

## **QFD 2000: Integrating QFD and Other Quality Methods to Improve the New Product Development Process**

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### **Abstract**

Competitiveness in the new millennium may belong more to those who can integrate a multitude of disciplines into a system, rather than to those who expect a single unnuanced tool to do it all. The House of Quality is really more of a "great room" to which various "outbuildings" and other structures must connect. This paper shows where well-known quality and other tools such as Consumer Encounters, New Lanchester Strategy, Kansei Engineering, Theory of Constraints, TRIZ, Voice of Customer Analysis, FMEA, SPC, and other methods can be integrated into the New Product Development Process.

### **Key Words**

QFD, New Product Development, Kansei Engineering, TRIZ, Voice of Customer

### **Demand for New Products**

Modern consumerism has resulted in ever-increasing customer demands for differentiated products that meet individualized needs for convenience, functionality, and image. Manufacturers have become more adept at responding to this demand with such systemic changes as Lean Manufacturing [Womack], Flexible Manufacturing Systems, MRP (Materials Resource Planning), and ERP (Enterprise Resource Planning). Service providers such as financial institutions, retailers, and others are beginning to achieve this with software and high tech solutions such as websites that deliver targeted messages to customers. In other words, technology is feeding this frenzy for individualized products and services, and the trend ought to continue as the number of households with personal computers and high-speed access grows.

Geography now plays an increasing role for both new markets and sources of new competition. Countries less invested in older technologies are often more willing to offer the improved functionality, performance, and reliability associated with new technology. Thus, there are opportunities for companies to sell in new geographical markets (providing they adapt to cultural differences [Ronney et al], and there are threats from new competitors with lower costs, newer technology, etc.

## Quality and New Product Development

W.E. Deming, often named as the father of modern quality management, discussed consumerism as people's desire to improve their lives, especially in this Information Age where it is easy to see how others live. Trade is necessary to accomplish this, and trade depended on quality, which exists "if it helps somebody and enjoys a good and sustainable market." He warned that it is insufficient to merely satisfy customers, build loyalty, and eliminate defects. Customers access information and are rapid learners, and will switch if they think they will come out ahead. "It is necessary to innovate, to predict the needs of the customer, give him more" [Deming].

We must continuously investigate what product or service would help our customers more. They demand improvements in style, comfort, performance, and functionality, whatever these words mean in their minds. Traditional quality methods which focus on improving established products and processes have spawned new approaches, such as Quality Function Deployment, that better address the new product development process (NPD).

Traditional market researchers, long the bastion NPD activities, are also finding that QFD can lead to a clearer definition of customer needs, better product concepts, and improved communication to internal operations that must then produce and deliver the product. Using tools and techniques from Comprehensive QFD:

- ⊙ Rubbermaid was able to significantly improve consumer panel acceptance rate of their new product concepts [Rings, Barton, and Mazur]
- ⊙ Host-Marriott was able to identify an underserved market of business women air travelers and offer them a wide choice of bagels baked fresh in the airport concourse, resulting in sales doubling in just 30 days [Lampa and Mazur]
- ⊙ MD Robotics, a supplier of robotic arms to NASA, was stymied in building an animatronic Triceratops for Universal Studios Florida's new Jurassic Park, until they visited a children's petting zoo to see what customers really cared about [Bolt and Mazur].

QFD goes beyond the product, however. True to Deming's belief that quality requires management and leadership, QFD addresses both the quality of the product and the management of the process to develop it. The QFD tools for developing the quality of the product are well known and include the House of Quality, Affinity Diagrams, Hierarchy Diagrams, etc. Lesser known are those for managing the product development process.

In Mizuno and Akao's pioneering work in QFD in the 1960s, Value Engineering techniques such as Function Analysis were applied not just to the product functions, but also to improve the business and operation functions of the NPD organization [Mizuno and Akao]. Tables, hierarchies, flow charts, and Quality Assurance Networks were the tools of choice. In more recent years, Akao has integrated ISO 9000 and related methods to improve NPD organizational effectiveness [Akao and Mazur], and by examining the internal back office activities of service organizations [Akao and Inayoshi] and hospitals [Akao and Fujimoto].

## Modern Quality Tools

In addition to QFD, there are numerous tools and techniques that can aid new product developers. This paper will identify those I call “quality” tools because they meet the following criteria:

- ⊙ they are measurable or use metrics
- ⊙ they systematically follow defined steps with input, analysis, output
- ⊙ they create documentation for review and reuse.

