Developing System Requirements

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Preamble

This is a continuation of the discussion on system *requirements*, which was initiated in the January 2002 *SOLEtech* (also refer to the December 2001 *SOLEtech*, Figure 4, block 2,). "Requirements" must be adequately defined from the beginning during system conceptual design, and the definition of such must commence with a good description of *customer* requirements and evolve into a solid set of specific *design-to* requirements (to include the requirements for logistics and the maintenance and support infrastructure). Design requirements are then realized through incorporation of the appropriate attributes (or characteristics) in the ultimate configuration of the system that is to be delivered to the customer (user) for operational use. In the event that such requirements are conflicting, there needs to be some *prioritization* for the purposes of delineating relative levels of importance. This process of "developing system requirements" can be facilitated through application of the *Quality Function Deployment (QFD)* model. The objective herein is to briefly discuss the QFD in this context, and to recommend that you review some of the references to gain further insight as to the value and benefits of this approach.

Introduction

In the January *SOLEtech*, the definition of system requirements was introduced through the accomplishment of a *feasibility analysis*, the development of *system operational requirements*, and definition of the *maintenance concept*. This results in the initial specification of quantitative and qualitative requirements at the system-level, which were evolved from the *needs analysis* (refer to the December *SOLEtech*, Figure 4, block 1). The next step is to refine these *system-level* requirements into detail *design* requirements, and to establish some priorities in the event of conflict.

While there may be different ways in which this can be accomplished, I have found that application of the *Quality Function Deployment (QFD)* method constitutes an excellent approach to facilitate such! The QFD method was developed at the Kobe Shipyard of Mitsubishi Heavy Industries, Ltd, and has evolved considerably since. The QFD structure can be related to the "House of Quality (HOQ)," a tool that is often utilized in the accomplishment of Total Quality Management (TQM) objectives. [1] A simplified approach to the QFD method, as applied in the development of design requirements, is described in the paragraphs to follow.

The Quality Function Deployment (QFD) Process [2]

The basic steps in accomplishing a QFD analysis are shown in Figure 1, which represents a simplified version of the overall process. Referring to the figure, the results from the feasibility analysis, development of system operational requirements, and the maintenance concept constitute a major input. It is essential that the real *need* be well defined in functional terms prior to any commitment relative to hardware, software, facilities, people, and so on. Following these steps will aid in facilitating this objective, and will include the accomplishment of customer surveys, interviews, trend analysis, competition analysis, potential configuration reviews, and so on. A "team" approach is required with the active participation of the customer, prime contractor, system designer, and/or major suppliers. The matrix utilized in displaying QFD information is shown in Figure 2.

