)

DI-S-3618/SI52, System Engineering Management Plan (SEMP)

UDI-S-23974, System Engineering Management Plan (SEMP)

DI-S-3619, Technical Performance Measurement Report

UDI-A-23862, Plan, Risk Management

Human Engineering

R. W. Bailey. Human Performance: A Guide for System Designers. Englewood Cliffs, NJ: Prentice-Hall, 1982.

H. R. Booher (ed.). MANPRINT: An Approach to Systems Integration. New York: Van Nostrand Reinhold, 1990.

H. E. Price (See entry H-Price).

R. Rubinstein and H. Hersh, The Human Factor: Designing Computer Systems for People. Burlington, MA: Digital Press, 1984 an easy-to-read book, will help system engineers develop an awareness of the importance of "user-centered design."

D. R. Towill, "Man-machine interaction in aerospace control systems," Radio Electron. Eng., vol. 50, pp. 447-458, Sept. 1980 emphasizes that optimizing the performance of man-machine systems is an interdisciplinary activity. He argues that the system engineering task of bringing together all the products and skills needed to optimize the performance of the man-machine system is not well understood. Towill brings together the constituent components of such systems in such a manner as to provide a firm foundation for the "systems engineering" aspect of design.

W. E. Woodson. Human Factors Design Handbook. New York: McGraw-Hill, 1981.

Life-Cycle Costs

B. S. Dhillon. Life Cycle Costing. New York: Gordon and Breach Science Publishers, 1989

R. B. Fuld, "The fiction of function allocation," Ergonomics in Design, January 1992, pp. 20-24.

T. P. Hall, "Systems life cycle model," J. Syst. Manag., pp. 29-31, Apr. 1980 summarizes the sequence of a system's life cycle (system engineering, Phase 6).

T. M. Loughney, "Design-to-cost-A new perspective," Logistics Spectrum, pp. 16-20, Winter 1984
explains the relationship between design to cost and life cycle cost analysis. Discussion is centered around Department of Defense Directive, DODD 4345.3, Design to Cost.

Michaels, Jack V., and William P. Wood. Design to Cost. New York: John Wiley & Sons, 1989. provides an excellent overall text on the subject. However, the index leaves a lot to be desired as it appears to not have been updated for the final version of the text.

Nielsen, J., "Traditional dialogue design applied to modern user interfaces," Comm. of the ACM, Vol. 33, No. 10, October 1990, pp. 109-118 presents several examples showing that principles for designing usable dialogues are just as important for modern graphical user interfaces as they are for traditional text-based interfaces.

T. L. Regulinski and Y. P. Gupta, "Reliability cost estimation: Managerial perspectives," IEEE Trans. Rel., vol. R-32, pp. 276-281, Aug. 1981 discusses selected sources of uncertainties associated with reliability related life cycle costs.

L. L. Taylor, "Systems engineering and the total system life cost," in Proc. Int. Conf. Systems, Man, and Cybernetics, vol. 2. New York: IEEE Press, 1983, pp. 1198-1201 promotes the use of systems engineering to minimize total system life cost (TSLC). A comprehensive understanding of the concept of TSLC is essential prior to the accomplishment of system engineering, Phase 6.

Logistics Support

B. S. Blanchard, "Maintainability engineering, system engineering, logistics support," Logistics Spectrum, vol. 6, pp. 18-26, Spring 1972 provides basic information essential for an understanding of maintainability principles, how maintainability integrates into system engineering and integrated logistics support, and the necessary emphasis on maintainability characteristics in product design.

J. de Corlieu, "Equipment availability and logistics principles," in Proc. 1977 Annu. Reliability and Maintainability Symp., pp. 462-466 investigates new approaches to logistics problems starting from the basic reason for logistics, states several principles and makes assumptions which simplify mathematical models. It is an excellent introductory essay.

C. L. Hwang, F. A. Tillman, and M. H. Lee (See entry O-Hwang).

R. Jager, "A systematic approach to designing for testability,' in 1984 Proc. Annu. Reliability and Maintain-ability Symp., pp. 520-524, 1984 presents a systematic approach to designing for all maintenance levels and an integrated maintenance concept.

J. V. Jones. Integrated Logistics Support Handbook. Blue Ridge Summit, PA: Tab Books, 1987.

M. L. Locks, "System reliability analysis: A tutorial" Microelectron. Rel., vol. 18, pp. 335-345, 1978 is a tutorial in two parts. Part 1 addresses the logical concepts of reliability analysis and Part 2 discusses probability calculations based on the principles presented in Part 1. The information presented is essential for a thorough understanding of the goals of reliability and maintainability engineering.

Models Modeling

A. Chapanis, "Men, machines, and models," American Psychologist, vol. XVI, no. 3, 113-131, March 1961.

B. L. Chapman, A. T. Bahill, and A. W. Wymore. Engineering Modeling and Design. Boca Raton, FL:CRC Press, 1992.

J. Gruhl, "Model validation," in Proc. Int. Conf. Cybernetics and Society, 1979, pp. 536-541 presents discussions and examples of a number of techniques that can be useful in making assessments of model validity.

C. J. Koomen, "Reducing model complexity in system design," in Proc. Int. Conf. Cybernetics and Society, 1979, pp. 830-833 considers the meaning of complexity in relation to system design and discusses principles of complexity reduction.

G. A. Mihram, "The modeling process," IEEE Tram. Syst., Man, Cybern., pp. 621-629, Nov. 1972 presents a taxonomy of 24 model categories and, in a discussion of the scientific method and the modeling process, indicates the evaluations pertinent to the selection of a modeling medium appropriate to a particular systems study.

G.R. Mosard, "Modeling in systems analysis," Eng. Manag. Int., vol. 3, pp. 85-90, 1985 describes modeling in the context of systems analysis and discusses the implications of modeling with respect to systems engineering (and other disciplines).

H. Muller-Merbach, "Model design based on the systems approach," J. Operation Res. Soc., vol. 34, pp. 739-751, Aug. 1983 presents a systems approach supporting interdisciplinary in that it encourages participation of non-mathematicians in the model design process.

E. B. Roberts, "On modelling," Technological Forecasting Social Change, vol. 9, pp. 231-238, 1976 is a tutorial addressing building models, choosing a modeling approach, testing and validity checking of models, and using models.

A. R. Teasdale, "Methodology of modeling," Electra Tech, vol. 78, pp. 65-74, Sept. 1966 describes the proper role of modeling in systems engineering and presents the fundamental concepts essential to good modeling techniques.

Process Models and Related Materials

ISO/IEC, Software Process Improvement Capability determination (SPICE) International Standard. (Visit http://www.sei.cmu.edu/technology/process/spice/index.shtml, for more information.)

NIST, The Malcolm Baldridge National Quality Award Criteria (Visit http://www.quality.nist.gov/crit2.htm).

Software Engineering Institute, *A Systems Engineering Capability Maturity Model*, Version 1.1, Carnegie Mellon University, November 1995.

Software Engineering Institute, *Relationship Between the Systems Engineering Capability Maturity Model and Other Products*, Version 1.0, Carnegie Mellon University, November 1995.

Software Engineering Institute, *A Description of the Systems Engineering Capability Maturity Model Appraisal Method*, Version 1.0, Carnegie Mellon University, June 1995.

Software Engineering Institute, *A Software Engineering Capability Maturity Model*, Version 1.1, Carnegie Mellon University.

Software Engineering Institute, *Integrated Product Development Capability Maturity Model*, Carnegie Mellon University.

Software Engineering Institute, *Software Acquisition Capability Maturity Model*, Version 1.01, Carnegie Mellon University, December 1996.

Production Engineering

K. Cross, "Manufacturing planning: Key to improving productivity," Ind. Eng., pp. 50-59, 1981 discusses some of the problems that production managers face when attempting to have the "right assets at the right place at the right time." An understanding and appreciation of these problems will aid systems engineers in performing the production engineering analysis required by MIL-STD-499B.

R. A. Pierson, "Practical side of systems design," Production Eng., vol. 26, pp. 38-40, Dec. 1979 summarizes the advantages of using standard components in system design and presents a grouping of practical "hints" that are applicable to the design of any system.

P.G. Smith and D. G. Reintertsen. Developing Products in Half the Time. New York: Van Nostrand Reinhold, 1991.

Reliability and Maintainability

J. E. Angus and L. E. James, "Combined hardware/software reliability models," in Proc. Annu. Reliability and Maintainability Symp., New York: IEEE Press, 1982, pp. 178-186 discusses a methodology for combining both hardware and software reliability / maintainability measures into a common reliability methodology. Their work will aid engineers trained in other disciplines to acquire an appreciation for the system approach.

R. Bernhard (See entry D-Bernhard).

B. I. Dhillon. Reliability Engineering in Systems Design and Operation. New York: Van Nostrand Reinhold., 1982.

Dhillon, B. S. (1988). Mechanical Reliability: Theory, Models, and Applications, American Institute of Aeronautics and Astronautics Inc, Washington DC.

A. J. Feduccia (See entry D-Feduccia).

N. B. Fuqua. Reliability Engineering for Electronic Design. New York: Marcel Dekker, 1987.

Gnedenko, B. and I. Ushakov (1995). Probabilistic Reliability Engineering, John Wiley & Sons, Inc., New York NY.