This paper is not an exhaustive list of tools and their utility to NPD, and readers may email regarding omissions and errors to [glenn@mazur.com](mailto:glenn@mazur.com). The following tools will be examined, and readers wishing to better familiarize themselves with them, will find a list of resources at the end. In alphabetical order:

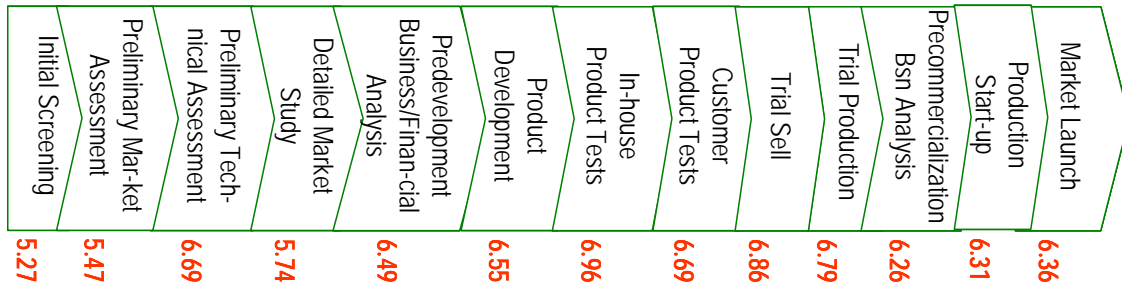
1. Analytic Hierarchy Process (AHP), including structure and prioritization of judgment criteria, prioritization of alternatives, and Analytic Network Process (ANP).
2. Balanced Scorecard, a system that measures and manages corporate goals such as mission, vision, customer and employee satisfaction.
3. Blitz QFD, a fast, matrix-less approach to addressing only the most critical customer needs.
4. Conjoint Analysis, a mathematical model of determining consumer preferences.
5. Consumer Encounters, combines gemba visits and consumer panel testing.
6. Customer Integrated Decision Making (CIDM), a business front end to QFD
7. deBono’s creativity methods, including Lateral Thinking, Provocation, Six Thinking Hats.
8. Deming approach to quality, including his 14 Points and System of Profound Knowledge.
9. Gemba Visit, an observational approach to consumer behavior to uncover true requirements.
10. Hoshin Planning, to develop, target, and deploy strategic initiatives.
11. Kano Model, a unique interviewing method using paired inverse questions to differentiate exciting, normal, and expected quality.
12. Kansei Engineering, a customer-driven approach to industrial design, including Semantic Differential, Quantification Methods, and Information Systems.
13. Lead User Research, a method for collaborating with technologically savvy users to develop breakthrough concepts for new products.
14. Lean Manufacturing, based on Toyota’s Production System, aims to cut the non-value added “fat” out of manufacturing systems.
15. New Lanchester Strategy, which uses war and game theory, operations research to identify strategic market and product opportunities, including market share profiling, strategies for the strong, and strategies for the weak.
16. Neural Linguistic Programming (NLP), a set of skills for psychologically influencing people, such as body language, verbal cues, etc.
17. Project Management, including Critical Path Method (CPM), PERT, and Gantt charts.
18. Pugh Concept Selection, a method to evaluate and improve new concepts.