1. Review And Refine Customer/Consumer Requirements (Figure 1, block 1)

The **system-level** requirements that have been defined to this point are further identified, classified, and translated into more specific customer requirements in order to better understand the perceived deficiency. The purpose of this first step is to ensure that we have fully captured the "Voice of the Customer." Referring to the left side of the modified "House of Quality (HOQ)" shown in Figure 2, the objective is to identify all applicable *requirements*,
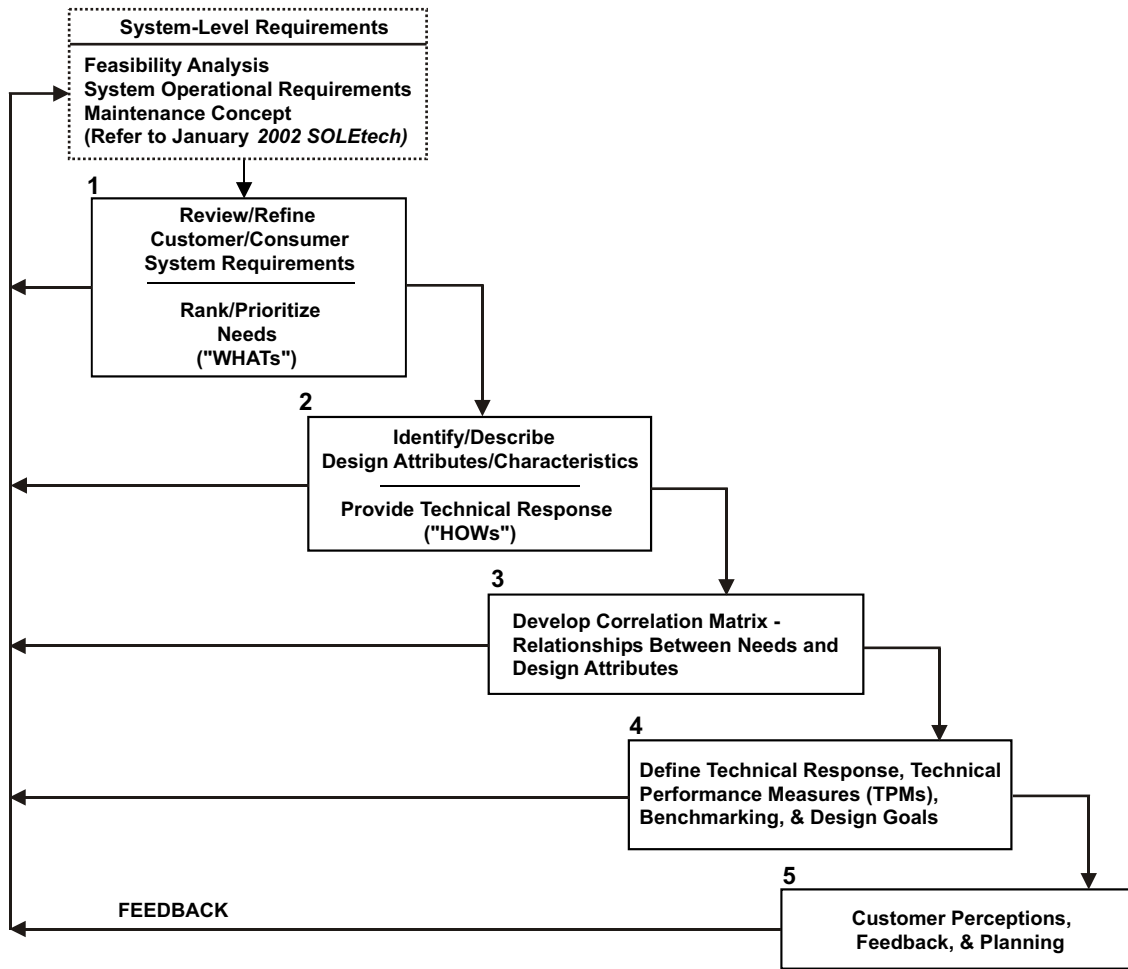
System-Level Requirements

Feasibility Analysis
System Operational Requirements
Maintenance Concept
(Refer to January *2002 SOLEtech*)

1

Review/Refine
Customer/Consumer
System Requirements

Rank/Prioritize
Needs
("WHATs")

2

Identify/Describe
Design Attributes/Characteristics

Provide Technical Response
("HOWs")

3

Develop Correlation Matrix -
Relationships Between Needs and
Design Attributes

4

Define Technical Response, Technical
Performance Measures (TPMs),
Benchmarking, & Design Goals

5

Customer Perceptions,
Feedback, & Planning

FEEDBACK

Figure 1. Basic Steps in the QFD Process (abbreviated)

Interrelationships
among attributes
(technical correlations)

Design attributes
"Hows"
(technical response)

Customer
(consumer)
needs
"whats"

Ranking of needs

Relationships
between
customer needs
and
design attributes

Planning matrix,
customer evaluation,
customer perceptions,
and strategic planning