Grosh, D. L. (1989). A Primer of Reliability Theory, John Wiley & Sons, New York NY.

C. L. Hwang, F. A. Tillman, and M. H. Lee, "System-reliability evaluation: Techniques for complex/large systems--A review," IEEE Tram. Rel., vol. R-30, pp. 416-422, Dec. 1981 reviews the literature related to system reliability evaluation techniques for small to large complex systems.

M. B. Kline, "Software and hardware R & M: What are the differences?" in 1980 Proc. Annu. Reliability and Maintainability Symp., pp. 179-185 discusses both hardware and software reliability and maintenance, points out their similarities and differences in both conceptual and practical terms, and proposes terminology applicable to both.

O'Connor, P. D. T. (1991). Practical Reliability Engineering, John Wiley & Sons, Chichester, UK.

Pham, H. (1995). Software Reliability and Testing, IEEE Computer Society, Los Alamitos CA.

T. F. Pliska, F. L. Jew, and J. E. Angus. Maintainability Prediction and Analysis Study. Final Technical Report, RADC-TR-78-169. Griffiss Air Force Base, NY: Rome Air Development Command, July 1978.

T. L. Regulinski and Y. P. Gupta (See entry K-Regulinski).

B. H. Sweet, "Reliability and maintainability in the acquisition process," Defense Manag. Rev., vol. 1, pp. 126-147 explains the provisions and underlying rationale behind Department of Defense Directive 5000.x, entitled "Reliability and Maintainability (R & M) of Systems and Equipment." Although this paper is dated, it still contains relevant background information.

F. A. Tillman, and S. Chatterjee, "Availability models of maintained systems," IEEE Tram. Rel., vol. R-24, pp. 69-72, Apr. 1975 presents the concept of availability (part of system engineering, Phase 5), which includes reliability and preventive and corrective maintenance. Tillman and Chatterjee present a system availability model which considers reliability factors and preventive and corrective maintenance.

J. W. Wilbur and N. B. Fuqua. A Primer for DOD Reliability, Maintainability and Safety Standards. Rome, New York: Reliability Analysis Center, RADC, Griffiss AFB, 1988.

Requirements

P. Aiken, "Planning for requirements analysis: The strawman approach," in Proceedings of the 1987 IEEE International Conference on Systems, Man, and Cybernetics, New York: IEEE, 1987.

A. Borning, "Computer system reliability and nuclear war," Comm. of the ACM, Vol. 30, No. 2, 112-131, February 1987.

B. E. Casey and B. Dasarathy, "Modelling and validating the man-machine interface," Software-Practice and Experience, vol. 12, pp. 557-569, 1982 presents a formal model for expressing the functional requirements of the man-machine interfaces of interactive systems. It shows how inconsistency, redundancy, and incompleteness checks against a specification, and validation of the implementation of an interface against its original requirements, can be automated.

G. J. Chambers and K. Manos, "Requirements: Their Origin, Format and Control." in Proceedings of the Second Annual International Symposium of the National Council on Systems Engineering, July 1992.

Davis, A. M. (1990). Software Requirements: Analysis and Specification, Prentice Hall, Englewood Cliffs NJ.

Fogle, F. R. (ed.). Proceedings of the 4th NASA Systems engineering Symposium--System Requirements: The Early Definition and Management Thereof. NASA Marshall Space Flight Center, March 18-19.

Gause, D. C. and G. M. Weinberg (1989). Exploring Requirements: Quality Before Design, Dorset House Publishing, New York NY.

A. Giddings, "Compromise is bad design." Naval Engineers J., 77-78, November 1986.

R. M. Godfrey, "Some thoughts on engineering systems development," IEE Proceedings, vol. 137, Pt. A, no. 5, 302-308, September 1990.

J. O. Grady. System Requirements Analysis. New York: McGraw-Hill, 1993.

R. Hirschheim, and G. Schafer, "Requirements analysis: A new look at an old topic," J. Applied Systems Analysis, 15:101-118, 1988.

Holtzblatt, K. and H. Beyer (1993). "Making Customer Centered Design Work for Teams," Communications of the ACM, Vol. 36, No. 10, October, pp. 93-103.

Holtzblatt, K. and H. R. Beyer (1995). "The Human Requirements Gathering," Communications of the ACM, Vol. 38, No. 5, May, pp. 31-32.

I. Hooks, "Why Johnny can't write requirements," in Proceedings, AIAA Space Programs and Technologies Conference, Huntsville, AL, 25-28, September 1990.

Jacobson, I., M. Christerson, P. Jonsson, and G. Overgaard (1992). Object-Oriented Software Engineering: A Use Case Driven Approach, Addison-Wesley Publishing Co., Wokingham, England.

Kowal, J. A. (1992). Behavior Models: Specifying User's Expectations, Prentice Hall, Englewood Cliffs NJ.

P. Loucopoulos and R. E. M. Champion, "Concept requirements specification", Software Engineering J., 116-124, March 1990.

H. L. Malchow and S. R. Croopnick, "A methodology for organizing performance requirements for complex dynamical systems," IEEE Tram. Eng. Manag., vol. EM-32, pp. 10-15, Feb. 1985 presents an orderly methodology, using a top-down approach, for establishing performance requirements for complex systems.

G. T. McKee and N. P. Nissanke, "Towards a systematic approach to the design of fixation mechanisms for active perception," in Proceedings 1990 IEEE International Conference on Systems, Man and Cybernetics, 4-7, 7-9, November 1990.

Roman, G. (1985). "A Taxonomy of Current Issues in Requirements Engineering," Computer, April, pp. 14-22.

D. T. Ross, "Guest editorial: Reflections on requirements," IEEE Trans. Software Engineering, vol. SE-3, no. 1, 2-5, January 1977.

R. B. Rowen, "Software project management under incomplete and ambiguous specifications," IEEE Trans. on Engineering Management, vol. 37, no. 1, 10-21, February 1990.

A. W. Saarinen Jr., and M. A. Hobel, "Setting and meeting requirements for quality," J. of Management in Engineering, vol. 6, no. 2, 177-185, April 1990.

A. P. Sage, Methodology for Large-Scale Systems. New York: McGraw-Hill, 1977.

T. B. Sheridan, "Designing complex technology: Understanding it as of, by, and for people," Technological Forecasting and Social Change, vol. 36, 89-97, 1989.

G. S. Vesilash, "Hearing the Voice of the Customer," Production, 66-68, Feb. 1989.

J. K. Willoughby, "Adaptations to the Systems Engineering Management process for projects with incomplete requirements," in Proceedings, 1989 IEEE Conference International Conference of Systems Engineering, 197-200.

Zultner, R. E. (1989). "Objectives: The Missing Piece of the Requirements Puzzle," Proceedings of the 5th Structured Techniques Association Conference, Chicago IL, 8-11 May, pp. 283-294.

Risk

Anon. (1989). Risk Management Concepts and Guidance, Defense Systems Management College, Fort Belvoir VA.

Anon (1980+). Risk Analysis, An Official Publication of the Society for Risk Analysis, Plenum Press, New York NY.

Apostolakis, G., B. J. Garrick and D. Okrent (1983). "On Quality, Peer Review, and the Achievement of Consensus in Probabilistic Risk Analysis," Nuclear Safety, Vol. 24, No. 6, November/December, pp. 792-800.

Batson, R. G. (1987). "Critical Path Acceleration and Simulation in Aircraft Technology Planning," IEEE Transactions on Engineering Management, Vol. EM-34, No. 4, November, pp.
244-251.

Batson, R. G. and R. M. Love (1988). "Risk Assessment Approach to Transport Aircraft Technology Assessment," AIAA Journal of Aircraft, Vol. 25, No. 2, February, PP. 99-105.

Bell, T. E., ed. (1989). "Special Report: Managing Risk in Large Complex Systems," IEEE Spectrum, June, pp. 21-52.

Beroggi, G. E. G., and W. A. Wallace (1994). "Operational Risk Management: A New Paradigm for Decision Making," IEEE Transactions on Systems, Man, and Cybernetics, Vol. 24, No. 10, October, pp. 1450-1457.

Black, R. and J. Wilder (1979). "Fitting a Beta Distribution from Moments," Memorandum, Grumman, PDM-OP-79-115.

Book, S. A. and P. H. Young (1992). "Applying Results of Technical-Risk Assessment to Generate a Statistical Distribution of Total System Cost," presented

D. Carlin and T. W. Planek, "Risk evaluation in industry: Methods and practice," Professional Safety, vol. 25, pp. 46-50, Mar. 1980 and pp. 29-35, Apr. 1980 presents a comprehensive tutorial-like discussion of risk assessment and evaluation. The essay is an excellent precursor to the paper by Sage and White below.

Chang, S. H., J. Y. Park and M. K. Kim (1985). "The Monte-Carlo Method Without Sorting for Uncertainty Propagation Analysis in PRA," Reliability Engineering, Vol. 10, pp. 233-243.

Chapman, C. B. (1979). "Large Engineering Project Risk Analysis," IEEE Transactions on Engineering Management, Vol. EM-26, N0. 3, August, pp. 78-86.