19. QFD (Comprehensive), including its many deployments of Organization, Schedule, Core Competencies Matrix, Customer Segments Table, Customer Process Table, Voice of Customer Tables, House of Quality, Function, Technology, Reliability, Capability (Tech. Map), Pugh Concept, Parts, Test, Manufacturing, Production, and Task.
20. Reliability, to prevent defects from being introduced during product design, including three types of Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis.
21. Seeds to Needs QFD, a technology driven QFD.
22. Seven Management and Planning Tools (7MP), a set of tools for managers to collect qualitative data and solve organizational and design problems.
23. Seven Product Planning Tools (7PP), a system to use market research tools more effectively.
24. Seven Quality Control Tools (7QC), a set of tools for front line employees to collect quantitative data and solve quality problems.
25. Six Sigma, an update of TQM methods, including Statistical Process Control (SPC), Statistical Quality Control (SQC), Analysis of Variation (ANOVA).
26. Software Engineering tools to better understand processes.
27. Stage-Gate, systematically applies go/no go decisions throughout NDP process.
28. Strategic Information Systems (SIS) to use point-of-sale purchase information to seamlessly coordinate and forecast consumer purchases.
29. Supply Chain Management
30. Taguchi Methods for Design of Experiments, Loss Function, Design Optimization.
31. Theory of Constraints to understand how to increase throughput of products into the customers' hands, including Thinking Process, Trees, Layers of Resistance, and Critical Chain.
32. Total Quality Management (TQM) methods for improving the quality of products and processes, including Daily Management, Kaizen, QI Story, 5 S, Pokayoke, Total Production Maintenance and Total Preventive Maintenance (TPM), Quality Control, and Quality Assurance.
33. TRIZ, a Russian system of inventive problem solving, including Table of Contradictions, Problem Formulator, Innovative System Questionnaire, ARIZ, Anticipatory Failure Determination, Directed Evolution, Su-Field Analysis.
34. Value Engineering, a dogged approach to uncovering cost reduction opportunities and improving product function, including FAST diagrams, Value Analysis, and Function Analysis.

## **New Product Development Process**

Design and development of new products is a multi-disciplinary activity that involves different people at different times, and will vary according to the company, its customers, and the subject product. In a landmark study, Robert Cooper surveyed 123 industrial companies regarding how well they performed their new product development process; the results showed that for the 13 most common NPD phases, companies averaged a rating between 5.27 – 6.96 on a scale of 10 [Cooper]. **(Figure 1.)** The author believes that the above quality tools could help improve the NPD process.

The following table will show each phase, the tasks required of each phase, and which tools would be useful. A case study will be referenced, when possible. Phases marked with a \* are those that Cooper's study showed were most in need of improvement.



**Figure 1 Self-evaluation of NPD efforts [Cooper].**

<b>NPD Stage</b>	<b>NPD Phase</b> (*needs to improve)	<b>NPD Task</b>	<b>Quality Tool</b>
Idea	Generate Concept (not in Cooper's model)	Generate new product concepts to be screened	Consumer Encounter, Lead User Research, Seed to Needs QFD, 7PP, TRIZ
	Initial Screening *	Formalize Go/Kill criteria	Hoshin Planning, 7MP, Project Goals Deployment
		Prioritize Go/Kill criteria	AHP
		Multi-disciplinary evaluation	AHP
	Preliminary Market Assessment *	Determine market potential	CIDM
		Determine expected market penetration	New Lanchester Strategy
		Focused definition of market	Customer Segments Table, CIDM
		Contact customers directly	Consumer Encounters, Conjoint Analysis, Lead User Research, 7PP, CIDM
		Sales Force	New Lanchester Strategy
		Review Competitors Products	Consumer Encounters
	Preliminary Technical Assessment	First Technical Appraisal	AHP, Seed to Needs QFD, Lead User Research, House of Quality, Core Competencies Matrix, Technology Map

Detailed Investigation	Detailed Market Study *	Study competitive products and prices	Gemba visits, Quality Planning Table (HoQ right room)
		Determine customer needs and wants	Voice of Customer Tables, 7MP, Customer Process Table, Kansei Engineering, NLP, S/W Eng Tools, TOC (Evaporating Cloud), VE (FAST), AHP
		Generate product specifications	Design Planning Table (HoQ basement), Taguchi Methods, Kansei Engineering < FMEA
		Market research objectives	Project goals deployment
		Clarify target segment	Customer Segments Table
		Determine market size	New Lanchester Strategy
		Test concept with customers	Conjoint Analysis, Kano, ANP
	Predevelopment Business/ Financial Analysis	Multi-disciplinary input	Cross-Functional Management, Narrow QFD, Hoshin, 7MP, VE
		Confirm market information	New Lanchester Strategy
		Business analysis	Project Goals, Org Goals
Development	Product Development	Design Product	Blitz QFD, Kansei, CIDM, Lead User, HoQ, Function D., Reliability D., Parts Deployments, 7MP,
		Resolve technical difficulties	deBono, Lead User, Pugh, Technology Deployment, Capability Deployment, FMEA, FTA, Taguchi, TRIZ, VE
		Resolve resource constraints	Schedule Deployment, VE, Task Deployment, TOC
		Develop Manuf Plan, Facilities Plan, Training	Manufacturing Deployment, Task Deployment, TOC, TRIZ, TQM, Lean Mfg
	In-house Product Tests	Strengthen test procedures	Test Deployment
		Test product	Taguchi, Pugh, Reliability Depl., FMEA, 7QC, TRIZ
Test & Validate	Customer Product Tests	Show customer sample or prototype	Conjoint Analysis, Kano
		Design customer test	
		Observe customer using product	Gemba Visit, Customer Process Table