Chiu, L. and T. E. Gear (1979). "An Application and Case History of a Dynamic R&D Portfolio Selection Model," IEEE Transactions on Engineering Management, Vol. EM-26, No. 1, February, pp. 2-7.

Committee on Public Engineering Policy (1972). Perspectives on Benefit-Risk Decision Making, National Academy of Engineering, Washington DC.

Joksimovich, V. (1985). "PRA: An Evaluation of the State-of-the-Art," Proceedings of the International Topical Meeting on Probabilistic Safety Methods and Applications, EPRI NP-3912-SR, pp. 156.1-156.10.

D. Cooper and C. Chapman. Risk Analysis for Large Projects: Models, Methods & Cases. New York: Wiley, 1987.

Cullingford, M. C. (1984). "International Status of Application of Probabilistic Risk Assessment," Risk & Benefits of Energy Systems: Proceedings of an International Symposium, Vienna Austria, IAEA-SM-273/54, pp. 475-478.

Dean, E. B. (1993). " Correlation, Cost Risk, and Geometry," Proceedings of the Fifteenth Annual Conference of the International Society of Parametric Analysts, San Francisco CA, 1-4 June.

Dienemann, P. F. (1966). Estimating Cost Uncertainty Using Monte Carlo Techniques, The Rand Corporation, Santa Monica CA, January, RM-4854-PR.

Dodson, E. N. (1993). Analytic Techniques for Risk Analysis of High-Technology Programs, General Research Corporation, RM-2590.

Fairbairn, R. (1990). "A Method for Simulating Partial Dependence in Obtaining Cost Probability Distributions," Journal of Parametrics, Vol. X, No. 3, October, pp. 17-44.

Garvey, P. R. and A. E. Taub (1992). "A Joint Probability Model for Cost and Schedule Uncertainties," presented at the 26th Annual Department of Defense Cost Analysis Symposium, September.

I. A. Gilhooley. "Auditing system development methodology," EDPACS (U.S.A.), vol. 12, no. 1,7-84.

Greer, W. S., Jr. and S. S. Liao (1986). "An Analysis of Risk and Return in the Defense Market: Its Impact on Weapon System Competition," Management Science, Vol. 32, No. 10, October, pp. 1259-1273.

Hazelrigg, G. A., Jr. and F. L. Huband (1985). "RADSIM - A Methodology for Large-Scale R&D Program Assessment," IEEE Transactions on Engineering Management, Vol. EM-32, No. 3, August, pp. 106-115.

Henley, E. J. and Kumamoto, H. (1992). Probabilistic Risk Assessment, IEEE Press, Piscataway NJ.

Hertz, D. B. (1979). "Risk Analysis in Capital Investment," Harvard Business Review, September/October, pp. 169-181.

Honour, E. C. (1994). "Risk Management by Cost Impact," Proceedings of the Fourth Annual International Symposium of the National Council of Systems Engineering, Vol. 1, San Jose CA,10-12 August, pp. 23-28.Ã

Hutzler, W. P., J. R. Nelson, R. Y. Pei, and C. M. Francisco (1985). "Non-nuclear Air-to-Surface Ordnance for the Future: An Approach to Propulsion Technology Risk Assessment," Technological Forecasting and Social Change, Vol. 27, pp. 197-227.

J. D. Hwang and J. L. Arnett, "Risk analysis," Defense Ind. Bull., vol. 6, pp. 13-16, Dec. 1970 is an excellent discussion of risk analysis as a tool. It compares risk analysis to systems analysis.

Kaplan, S. and B. J. Garrick (1981). "On the Quantitative Definition of Risk," Risk Analysis, Vol. 1, No. 1, pp. 11-27.

Keeney, R. L. and D. von Winterfeldt (1991). "Eliciting Probabilities from Experts in Complex Technical Problems," IEEE Transactions on Engineering Management, Vol. 38, No. 3, August, pp. 191-201.

Kyburg, H. E. Jr. and H. E. Smokler (1964). Studies in Subjective Probability, John Wiley & Sons, New York NY.

Lau, H. and C. Somarajan (1995).

Lichtenberg, J. and D. MacLean (1992). "Is Good News No News?", The Geneva Papers on Risk and Insurance, Vol. 17, No. 64, July, pp. 362-365.

March, J. G. and Z. Shapira (1987). "Managerial Perspectives on Risk and Risk Taking," Management Science, Vol. 33, No. 11, November, pp. 1404-1418.

Markowitz, H. M. (1959). Portfolio Selection: Efficient Diversification of Investment, 2nd. ed., John Wiley & Sons, New York NY, reprinted in 1991 by Basil Blackwell, Cambridge MA.

D. McComb and J. Y. Smith, "System project failure: The heuristics of risk," J. of Information Systems Management, 25-34, Winter 1991.

McKim, R. A. (1993). "Neural Networks and the Identification and Estimation of Risk," Transactions of the 37th Annual Meeting of the American Association of Cost Engineers, Dearborn MI, 11-14 July, P.5.1-P.5.10.

Morgan, M. G. and M. Henrion (1990). Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis, Cambridge University Press, Cambridge, England.

Ock, J. H. (1996). "Activity Duration Quantification Under Uncertainty: Fuzzy Set Theory Application." Cost Engineering, Vol. 38, No. 1, pp. 26-30.

Quirk, J., M. Olson, H. Habib-Agahi, and G. Fox (1989). "Uncertainty and Leontief Systems: an Application to the Selection of Space Station System Designs," Management Science, Vol.35, No. 5, May, pp. 585-596.

R. Robinson and L. Kunath, "Dynamic approach to risk management," Risk Manag., vol. 28, pp. 42-44, Sept. 1981 presents a model that could serve as an effective framework for putting the concepts of risk management into proper perspective.

W. D. Rowe. An Anatomy of Risk. New York: Wiley, 1977.

Rowe, W. D. (1994). "Understanding Uncertainty," Risk Analysis, Vol. 14, No. 5, pp. 743-750.

A. P. Sage and E. B. White, "Methodologies for risk and hazard assessment: A survey and status report," IEEE Trans. Syst., Man, Cybern., vol. SMC-10, pp. 425-446, Aug. 1980 provides an overview of various methodologies available to enable efficacious assessment of the effects of potential risks and associated resource allocation.

Savvides, S. (1994). "Risk Analysis in Investment Appraisal," Project Appraisal, Vol. 9, No. 1, March, pp. 3-18.

Shafer, G. and J. Pearl, ed. (1990). Readings in Uncertain Reasoning, Morgan Kaufmann Publishers Inc., San Mateo CA.

Sholtis, J. A., Jr. (1993). "Promise Assessment: A Corollary to Risk Assessment for Characterizing Benefits," Tenth Symposium on Space Nuclear Power and Propulsion, Alburquerque NM, American Institute of Physics Conference Proceedings 271, Part 1, pp. 423-427.

Shumskas, A. F. (1992). "Software Risk Mitigation," in Schulmeyer, G. G. and J. I. McManus, ed., Total Quality Management for Software, Van Nostrand Reinhold, New York NY.

Skjong, R. and J. Lerim (1988). "Economic Risk of Offshore Field Development," Transactions of the American Association of Cost Engineers, New York NY, pp. J.3.1-J.3.9.

Slovic, P. (1987). "Perception of Risk," Science, Vol. 236, pp. 281- 285.

Slovic, P. (1993). "Perceived Risk, Trust, and Democracy," Risk Analysis, Vol. 13, No. 6, pp. 675- 682.

Timson, F. S. (1968). Measurement of Technical Performance in Weapon System Development Programs: A Subjective Probability Approach, The Rand Corporation, Memorandum RM-5207-ARPA.

Wahlstrom, B. (1994). "Models, Modeling and Modellers: an Application to Risk Analysis," European Journal of Operations Research, Vol. 75, No. 3, pp.477-487.

Wenk, E. et. al. (1971). Perspectives on Benefit-Risk Decision Making, The National Academy of Engineering, Washington DC.

Williams, T. (1995). "A Classified Bibliography of Recent Research Relating to Project Risk Management," European Journal of Operations Research, Vol. 85, pp.18-38.

Zadeh, L. A. and J. Kacprzyk, ed. (1992). Fuzzy Logic for the Management of Uncertainty, John Wiley and Sons, New York NY.

Software Engineering

Abelson, H., G. J. Sussman and J. Sussman (1985). Structure and Interpretation of Computer Programs, The MIT Press, Cambridge MA.

Anderson, C. and M. Dorfman, ed. (1991). Aerospace Software Engineering: A Collection of Concepts, American Institute of Aeronautics and Astronautics, Washington DC.

Basili, V. R. and J. D. Musa (1991). "The Future Engineering of Software: A Management Perspective," Computer, September, pp. 90-96.

Boehm, B. W. (1973). "Software and its Impact: A Quantitative Assessment," Datamation, May, pp. 48- 59.

Boehm, B. W. (1981). Software Engineering Economics, Prentice-Hall Inc., Englewood Cliffs NJ.

Boehm, B. W. (1988). "A Spiral Model of Software Development and Enhancement," Computer, May, pp.61-72.

Cameron, J. (1989). JSP and JSD: The Jackson Approach to Software Development, 2nd. ed., IEEE Computer Society Press, Washington DC.

Coad, P. and E. Yourdon (1991). Object Oriented Analysis, 2nd. ed., Yourdon Press, Englewood Cliffs NJ.

Connell, J. L. and L. Shafer (1989). Structured Rapid Prototyping: An Evolutionary Approach to Software Development, Prentice-Hall Inc., Englewood Cliffs NJ.

Cusumano, M. A. (1990). "A Quantitative Analysis of U.S. and Japanese Practice and Performance in Software Development," Management Science, Vol. 36, No. 11, November, pp. 1384-1406.

Cusumano, M. A. (1991). Japan's Software Factories: A Challenge to U. S. Management, Oxford University Press, New York NY.

Cusumano, M. A., ed. (1992). Software Reuse in Japan, Technology Transfer International Inc., Colorado Springs CO.

Department of the Air Force, Software Technology Support Center, *Guidelines for Successful Acquisition and Management of Software Intensive Systems: Weapons Systems, Command and Control Systems, Management Information Systems*; Vols. 1 and 2, September 1994.

DeMarco. T. (1982). Controlling Software Projects, Yourdon Press, New York NY.

Dijkstra, E. W. (1976). A Discipline of Programming, Prentice-Hall Inc., Englewood Cliffs NJ.

Freedman, D. P. and G. M. Weinberg (1990). Handbook of Walkthroughs, Inspections, and Technical Reviews: Evaluating Programs, Projects, and Products, Dorset House Publishing, New York NY.

Gibbs, W. W. (1994). "Software's Chronic Crisis," Scientific American, September, pp. 86-95.

Glass, R. L. (1992). Building Quality Software, Prentice-Hall Inc., Englewood Cliffs NJ.

Halstead, M. H. (1977). Elements of Software Science, Elsevier, New York NY.

Hamilton, M. and S. Zeldin (1976). "Higher Order Software - A Methodology for Defining Software," IEEE Transactions on Software Engineering, Vol. SE-2, No. 1, March, pp. 9-32.

Jacobson, I., M. Christerson, P. Jonsson, and G. Overgaard (1992). Object-Oriented Software Engineering: A Use Case Driven Approach, Addison-Wesley Publishing Co., Wokingham, England.

Jones, C. (1995). "Patterns of Large Software Systems: Failure and Success," Computer, March, pp. 86-87.

Karp, R. A. (1983). Proving Operating Systems Correct, UMI Research Press, Ann Arbor MI.

Martin, J. (1985). System Design from Provably Correct Constructs, Prentice-Hall, Englewood Cliffs NJ.

McCabe, T. J. (1976). "A Complexity Measure," IEEE Transactions on Software Engineering, Vol. SE-2, N0. 4, December, pp. 308-320.

McClure, C. (1989). Case is Software Automation, Prentice-Hall, Englewood Cliffs NJ.

McGowan, C. (1975). "Structured Programming: A Review of Some Practical Concepts," Computer, June, pp. 25-30.

Möller, K. H. and D. J. Paulish (1993). Software Metrics: A Practitioners Guide to Improved Product Development, Chapman & Hall, London, UK.

Nakata, I. and M. Hagiya, ed. (1991). Software Science and Engineering - Selected Papers from the Kyoto Symposia, World Scientific, Singapore.

Nejmeh, B. A. (1995). "Process Cost and Value Analysis," Communications of the ACM, Vol. 38, No. 6, pp. 19-24

Orr, K. T. (1977). Structured Systems Development, Yourdon Press, Prentice-Hall, Englewood Cliffs NJ.

Potts, C. (1993). "Software-Engineering Research Revisited," IEEE Software, September, pp. 19-28.

Raghavan, S. A. and D. R. Chand (1989). "Diffusing Software-Engineering Methods," IEEE Software, July, pp. 81-89.

Saidian, H. and R. Kuzara (1995). "SEI Capability Maturity Model Impact on Contractors," Computer, January, pp. 16-26.

Schulmeyer, G. G. and J. I. McManus, ed. (1992). Total Quality Management for Software, Van Nostrand Reinhold, New York NY.

Shaler, S. and S. J. Mellor (1992). Object Lifecycles: Modeling the World in States, Yourdon Press, Englewood Cliffs NJ.

Tracz, W. (1988). Tutorial: Software Reuse: Emerging Technology, The Computer Society Press, Washington DC.

Vick, C. R. and C. V. Ramamoorthy, ed. (1984). Handbook of Software Engineering, Van Nostrand Reinhold Company, New York NY.

Wasserman, A. I. and P. Freeman (1977). "Software Engineering Concepts and Computer Science Curricula," Computer, June, pp. 85-91.

Yourdon, E. (1989). Modern Structured Analysis, Yourdon Press, Englewood Cliffs NJ.

Zultner, R. E. (1988). "The Deming Approach to Software Quality Engineering," Quality Progress, November, pp. 58-64.

Zultner, R. E. (1990). "Software Total Quality Management (TQM): What Does It Take to Be World Class," American Programmer, November, pp. 2-21.

Specifications

G. C. Belev. "Guidelines for specification development," in Proceedings of the Annual IEEE Symposium on reliability and Maintainability, 1989.

G. J. Chambers, "Sources, types, and preparation of military system specifications," in development.

_____[author missing], "Sources, types and preparation of military specifications and standards," Naval Engineer's Journal, September, 1989.

B. Cohen, "Justification of formal methods for systems specification," Software Microsyst., vol. 1, pp. 119-127, Aug. 1982 emphasizes the application of recent developments in computer science and mathematics and argues that systems engineers should become as competent in these fields as they are
expected to be in traditional mathematics and physics.

M. Fischer. Engineering Specification Writing Guide. Englewood Cliffs, NJ: Prentice-Hall, 1983.

S. D. Perone, "System definition, specification, and functional design," ASTM Standardization News, vol. 4, pp. 14-17, May 1976 provides a working set of guidelines or standard procedures for the specification, design, and implementation of computer-automated laboratory systems. Although not rigorous, this methodology is applicable to any system development effort.

E. L. Peterson, "MIL-STD-499A and its application to systems engineering," Defense Syst. Manag. Rev., vol. 3, no. 2, pp. 105-108, Spring 1980 recounts the evolution of MIL-STD-499B, the source of the system engineering model used in compiling this bibliography.

D. C. Purdy. A Guide for Writing Successful Engineering Specifications. New York: McGraw-Hill, 1991.

K. Shumate and M. Keller. Software Specification and Design. New York: John Wiley & Sons, Inc., 1992.

L. C. Verman and H. C. Visesvaraya, "A systems approach to standardization," ASTM Standardization News, vol. 5, pp. 12-23, Feb. 1977 describes the development of standardization and the benefits to be derived from standardization.

Standards (Commercial)

Electronic Industries Association (EIA), Engineering Department, *EIA Interim Standard -- Systems Engineering -- EIA/IS-632*, December 1994.

Electronic Industries Association (EIA), *Statistical Process Control Systems (ANSI/EIA-557-89)* (May, 1989)

ISO 9000-1: 1994 Quality management and quality assurance standards-Part 1: Guidelines for selection and use.

ISO 9000-2:1993 Quality management and quality assurance standards-Part 2: Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003.

ISO 9000-3:1991 Quality management and quality assurance standards-Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.

ISO 9000-4:1993 Quality management and quality assurance standards -- Part 4: Guide to dependability program management

ISO 9001:1994 Quality system-model for quality assurance in design, development, production, installation and servicing.

ISO 9002:1994 Quality system-model for quality assurance in production, installation and servicing.

ISO 9003:1993 Quality Systems-Model for quality assurance in final inspection and test.

ISO 10011-1: 1990 Guidelines for auditing quality systems. Part 1: Auditing.

ISO 10011-2: 1991 Guidelines for auditing quality systems. Part 2: Qualification criteria for quality systems auditors.

ISO 10011-3: 1991 Guidelines of auditing quality systems. Part 3: Management of audit programs.

ISO 10012-1: 1992 Quality assurance requirements for measuring equipment-Part 1: Metrological confirmation system for measuring equipment.

ISO 10013 Guidelines for developing quality manuals.

ISO/TR 13425 Guidelines for the selection of statistical methods in standardization and specification.

ISO 8402:1994 Quality management and quality assurance-Vocabulary

Systems Engineering (General)

H. A. Affel, Jr., "System engineering," Int. Sci. Technol., vol. 35, pp. 18-26, 79-82, Nov. 1964 provides insight into the historical development of the system engineering concept.

T. H. Allen, "Systems engineering bibliography," Ind. Quality Contr., vol. 24, pp. 317-321, Dec. 1967

W. R. Beam. Systems Engineering: Architecture and Design. New York: McGraw-Hill, 1990.

C. L. Biggs, E. G. Birks and W. Atkins. Managing the System Development Process. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Bilardo, V. J. (ed.). Proceedings of the 3rd NASA System Engineering Symposium--The Role of Systems Engineering in a Research Environment. NASA Ames Research Center, November 13-14, 1991.

B. S. Blanchard. System Engineering Management. New York: Wiley, 1991.

Blanchard, B. S., and W. J. Fabrycky. Systems Engineering and Analysis (2nd ed.). Englewood Cliffs: Prentice-Hall, 1990 presents a general overview of the process of bringing systems into being and for improving existing systems.