	Trial Sell *	Gauge market acceptance		
		Define test market	Customer Segments Table	
		Objectively measure results	Project Goals Deployment	
	Trial Production	Test production system	Process FMEA, TRIZ, Production Depl., Taguchi, TPM	
		Test production equipment	Process FMEA, 7QC, Pokayoke	
		Check product against specs	7QC, SPC, SQC, Design review	
		Confirm production volumes	Cross-Functional Mgt – Delivery, TOC	
	Full Production & Market Launch	Pre-commercialization Business Analysis	Detailed financial analysis	Project Goals Depl,
Detailed market information review (sales forecasting, marketing costs)			New Lanchester Strategy	
Detailed cost review			VE, CFM – Cost, TOC, Supply Chain Mgt, Lean Mfg	
Final Go/Kill decision			Project Goals Depl., House of Quality	
Production Start-up		Review/change production facilities, operator training	Production Depl., QI Story, SPC, 7QC, Pokayoke, 5S, TPM, TOC, Lean Mfg, Supply Chain Mgt	
Market Launch		Advertise and promote product	New Lanchester Strategy	
		Confirm marketing objectives	Project Goals Depl, Quality Planning Table (Rt room in HoQ)	
		Communication among sales, marketing, production	Narrow QFD, 7MP, CFM-Delivery,	
		Train sales force	New Lanchester Strategy	
Project/Process Management		Manage New Development Process		Critical Chain Project Management, Stage-Gate, Balanced Scorecard

While this list is by no means exhaustive, marketers, engineers, and quality professionals should find it useful for improving the quality of the NPD process by integrating the traditional quality methods with marketing methods and creativity methods. No single project needs every tool because time-to-market would suffer. Rather, it is recommended that each organization review their NPD process, starting with the phases Cooper found

weak (marked with a \*) and apply whichever tools are necessary to strengthen this most important business activity.

## Resources for QFD and Other Quality Methods

### **Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP)**

Dyer, Robert F. and Ernest H. Forman. 1991. *An Analytic Approach to Marketing Decisions*. Prentice-Hall. ISBN 0-13-558826-X

Saaty, Thomas L. 1990. *Decision Making for Leaders: The Analytic Hierarchy Process for Decisions in a Complex World*. rev. 2nd ed. Pittsburgh: RWS Publications. ISBN 0-9620317-0-4

### **Balanced Scorecard**

Robert S. Kaplan, David P. Norton. *The Balanced Scorecard : Translating Strategy into Action*. Harvard Business School Press; ISBN: 0875846513

### **Blitz QFD**

Zultner, Richard E. 1996. "Blitz QFD." *Tutorials of the Eighth Symposium on QFD/International Symposium on QFD '96 – Novi*. Ann Arbor, MI:QFD Institute. ISBN1-889477-08-7

Zultner, Richard E. 1997a. "Blitz QFD for Project Management of Software Development." *Transactions from the Ninth Symposium on Quality Function Deployment*, Ann Arbor, MI:QFD Institute. ISBN1-889477-09-5

### **Conjoint Analysis**

Bergman, Bo et al. 1996. "Conjoint Analysis - A Useful Tool in the Design Process." *Transactions of the 8th Symposium on QFD / 2nd International Symposium on QFD*. QFD Institute. ISBN1-889477-08-7

Gustafsson, Anders. 1996. *Customer Focused product Development by Conjoint Analysis and QFD*. Linkoping University. ISBN 91-7871-668-3

### **Consumer Encounters**

Rings, Cathy, Brian Barton, and Glenn Mazur, 1998. "Consumer Encounters of the Third Kind: Improving Idea Development and Concept Optimization." *Transactions from the Tenth Symposium on Quality Function Deployment*, Ann Arbor, MI:QFD Institute, June, 1998. ISBN 1-889477-10-9

### **Customer Integrated Decision Making (CIDM)**

Daetz, Douglas, William Barnard, Richard Norman. 1995. *Customer Integration: The Quality Function Deployment (QFD) Leader's Guide for Decision Making*. New York: John Wiley & Sons, Inc. ISBN 0471-13277-2

### **DeBono**

de Bono, Edward. 1970. *Lateral Thinking: Creativity Step by Step*. ISBN 0-06-090325-2

deBono, Edward. 1992. *Serious Creativity*. Harper Business. ISBN 0-88730-566-0

### **Deming**

Deming, W. Edwards. 1982, 1986. *Out of the Crisis*. MIT-CAES. ISBN 0-911379-01-0



Deming, W. Edwards. 1993. *The New Economics: For Industry, Government, Education*. MIT-CAES. ISBN 0-911379-05-3

### **Gemba Visit/Voice of Customer Analysis**

Bolt, Andrew and Glenn Mazur. 1999. "Jurassic QFD." *Transactions from the Eleventh Symposium on Quality Function Deployment*. Novi, MI: QFD Institute. ISBN1-889477-11-7

Mazur, Glenn. 1997. "Voice of Customer Analysis: A Modern System of Front-End QFD Tools with Case Studies." AQC 1997. Milwaukee, WI: American Society of Quality Control.

Nelson, Dale. 1992. The Customer Process Table: Hearing Customers' Voices Even If They're Not Talking. In *Transactions of the Fourth Symposium on Quality Function Deployment*. Ann Arbor, MI: QFD Institute.

Ronney, Eric, Peter Olfe, and Glenn Mazur. "Gemba Research in the Japanese Cellular Phone Market." *Transactions from the Twelfth Symposium on Quality Function Deployment/6<sup>th</sup> International Symposium on QFD*, Ann Arbor, MI:QFD Institute, June, 2000. ISBN 1-889477-12-5

### **Hoshin Planning**

Akao, Yoji. ed. 1991. *Hoshin Kanri*. [Translated by Glenn H. Mazur]. Productivity Press. ISBN 0-915299-57-7

Colletti, Joe. 1995. A Field Guide to Focused Planning: Hoshin Kanri - American Style. Woodledge Group.

Cowley, Michael and Ellen Domb. 1997. *Beyond Strategic Vision: Effective Corporate Action with Hoshin Planning*. Butterworth Reinemann. ISBN 0-7506-9843-8

Mazur, Glenn, Hisashi Takasu and Michiteru Ono. 1998. *Policy Management: Quality Approach to Strategic Planning*, IQD (www.iqd.com or 800-870-4200). ISBN0-9-664655-0-4

Melum, Mara Minerva and Casey Collett. 1995. *Breakthrough Leadership*. American Hospital Publishing. 800-242-2626 or GOAL/QPC 508-685-3900. ISBN 1-55648-133-0.

### **Kano Model**

Kano, Noriaki, Nobuhiko Seraku, Fumio Takahashi, and Shinichi Tsuji. 1984. Attractive Quality and Must-Be Quality. *Hinshitsu* 14, no. 2. (February): 39-48.

### **Kansei Engineering**

Mazur, Glenn. 2000. "Kansei Engineering." *Tutorials of the 12<sup>th</sup> Symposium on QFD/6<sup>th</sup> International Symposium on QFD*, Ann Arbor, MI:QFD Institute, June, 2000. ISBN 1-889477-81-8

Nagamachi, Mitsuo. 1999. "Kansei Engineering and Its Applications in Automotive Design. *SAE Technical Paper Series*. 1999-01-1265 ISSN 0148-7191

### **Lead User Research**

Cooper, Alex. 1999. "3M Uses Lead User Research to Pursue Innovation." *Product Development Best Practices Report*. Vol 6:5. May 1999. pp. 1-5.

Von Hippel, Eric. 1994. *The Sources of Innovation*. Oxford Univ Press. ISBN 0195094220

### **Lean Manufacturing**

Kochan, Thomas A. et al. 1997. *After Lean Production*. Cornell University Press. ISBN 0-8014-8413-8

Liker, Jeffrey K. 1999. *Becoming Lean : Inside Stories of U.S. Manufacturers*. Productivity Press; ISBN: 1563271737

Womack, James P. et al. 1991. *The Machine That Changed the World : The Story of Lean Production*. Harpercollins; ISBN: 0060974176

### **New Lanchester Strategy**

Taoka, N. 1997. *Lanchester Strategy: An Introduction*. Lanchester Press. ISBN 1-57321-009-9