R. Bogusla. The New Utopians: A Study in Systems Design and Social Change. Englewood Cliffs, NJ: Prentice-Hall, 1965.

J. S. Baumgartner. Systems Management. Washington, DC: Bureau of National Affairs, Inc.

R. C. Booton, Jr., and S. Ramo, "The development of systems engineering," IEEE Tram. Aerosp. Electron. Syst., vol. AES-20, pp. 306-309, July 1984 describes systems engineering as "the design of the whole as distinguished from the design of the parts." Systems engineers create the architecture of the system, define the criteria for its evolution, and perform trade-off studies for optimization of the subsystem characteristics. According to these authors, the major growth of systems engineering is expected to be in the improvement of its tools and in the enlargement of the range of problems to which it is applied.

G. J. Chambers, "Roles of the Technical Director, the Lead System Engineer, and System Engineers during a System Design and Development Effort," Presented at a NCOSE Workshop, 25 June 1991.

_____ [author missing], "Systems engineering management in the 21st Century," in Proceedings, 1990 IEEE International Conference on Systems, Man, and Cybernetics, 733-738, 1990.

W. P. Chase Management of Systems Engineering. (reprint ed.). Malabar, FL: Robert E. Kriger Publishing Company, Inc., 1984.

Chambers, G. J. (1986). "The System Engineering Process: A Technical Bibliography", IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-16, No. 5, September/October, pp.
712-722.

H. Chestnut, Systems Engineering Methods. New York: Wiley, 1967 is one of the classics of system engineering that belongs on every system engineer's bookshelf.

Defense Systems Management College. Systems Engineering Management Guide. Washington, D.C.: U. S. Government Printing Office, 1990.

Gheorghe, A. (1982). Applied Systems Engineering, John Wiley & Sons, New York, NY, USA.

K. B. De Greene. Social-technical Systems: Factors in Analysis, Design, and Management. Englewood Cliffs, NJ: Prentice-Hall, 1973.

EIA. EIA Engineering Bulletin: System Engineering (SYSB-1). Electronic Industries Association, December 1989.

IEE. Code of Practice for Systems Engineering, IEE Draft Code of Practice--Issue A2. D. K. Hitchins, J. Boarder, and P. R. Moore (eds.). IEE (Undated).

C. D. Flagel, W. H. Huggins, and R. H. Roy, Eds., Operations Research and Systems Engineering. Baltimore, MD: Johns Hopkins Press, 1960 consists of a set of lectures delivered at the Johns Hopkins University early in the developmental stages of the concept of "system engineering." The initial chapters are devoted to the philosophical and historical aspects of systems engineering and operations research. These provide valuable background for those who are interested in following the development of the
system engineering concept.

R. A. Frosch, "A new look at systems engineering," IEEE Spectrum, pp. 24-28, Sept. 1969 gives a critical assessment of a "potential technocratic monster" and advocates a return to engineering as an art form. This advice is just as cogent today as when it was first offered.

H. Goode and R. E. Machol, Systems Engineering: An Introduction to the Design of large-Scale Systems. New York: McGraw-Hill, 1957 is the first text to address systems engineering specifically. Although some of the examples and techniques are dated, the principles presented are just as germane today as they were when first published. This is definitely a "must read" book!

Ground Systems Group. A Plan for System Engineering and Technical Director Personnel Development. Fullerton, CA: Hughes Aircraft Company, 29 June 1984.

V. J. Hajek. Management of Engineering Projects (3rd ed.). New York: McGraw Hill, 1984.

A. D. Hall, A Methodology for Systems Engineering. Princeton, NJ: Van Nostrand, 1962 is one of the originals on systems engineering, and as such, it is "required reading" for all system engineers.

G. S. Handler, G. Hammerle and W. Rucker. Navy Program Manager's Guide. Washington, D.C.: Naval Material Command, 1985.

D. J. Hatley and I. M. Pirbhai. Strategies for Real-Time System Specification. New York: Dorset House, 1988.

L. S. Hill, "Systems engineering in perspective," IEEE Trans. Eng. Manag., vol. EM-17, pp. 124-131, Nov. 1970 presents a background on the evolution of the systems engineering process and attempts to synthesize a more complete resolution than was generally available in the literature. Hill's work shows the relationship between systems engineering and the engineering design process. This comparison will aid in understanding the implied requirements of MIL-STD-499B.

K. Hino, "A standardized approach to systems engineering," Signal, pp. 41-42, Dec. 1965.

Hoban, F. T. and W. M. Lawbaugh, ed. (1993). Readings in System Engineering, National Aeronautics and Space Administration, Washington, DC, USA, SP-6102

Hoehn, W. K. (1992). An Integrated Decision Approach: Combining the Demand-Revealing, Quality Function Deployment, and Elements of the Systems Engineering Process, Master of Science Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA.

S. A. Horanessian, "Research and development of a large-scale electronic system," IEEE Trans. Eng. Manag., vol. EM-22, pp. 94-101, Aug. 1975 discusses the research and development phase of system development in terms of methodology, system design concepts, cost effectiveness, and customer acceptance.

G. M. Jenkins, "The systems approach," J. Syst. Eng., vol. I, pp. 3-49, 1969 discusses the philosophy underlying a systems approach to the solution of problems. Three questions are answered: "What is systems engineering?" "What is a systems engineer?" and "How does a systems engineer go about solving any problem?"

A. Kaposi and I. Pyle, "Systems are not only software," Software Engineering J., January 1993, pp. 31-39 presents a "systems approach which affords insight into the whole development process by use of a small set of concepts: systems, their properties, their structure, and models thereof." This paper can help to establish a common body of "system engineering" terminology and to dispel some of the parochial ideas that "My systems engineering is different than...."

Keys, L. K. "Systems engineering, practice prospects: A summary view," in Proc. 1989 IIE Integrated Systems Conf., Atlanta, GA, Nov. 12-15, 1989, pp. 85-91 provides "some of the history, challenges, promises and raise[s] issues on opportunity for research... on systems engineering, life-cycle engineering, and concurrent engineering."

H. Kerzner, Project Management: A System Approach to Planning, Scheduling and Controlling, 2nd ed. New York: Van Nostrand Reinhold, 1984, pp. 80-82.

M. B. Kline and M. W. Lifson, "Systems engineering," in Cost-Effectiveness: The Economic Evaluation of Engineered Systems, I. M. English, Ed. New York: Wiley, 1968, pp. 11-32 reviews conceptual developments in systems engineering from the time of Goode and Machol's 1957 seminal work. This work provides the background necessary for understanding the evolution of MIL-STD-499B. (See also entry R-Peterson for additional background on MIL-STD-499B.)

J. A. Lacy. Systems Engineering Management: Achieving Total Quality. New York: McGraw-Hill, 1992.

R. E. Machol, Ed., Systems Engineering Handbook. New York: McGraw-Hill, 1965 is perhaps the first, and last, published system engineering handbook. Although over 20 years old, the material is still relevant, both from a practical and a historical viewpoint. (See also entry T-Machol for an updated version of some of the material presented in this early work.)

P. K. M'Pherson, "Systems engineering: An approach to whole-system design," Rad. Electron. Eng., vol. 50, pp. 545-558, Nov./Dec. 1980 presents an overview of the evolution of systems methodologies beginning with operations research and including systems analysis, systems engineering, and servo-mechanism theory. The identification of "factors inducing problems of complexification" is particularly valuable.

National Council on Systems Engineering. Systems Engineering for the 21st Century. Proceedings of the Second Annual International Symposium of the National Council on Systems Engineering (NCoSE), Seattle, WA, July 20-22, 1992.

National Council on Systems Engineering. Systems Engineering in the Workplace. Proceedings of the Third Annual International Symposium of the National Council on Systems Engineering (NCoSE), Arlington, VA, July 26-28, 1993.

A. V. Oppenheim, A. S. Willsky, and I. T. Young. Signals and Systems. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1983 presents the elements essential to understanding basic characteristics of typical input and output signals and performing a system analysis. Understanding the treatment of various signals types will allow systems engineers to not only perform a system analysis but to effectively evaluate analysis tools under consideration.

T. G. Peck, "Worldwide systems engineering," IBM Systems J., vol. 24, nos. 3/4, 182-188, 1985.

G. Pellegrinetti, "Examining the System concept-A professional's viewpoint," Specifying Eng., pp. 82-83, Feb. 1982, pp. 136-139, May 1982 is an essay on systems concepts, less formal than other sources, but providing valuable insights into the system engineering process. These insights are all the more cogent as they come from a viewpoint outside of academia or the aerospace industry.

This reference info (S-15a) is currently missing (?) presented an overview of the systems engineering process and discusses how it could be applied, possibly, to solving complex social problems.

D. G. Raheja. Assurance Technologies. New York: McGraw-Hill, Inc., 1991.

E. Rechtin, "Systems engineering--But isn't that what I've been doing all along?" Astronautics and Aeronautics, Vol. 6, June 1968, pp. 70-74.

A. B. Rosenstein, "Systems engineering and modern engineering design," in Proceedings, Annual Meeting of the American Ceramic Society, April 1966, pp. 1-9.

A. M. Ruskin, "Project Management and Systems Engineering: A marriage of convenience," PM Network, 38-41, July 1991.

A. P. Sage, "Systems engineering: Fundamental limits and future prospects," Proc. IEEE, vol. 69, pp. 158-166, Feb. 1981 describes presently perceived limits in systems engineering along with contemporary and projected future efforts to reach, circumvent, or ameliorate the effects of these limits.

P. Sage, "The role of systems engineering in electrical engineering education," IEEE Trans. Education, vol. E-22, pp. 81-85, May 1979.

S. M. Shinners, Techniques of Systems Engineering. New York: McGraw-Hill, 1967 is one of the last to focus on hardware-oriented systems rather than data-oriented systems.

S. E. Stephanou, "Semantic problems in Systems engineering," in Proc. Int. Systems Engineering, vol. 2. Lafayette, IN: Purdue Univ., 1972, pp. 338-343 will help system engineers when reading the literature on the semantic problems Stephanou highlighted in 1972 which still plague the field of system engineering (see also entry T-Ackoff).

R. T. Stevens. Operational Test and Evaluation: A Systems Engineering Process. New York: Wiley, 1979.

Weinberg, G. M., Quality Software Management, Volume 1: Systems Thinking. New York: Dorset House, 1992 provides the first requirement for development of quality software (or any system): learning to think correctly. Weinberg provides guidelines for thinking about problems, solutions, and quality. This is volume 1 of a 3-volume series.

A. W. Wymore. A Mathematical Theory of System Design. Tucson, AZ:SANDS, draft, May 1987.

_____ author missing(?). Putting Systems to Work. New York: John Wiley,.....(?)

System Theory

R. L. Ackoff, "Towards a system of system concepts, Management Sci., "vol.17, pp 661-671, 1971 attempts to organize the concepts and terms used to talk about systems (see entry S-Stephanou).

K. Balkus and E. E. McClure, "Toward a general systems formulation," in Progress in Cybernetics and Systems Research, vol. 1, R Trappi and F. de P. Hanika, Eds. Washington, DC: Hemisphere, 1975, pp. 84-92 provides a starting point for development of a "general, concise and integrated explanation of the system issue from systems formulation to its spatial and relational structure." The authors argue that an effective system formulation should be suitable for applications and for the cultivation of the intellect.

R. Boguslaw. The New Utopians: A Study in Social Change. Englewood Cliffs, NJ: Prentice-Hall, 1965.

P. B. Checkland, "The development of systems thinking by systems practice--A methodology from an action research program," in Progress in Cybernetics and Systems Research, vol. 2, R. Trappi and F. de P. Hanika, Eds. Washington, DC: Hemisphere, 1975, pp. 279-283 defines a methodology as intermediate in status between a "philosophy" and a "technique or method." An understanding of these distinctions will aid system engineers to develop their understanding of system theory.

H. Chestnut, "Information requirements for systems understanding," IEEE Trans. Syst. Sci. Cybern., vol. SSC-6, pp. 3-12, Jan. 1970 categorizes the basic information requirements for describing systems as 1) structure, the interrelationships of the system's parts; 2) distinguishing qualities, what differentiates the system from other structures of a similar form or nature; and 3) magnitude, probability, and time. Chestnut argues that knowledge of these parameters could prevent unnecessary duplication of effort and more efficient use of hardware and software.

S. Cornack, "The structure of the systems paradigm," in Progress in Cybernetics and Systems Research, vol. 4, 139-148, 1978.

C. Eden and IL Graham, "Hallway to infinity: Systems theorizing for the practitioners?" J. Operational Res. Soc., vol. 34, pp. 723-728, Aug. 1983 compares and contrasts the rational theorizing about system design to the non-rational process of implementation. They propose a position halfway between these two extremes that is based upon reflection on experience, using system theory as a framework for thinking rather than a guide for action.

D. O. Ellis, and F. J. Ludwig. Systems Philosophy. Englewood Cliffs, NJ: Prentice-Hall, 1962.

F. E. Emery (ed.). Systems Thinking (vols. 1 & 2). New York, Penguin Books, 1981.

W. W. Gasparski, "Systems methodology--Its nature, structure and applications. Some remarks," in Progress in Cybernetics and Systems Research, vol. 2, IL Trappi and F.de P. Hanika, Eds. Washington, DC: Hemisphere, 1975, pp. 3O8-32O presents some insights into system methodology from a point of view slightly different from that of most American writers. Gasparski's "methodology model" is particularly useful for building an understanding from which to evaluate other methodologies.

V. Hubka and W. E. Eder. Theory of Technical Systems: A Total Concept Theory for Engineering Design. New York: Springer-Verlag, 1988.

E. Laszlo. Introduction to Systems Philosophy: Toward a New Paradigm of Contemporary Thought. New York: Gordon & Breach, 1972.

_____(? author missing), "The case for system's philosophy, " Metaphilosophy, vol. 3, no. 2, 123-150, April 1972.

R. E. Machol and R. F. Miles, Jr., "The engineering of large-scale systems," in Systems Concepts: lectures on Contemporary Approaches to Systems, R. F. Miles, Jr., Ed. New York: Wiley, 1973, pp. 33-50 is a review and update of material originally presented in MachoI's System Engineering Handbook (see entry S-Machol).

R. F. Miles, Jr., "Introduction to systems concepts," in Systems Concepts: lectures on Contemporary Approaches to Systems, F. Miles, Jr., Ed. New York: Wiley, 1973, pp. 1-11 states that "systems engineering is good engineering" and that it is "more a change in emphasis than a change in content." The change places more emphasis on defining goals, relating system performance to defined goals, developing alternatives and decision criteria, modeling systems for analysis and on controlling implementation and operation.

G. A. Miller, "The magical number seven, plus or minus two," Psychological Review, vol. 63, no. 2, xx, March 1956.

J. D. Palmer (see entry I-Palmer).

I. W. Sandberg, "A perspective on system theory," IEEE Trans. Circuits Syst., vol. CAS-31, pp. 88-103, Jan. 1984 discusses the origins and history of system theory from the mathematical point of view.

Weinberg, G. M. An Introduction to General Systems Thinking. New York: John Wiley, 1975.

B. Wilson (see entry I-Wilson).

A. W. Wymore, Systems Engineering Methodology for Interdisciplinary Teams. New York: Wiley, 1976 presents a system engineering methodology in a highly structured academic manner. Extensive use is made of mathematical terminology and symbolism. This sometimes obscures the highly valuable information in the text.

Taguchi Methods

Anon. (1989). Taguchi Methods: Introduction to Quality Engineering 5-Day Workshop Course Manual, American Supplier Institute, Dearborn, MI, USA.

Anon. (1988). Sixth Symposium on Taguchi Methods, November, American Supplier Institute, Dearborn, MI, USA.

Anon. (1989). Seventh Symposium on Taguchi Methods, October, American Supplier Institute, Dearborn, MI, USA.

Anon. (1990). Eighth Symposium on Taguchi Methods, October, American Supplier Institute, Dearborn, MI, USA.

Barker, T. B. (1986). "Quality Engineering By Design: Taguchi's Philosophy," Quality Progress, December, pp. 32-42.

Bryne, D., M. and Taguchi, S. (1986). "The Taguchi Approach to Parameter Design", ASQC Quality Congress Transactions, Anaheim, CA, USA.

Bush, L. B. and R. Unal (1992). "Preliminary Structural Design of a Lunar Transfer Vehicle Aerobrake," presented at the AIAA 1992 Aerospace Design Conference, Irvine CA, 3-6 February, AIAA-92-1108.

Cobb, B. D. and J. M. Clarkson (1994). "A Simple Procedure for Optimizing the Polymerase Chain Reaction (PCR) Using Modified Taguchi Methods," Nucleic Acids Research, Vol. 22, No. 18, pp. 3801-3805.

Crossfield, R. T. and B. G. Dale (1991). "Applying Taguchi Methods to the Design Improvement Process of Turbochargers," Quality Engineering, 3(4), pp. 501-516.

Fowlkes, W. Y. and C. M. Creveling (1995). Engineering Methods for Robust Product Design: Using Taguchi Methods in Technology and Product Development, Addison-Wesley Publishing Company, Reading, MA, USA.

Kacker, R. N. (1986). "Taguchi's Quality Philosophy: Analysis and Commentary," Quality Progress, December, pp. 21-29.

Maghsoodloo, S. (1990). "The Exact Relation of Taguchi's Signal-to-Noise Ratio to His Quality Loss Function," Journal of Quality Technology, Vol. 22, No. 1, January, pp. 57-67.

Mather, A., K. R. Pattipati, and A. Song (1994). "Robust Local Experiments in Sequential Process Improvement," Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics, San Antonio, TX, USA 2 - 5 October, pp. 2566-2571.

Morrow, J. A. (1988). An Investigation of the Penetration of Taguchi Quality Engineering in Five U. S. Corporations, Thesis, Master of Science in the Management of Technology, Massachusetts Institute of Technology, Cambridge, MA, USA.