Yano, Shinichi. 1995 *New Lanchester Strategy*. Lanchester Press. ISBN 1-57321-000-5

Yano, Shinichi. 1996 *New Lanchester Strategy: Sales and Marketing Strategy for the Weak*. Lanchester Press. ISBN 1-57321-004-8

Yano, Shinichi. 1996 *New Lanchester Strategy: Sales and Marketing Strategy for the Strong*. Lanchester Press. ISBN 1-57321-005-6

### **Neural Linguistic Programming (NLP)**

O'Conner, Joseph. 1999. *Leading With NLP : Essential Leadership Skills for Influencing and Managing People*. Motorbooks International; ISBN: 0722537670

### **Project Management**

Goldratt, Eliyahu M. 1997. *Critical Chain*. North River Press. ISBN 0-88427-153-6

Kerzner, Harold. 1998. *In Search of Excellence in Project Management*. Van Nostrand Reinhold. ISBN 0-442-02706-0

### **Pugh Concept Selection**

Pugh, Stuart, et al. *Creating Innovative Products Using Total Design : The Living Legacy of Stuart Pugh*. Addison-Wesley Pub Co; ISBN: 0201634856

### **QFD (Comprehensive)**

Akao, Yoji, ed. 1990. *Quality Function Deployment: Integrating Customer Requirements into Product Design*. [Translated by Glenn H. Mazur] Portland, OR: Productivity Press. ISBN 0-915299-41-0

Mazur, Glenn. 2000. *Comprehensive QFD for Service Organizations v2000* Ann Arbor, MI: Japan Business Consultants, Ltd.

Mazur, Glenn. 2000. *Comprehensive QFD for Products v2000*. Ann Arbor, MI: Japan Business Consultants, Ltd.

Mizuno, Shigeru and Yoji Akao, ed. 1994. *Quality Function Deployment: The Customer-Driven Approach to Quality Planning and Deployment*. [Translated by Glenn H. Mazur] Tokyo:Asian Productivity Organization. ISBN 92-833-1122-1

### **Reliability**

Stamatis, D.H. 1995. *Failure Mode and Effect Analysis: FMEA from Theory to Execution*. ASQ Press. ISBN 0-87389-300-X

### **Seeds to Needs QFD**

Koura, Kozo. 1996. "How to Connect Technology Seeds to Customer Needs." *Transactions of the 8th Symposium on QFD / 2nd International Symposium on QFD*. QFD Institute. ISBN1-889477-08-7

### **Seven Management and Planning Tools (7MP)**

Brassard, Michael and Diane Ritter. 1994. *The Memory Jogger II*. Methuen, MA: GOAL/QPC. ISBN 1-879364-44-1

Mizuno, Shigeru, ed. 1988. *Management for Quality Improvement: The 7 New QC Tools*. Cambridge, MA: Productivity Press. ISBN 0-915299-29-1

Nayatani, Yoshinobu. 1994. *The Seven New QC Tools*. 3A Corporation/Quality Resources. ISBN 4-88319-004-8

### **Seven Product Planning Tools (7PP)**

- Gustafsson Anders et al. 1996. "7 Product Planning Tools." *Tutorials of the Eighth Symposium on QFD*. QFD Institute. ISBN 1-889477-76-1
- Kanda, Noriaki et al. 1994. The Seven Product Planning Tools for New Product Development. *Hinshitsu Kanri* 45-46(July 1994-May, 1995). (Series of Japanese articles translated into English for QFD Institute Master Class 1995).

### **Seven Quality Control Tools (7QC)**

- Brassard, Michael and Diane Ritter. 1994. *The Memory Jogger II*. Methuen, MA: GOAL/QPC. ISBN 1-879364-44-1
- Hosotani, Katsuya. 1992. *Japanese Quality Concepts: An Overview*. [Translated by Glenn H. Mazur]. New York: Quality Resources. ISBN 0-527-91651-X
- JUSE Problem Solving Research Group. 1991. *TQC Solutions: The 14-Step Process*. Productivity Press. ISBN 0-915299-79-8

### **Six Sigma, SPC**

- Wheeler, Donald J. 1992. *SPC at the Esquire Club*. SPC Press. ISBN 0-945320-30-2
- Wheeler, Donald J. 1993. *Understanding Variation: The Key to Managing Chaos*. SPC Press. ISBN 0-945320-35-3
- Wheeler, Donald J. and David S. Chambers. 1992. *Understanding Statistical Process Control*. SPC Press. ISBN 0-945320-13-2