Nair, V. N., ed. (1992). "Taguchi's Parameter Design: A Panel Discussion," Technometrics, Vol. 34, No. 2, May, pp. 127-161.

Peace, G. S. (1993). Taguchi Methods: A Hands-On Approach, Addison-Wesley Publishing Company, Reading, MA, USA.

Peterson, G. E., D. C. St. Clair, S. R. Aylward, and W. E. Bond (1995). "Using Taguchi's Method of Experimental Design to Control Errors in Layered Perceptrons," IEEE Transactions on Neural Networks, Vol. 6, No. 4, July.

Phadke, M. S. (1989). Quality Engineering Using Robust Design, Prentice Hall, Englewood Cliffs, NJ, USA.

Ross, P. J. (1988). Taguchi Techniques for Quality Engineering: Loss Function, Orthogonal Experiments, Parameter and Tolerance Design, McGraw-Hill Book Company, New York, NY, USA.

Roy, R. K. (1990). A Primer on the Taguchi Method, Van Nostrand Reinhold, New York, NY, USA.

Santell, M. P., J. R. Jung, Jr., and J. C. Warner (1992). "Optimization in Project Coordination Scheduling Through Application of Taguchi Methods," Project Management Journal, Vol. 23, No. 3, September, pp. 5-16.

Shina, S. G. (1991). "The Successful Use of the Taguchi Method to Increase Manufacturing Process Capability," Quality Engineering, 3(3), pp. 333-349.

Song, A. A., A. Mathur, and K. R. Pattipati (1995). "Design of Process Parameters Using Robust Design Techniques and Multiple Criteria Optimization," IEEE Transactions on Systems, Man, and Cybernetics, Vol. 25, No. 11, November.

Song A., K. R. Pattipati, and A. Mathur (1994). "Multiple Criteria Optimization for the Robust Design of Quantitative Parameters." Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics, San Antonio, TX, USA, 2 - 5 October, pp. 2572-2577.

Sullivan, L. P. (1987). "The Power of Taguchi Methods," Quality Progress, June, pp. 76-79.

Taguchi, G. (1986). Introduction to Quality Engineering: Designing Quality into Products and Processes, Asian Productivity Organization, available in the USA from American Supplier Institute, Dearborn, MI, USA.

Taguchi, G. (1987). System of Experimental Design: Engineering Methods to Optimize Quality and Minimize Costs, Vols. 1 & 2, UNIPUB/Kraus International Publications, White Plains, NY, USA.

Taguchi, G. (1993). Taguchi on Robust Technology Development: Bringing Quality Engineering Upstream, ASME Press, New York NY.

Taguchi, G. and D. Clausing (1990). "Robust Quality," Harvard Business Review, Jan.-Feb.

Taguchi, G. and S. Konishi (1987). Taguchi Methods, Orthogonal Arrays and Linear Graphs, American Supplier Institute, Dearborn, MI, USA.

Taguchi, G. and Y. Yokoyama (1994). Taguchi Methods: Design of Experiments, American Supplier Institute, Dearborn MI, in conjunction with the Japanese Standards Association, Tokyo, Japan.

Unal, R. and E. B. Dean (1991). "Design for Cost and Quality: The Robust Design Approach" Journal of Parametrics, Vol. XI, No. 1, August.

Unal, R., D. O. Stanley, and C. R. Joyner (1993). "Propulsion System Design Optimization Using the Taguchi Method," IEEE Transactions on Engineering Management, Vol. 40, No. 3, August, pp. 315-322.

Wille, R. H. (1990). "Landing Gear Weight Optimization Using Taguchi Analysis," Weight Engineering, Winter, pp. 31-40.

Tools

H. Chestnut. Systems Engineering Tools. New York: John Wiley, 1965.

H. Eisner, Computer-Aided System Engineering. New York: Prentice-Hall, 1988.

_____ (? author unknown), "CASE: Computer Aided Systems Engineering for C3I systems," Signal, 15-21, July, 1984.

M. D. Rychener, "Expert systems for engineering design," Expert Systems, vol. 2. no. 1, 30-44, January 1985.

Shishko, R. Catalog of JPL System Engineering Tools and Models (JPL D-8060). NASA/Caltech Jet Propulsion Laboratory, 1990.

_____ (ed.)(? ed. unknown). Proceedings of the Fifth NASA Systems engineering Symposium--Integrated Systems Engineering Tools: Current Capabilities and Future Directions. NASA/Caltech Jet Propulsion Laboratory, February 26-27, 1993.

A. Ruskin., System Development at JPL: An Overview of the JPL System Development Management Guide (D-5000). NASA/Caltech Jet Propulsion Laboratory, November 16, 1990 This document was prepared to improve system development at JPL by: Establishing comparable benchmarks among projects
Standardizing selected aspects of system development The reader must be aware that the system development effort has a different focus at JPL than at most other organizations. Most other system development organizations are primarily driven by cost and technical performance considerations. JPL is primarily schedule and technical performance driven. The reason for this difference is that the position of the celestial bodies in the sky determines, to a large extent, the success or failure of their programs. D-5000 approaches "system" as a hierarchy of subsystems, sub-subsystems, etc. and applies systems engineering at all seven-phases (their model) of system development. JPL sees the role of systems engineering as being that of delivering to management a fully developed, certified system that meets user requirements. This includes such activities as: defining requirements, developing alternative designs, allocating performance margins and allowances, supporting supersystem development (resolving interface problems), overseeing subsystem engineering, and coordinating system certification.

User Interface Design

Aspillaga, Macarena. "Implications of Screen Design upon Learning." Journal of Educational Technology Systems 20, no. 1 (1991-92): 53-58.

Aspillaga, Macarena. "Screen Design: Location of Information and Its Effects on Learning." Journal of Computer-Based Instruction 18, no. 3 (1991): 89-92.

Banks, William W., and Jon Weimer. Effective Computer Display Design. Englewood Cliffs, NJ: Prentice Hall, 1992.

Barfield, Lon. The User Interface: Concepts & Design. Reading, MA: Addison-Wesley Pub. Co., 1993.

Benbasat, Izak, and P. Todd. "An Experimental Investigation of Interface Design Alternatives: Icon vs. Text and Direct Manipulation vs. Menus." International Journal of Man-Machine Studies 38, no. 3 (1993): 369-402.

Bielenberg, Daniel R. "Interactive Design and the Mythical 'Intuitive User Interface.'" Journal of Interactive Instruction Development 6, no. 2 (1993): 14-19.

Blattner, Meera M., and Roger B. Dannenberg, eds. Multimedia Interface Design. Reading, MA: Addison-Wesley Pub., 1992.

Chapman, William. "Color Coding and Interactivity of Multimedia." Journal of Educational Multimedia and Hypermedia 2, no. 1 (1993): 3-23.

Coll, Joan H., et al. "The Blinking Cursor: a Two-Experiment Sequence Investigating Whether a Blinking Cursor Facilitates User Performance." International Journal of Man-Machine Studies 39, no. 2 (1993): 177-185.

Cox, Kevin, and David Walker. User-Interface Design. New York: Prentice Hall, 1993.

Dringus, Laurie P. "Interface Issues Associated with Using the Internet as a Link to Online Courses." Journal of Interactive Instruction Development 8, no. 2 (Fall 1995): 16-20.

Dumas, Joseph S. Designing User Interfaces for Software. Englewood Cliffs, NJ: Prentice Hall, 1988.

Eberts, Ray E. User Interface Design. Englewood Cliffs, NJ: Prentice Hall, 1994.

Emery, D. "Developing Effective Instructional Graphics." Journal of Interactive Instruction Development 6, no. 2 (1993): 20-24.

Emurian, Henry H. "Some Effects of Row, Diagonal, and Column Screen Formats on Search Time and Strategy." Computers in Human Behavior 6, no. 2 (1990): 153-66.

Faiola, Tony. "Designing a Visual Factors-Based Screen Display Interface: The New Role of the Graphic Technologist." Educational Technology 28, no. 8 (1988): 12-21.

Fowler, Susan, and Victor Stanwick. The GUI Style Guide. Boston: AP Professional, 1995.

Galitz, Wilbert O. User-Interface Screen Design. Boston: QED Pub. Group, 1993.

Grabinger, R. Scott. "Computer Screen Designs: Viewer Judgments." Educational Technology Research and Development 41, no. 2 (1993): 35-73.

Grabinger, R. Scott. "CRT Text Layout: Perceptions of Viewers." Computers in Human Behavior 4, no. 3 (1988): 189-205.

Grabinger, R. Scott. "The Effect of CRT Screen Design on Learning." In Proceedings of Selected Research Papers. New Orleans, LA: Association for Educational Communications and Technology, 1988.

Grabinger, R. Scott. "Screen Layout Design: Research into the Overall Appearance of the Screen." Computers in Human Behavior 5, no. 3 (1989): 175-83.

Hannafin, Michael J. "An Integrated Framework for CBI Screen Design and Layout." Computers in Human Behavior 5, no. 3 (1989): 155-65.

Heckel, Paul. The Elements of Friendly Software Design. San Francisco: Sybex, Inc., 1991.

Hedberg, John G., B. Harper, and C. Brown. "Reducing Cognitive Load in Multimedia Navigation." Australian Journal of Educational Technology 9, no. 2 (1993): 157-81.

Hillman, D. C. A., D. J. Willis, and C. N. Gunawardena. "Learner-Interface Interaction in Distance Education: An Extension of Contemporary Models and Strategies for Practitioners." AmericanJournal of Distance Education 8, no. 2 (1994): 30-42.

Horton, William. Illustrating Computer Documentation: the Art of Presenting Information Graphically on Paper and Online. New York: John Wiley & Sons, 1991.

Hunka, S. "Design Guidelines for CAI Authoring Systems." Educational Technology 29, no. 11 (1989): 12-17.

Isaacs, G. "Text Screen Design for Computer-Assisted Learning." British Journal of Educational Technology 18, no.1 (1987): 41-51.

Jonassen, David H. "Functions, Applications, and Design Guidelines for Multiple Window Environments." Computers in Human Behavior 5, no. 3 (1989): 185-94.

Jones, Mark K. Human-Computer Interaction: A Design Guide. Englewood Cliffs, NJ: Educational Technology Publications, 1989.

Jones, Marshall G., John D. Farquhar, and Daniel W. Surry. "Using Metacognitive Theories to Design User Interfaces for Computer-Based Learning." Educational Technology 35, no. 4 (July/August 1995): 12-22.

Kristof, Ray, and Amy Satran. Interactivity by Design: Creating & Communicating with New Media. Mountain View, CA: Adobe Press, 1995.

Laurel, Brenda, ed. The Art of Human-Computer Interface Design. Reading, MA: Addison-Wesley Pub. Co., 1990.

McFarland, Ronald D. "Ten Design Points for the Human Interface to Instructional Multimedia." T.H.E. Journal 22, no. 7 (February 1995): 67-69.

Milheim, William D. "Screen Design for Computer-Based Training and Interactive Video: Practical Suggestions and Overall Guidelines." Performance and Instruction 31, no. 5 (1992): 13-21.

Misanchuk, Earl R., and R. A. Schwier. "The Mythology of Colour in Mutimedia Screen Design: Art, Science and Connoiseurship." Canadian Journal of Educational Communication 24, no. 1 (1995): 3-26.

Morrison, Gary R., et al. "Implications for the Design of Computer-Based Instruction Screens." Computers in Human Behavior 5, no. 3 (1989): 167-73.

Nibley, M. "Words and Pictures: Scripting and Producing the Multimedia Educational Program." Journal of Interactive Instruction Development 6, no. 2 (1993): 10-13.

Norman, Donald A. The Design of Everyday Things. New York: Doubleday, 1990.

Norman, Donald A., and Stephen W. Draper, eds. User Centered System Design: New Perspectives on Human-Computer Interaction. Hillsdale, NJ: L. Erlbaum Associates, 1986.

Norman, Kent L. "Navigating the Educational Space with Hypercourseware." Hypermedia 6, no. 1 (1994): 35-60.

Orr, K. L., K. C. Golas, and K. Yao. "Storyboard Development for Interactive Multimedia Training." Journal of Interactive Instruction Development 6, no. 3 (1993): 18-31.

Park, Ok-Choon, and R. Hopkins. "Instructional Conditions for Using Dynamic Visual Displays: A Review." Instructional Science 21, no. 6 (1993): 427-49.

Pett, Dennis, and Trudy Wilson. "Color Research and Its Application to the Design of Instructional Materials." Educational Technology Research and Development 44, no. 3 (1996): 19-35.

Price, Robert V. Computer-aided Instruction: A Guide for Authors. Belmont, CA: Wadsworth, 1991.

Rosendahl-Kreitman, Kristee. User Interface Design Workbook. Santa Clara, CA Multimedia Computing Corp., 1990.

Rubin, Tony. User Interface Design for Computer Systems. New York: Halsted Press, 1988.

Sassoon, R. "Closing the Gap between Computers and Typography." Advanced Information Systems 1, no. 1 (1993): 27-29.

Sassoon, R., ed. Computers and Typography. Oxford: Intellect, Ltd, 1993.

Schaefermeyer, Shanna. "Standards for Instructional Computing Software Design and Development." Educational Technology 30, no. 6(1990): 9-15.

Schwier, Richard A., and Earl R. Misanchuk. "Designing Multimedia for the Hypertext Markup Language." Journal of Interactive Instruction Development 8, no. 4 (Spring 1996): 15-25.

Schwier, Richard A., and Earl R. Misanchuk. Interactive Multimedia Instruction. Englewood Cliffs, NJ: Educational Technology Publications, 1993.

Shneiderman, Ben. Designing the User Interface: Strategies for Effective Human-Computer Interaction. Reading, MA: Addison-Wesley, 1992.

Strauss, Roy. "Some Basics of Screen Design for Television-based Multimedia." Multimedia & Videodisc Monitor (November 1991): 24-28.

Taylor, C. David. "Choosing a Display Format for Instructional Multimedia: Two Screens vs. One." Paper presented at the Convention of the Association for Educational Communications and Technology, Washington, DC, February 5-9, 1992.

Thimbleby, Harold. User Interface Design. New York: Reading, MA: Addison-Wesley Pub., 1990.

Thomas, P., and R. Macredie. "Games and the Design of Human-Computer Interfaces." Educational & Training Technology International 31, no. 2 (1994): 134-42.

Tognazzini, Bruce. Tog on Interface. Reading, MA: Addison-Wesley, 1992.

Treu, Siegfried. User Interface Design: A Structured Approach. New York: Plenum Press, 1994.

Tufte, Edward R. Envisioning Information. Cheshire, CT: Graphics Press, 1990.

Tufte, Edward. "The User Interface: The Point of Competition." Bulletin of the American Society for Information Science 18, no. 5 (1992): 15-17.

Waterworth, John A. Multimedia Interaction with Computers: Human Factors Issues. New York: Ellis Harwood, 1992.

White, Jan V. Color for the Electronic Age. New York: Watson-Guptill Publications, 1990.

White, Jan V. Graphic Design for the Electronic Age. New York: Watson-Guptill Publications, 1988.

World Wide Web's Systems Engineering Related Sites

ACM On-Line Catalogue
http://www.acm.org/catalog/catalog.html

Acquisition Systems Management
http://www.acq.osd.mil/api/asm/product.html

An Acronyms and Abbreviations Server
http://www.ucc.ie/info/net/acronyms/

American Society of Mechanical Engineers
http://www.asme.org/index.html

American Society of Naval Engineers
http://www.jhuapl.edu/ASNE/

ANSI Home Page
http://www.ansi.org/

Configuration Management Related Links
http://www.quality.org/html/config.html

Defense Acquisition Deskbook
http://www.deskbook.osd.mil/

Defense Standardization Program Home Page
http://www.acq.osd.mil/es/std/stdhome.html

The Electronic Industries Association (EIA)
http://www.eia.org/

Engineering of Complex Systems (ECS) Project - NSWC-DL
http://coral.nswc.navy.mil/

Enterprise Process Improvement Collaboration (EPIC)
http://www.ti.com/indcoll/docs/ic-desc.htm

George Mason University Systems Engineering Home Page http://www.site.gmu.edu/~syst/

Human factors and Ergonomics Links
http://www.usernomics.com/hf.html

Human Factors and Ergonomic Society
http://hfes.org/

IEEE Home Page
http://www.ieee.org/

The International Council on Systems Engineering (INCOSE)
http://www.inncose.org/index.html

International Standards Organization (ISO)
http://www.iso.ch/welcome.html

ISO Standards Discussion Page
http://www.exit109.com/~leebee/

Malcolm Baldrige National Quality Award Home Page
http://www.quality.nist.gov/

MO&DSD SYSTEMS ENGINEERING ENVIRONMENT (MSEE)
Tools Capabilities Inventory NASA GSFC Developed Tools
http://joy.gsfc.nasa.gov/MSEE/toolgsfc.htm

NASA Marshall Space Flight Center Systems Analysis and Integration Laboratory
http://elses1.msfc.nasa.gov/

Project Management Institute
http://www.pmi.org/

Project Management System (‘Manage and Control large and complex technical systems')
http://www.airtime.co.uk/users/wysywig/index.htm

Publications from the Software Engineering Institute (SEI)
http://www.sei.cmu.edu/products/publications.info.html

Requirements Engineering Newsletter
http://web.cs.city.ac.uk/homes/acwf/rehome.html

To download SE-CMM materials
http://www.csz.com/secat/download.htm

Software Productivity Center
http://www.spc.ca/

SPAWAR / NRaD Specs & Standards
http://diamond.spawar.navy.mil/specs/

Systems Engineering Capability Assessment And Training
http://www.csz.com/secat/

Systems Engineering Capability Maturity Model (SE-CMM)
http://www.ti.com/indcoll/docs/se-desc.htm

Systems Engineering Home Page of NASA’s Goddard Space Flight Center
http://rs712b.gsfc.nasa.gov/704/704home.html

Systems Engineering Dictionary (from George Mason University)
http://systeng.gmu.edu/insert/dictionary/index.html

System Engineering Management Plan - Model Text
http://www.airtime.co.uk/users/wysywig/semp.htm

University of Maryland’s Institute for Systems Research
http://www.isr.umd.edu/