### **Software Engineering**

- Gane, Chris and Trish Sarson. 1977. *Structured Systems Analysis: Tools and Techniques*. New York: Improved System Technologies, Inc. ISBN 0-931096-00-7
- Mazur, Glenn. 1995b. Elicit Service Customer Needs Using Software Engineering Tools. In *Transactions of the Seventh Symposium on Quality Function Deployment*. Ann Arbor, MI: QFD Institute. ISBN1-889477-07-9

### **Stage-Gate**

- Cooper, Robert G. 1993. *Winning at New Product 2<sup>nd</sup> Edition*. Addison-Wesley. ISBN 0-201-56381-9

### **Strategic Information Systems (SIS)**

- Shimada and Ebizawa. 1989. *Strategic Information Systems: Construction and Deployment*. [in Japanese] JUSE.

### **Supply Chain Management**

- Simchi-Levi, David et al. 1999. *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies*. Irwin/McGraw-Hill; ISBN: 0072357568

### **Taguchi Methods**

- Taguchi, Genichi. 1986. *Introduction to Quality Engineering: Designing Quality into Products and Processes*. APO. ISBN 92-833-1084-5

### **Theory of Constraints**

- Dettmer, H. William. 1997. *Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement*. ASQC Press. ISBN 0-87389-370-0
- Goldratt, Eliyahu M. 1994. *It's Not Luck*. North River Press. ISBN 0-88427-115-3

Goldratt, Eliyahu M. and Jeff Cox 1992 Second Revised Edition. *The Goal*. North River Press. ISBN 0-88427-061-0

Scheinkopf, Lisa J. 1999. *Thinking for a Change: Putting the TOC Thinking Processes to Use*. St. Lucie Press. ISBN 1-57444-101-9

### **Total Quality Management (TQM)**

Imai, Masaaki. 1986. *Kaizen: The Key to Japan's Competitive Success*. McGraw-Hill. ISBN 0-07-554332-X

Imai, Masaaki. 1997. *Gemba Kaizen: A Commonsense, Low-Cost Approach to Management*. McGraw-Hill. ISBN 0-07-031446-2

Kurogane, Kenji. 1993. *Cross-Functional Management: Principles and Practical Applications*. Asian Productivity Organization. ISBN 92-833-1118-3

Mazur, Glenn. TQM Virtual Course Pack, College of Engineering University of Michigan. [www-personal.engin.umich.edu/~gmazur/tqm/](http://www-personal.engin.umich.edu/~gmazur/tqm/)

### **TRIZ**

Terninko, John, Alla Zussman, Boris Zlotin. 1996. *Step-by-Step TRIZ: Creating Innovative Solution Concepts*. ISBN 1-882382-12-9

TRIZ Journal. [www.triz-journal.com](http://www.triz-journal.com)

### **Value Engineering**

Shillito, Larry. 1994. *Advanced QFD: Linking Technology to Markets and Company Needs*. Wiley-Interscience. ISBN 0-471-03377-4

## **About the Author**

Glenn H. Mazur has been active in QFD since its inception in North America, and has worked extensively with the founders of QFD on their teaching and consulting visits from Japan. His primary focus is in the service industry, as a manager for over 15 years in automobile repair and parts warehousing, as a teacher, and as an owner of a translating and consulting business he started in 1982. He is one of North America's leaders in the application of QFD to service industries, sits on several advanced QFD research committees, and sits on the steering committee of the Symposium on Quality Function Deployment held annually in Detroit. He is also Executive Director of the non-profit QFD Institute and the International Council for QFD. He is an Adjunct Lecturer of Total Quality Management at the University of Michigan College of Engineering. He lectures and trains in QFD worldwide. Mazur holds a Master's Degree in Business Administration and a Bachelor's Degree in Japanese Language and Literature, both from the University of Michigan. In 1998, he was awarded the Akao Prize for Excellence in QFD. He can be reached at [glenn@mazur.com](mailto:glenn@mazur.com) or fax: +1-734-995-3810

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Cooper, Robert G. 1993. *Winning at New Product 2<sup>nd</sup> Edition*. Addison-Wesley. ISBN 0-201-56381-9

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