Technical response
measures and priorities
competitive benchmarking
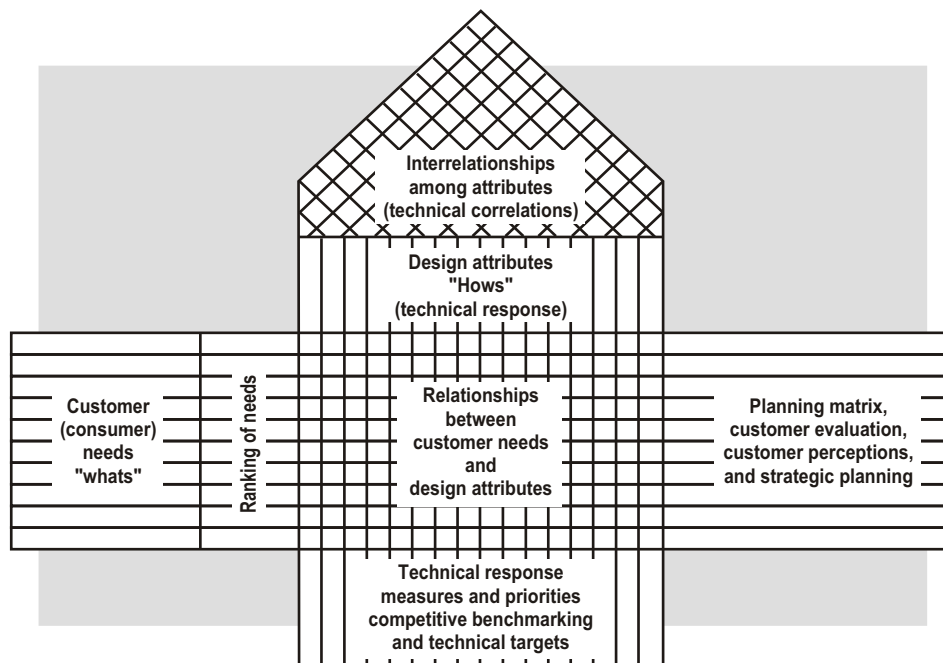**and technical targets**

Figure 2. The QFD Matrix - Modified "House Of Quality"
(source: Blanchard, B.S., Logistics Engineering and Management,
5th Ed., Prentice Hall, NJ, 1998, Figure 3.17)

and to describe these in clear, precise, and "measurable" terms. It is not uncommon for early requirements to be stated in general qualitative language which, in turn, imparts vagueness and imprecision at this early stage of design.

Given a good and thorough listing of requirements, the next step is to *prioritize* these in rank order, delineating the level(s) of importance of each. Quite often one will find that selected requirements may have an adverse impact on each other. For example, a customer may desire ease while opening and closing a car door, but at the same time want power windows. The addition of power windows will increase the weight of the door and this correlates negatively with the ease of opening and closing the door. In other words, if one had to make a "compromise" in the design process, which feature(s) would be "traded-off?" To overcome such possible conflicts, requirements are assigned priorities, and it is essential that such priorities reflect the preferences of the customer. While there are different approaches to prioritizing customer requirements, one that quickly comes to mind is the *analytical hierarchy process (AHP)*. [3]

Application of the QFD process (and the development of customer requirements) is often accomplished as a result of a brainstorming exercise (involving an iterative approach) by members of the design team. While the design team may constitute the proper representation (i.e., customer/user, contractor, system designer, supplier), care must be taken to ensure that the "Voice of the Customer" is reflected in the output results -- not the "Voice of the Team Leader," the "Voice of the Company," and so on. In any event, the objective in this initial step is to define the "**WHATs**" in design.

2. Identify And Describe Design Attributes/ Characteristics (Figure 1, block 2)

The next step is to develop a **technical response** by identifying a set of design-dependent parameters (DDPs) that, when incorporated into the ultimate design configuration, will respond to the requirements that have been specified earlier. The question is -- what characteristics should be incorporated into the design in order for the system to accomplish its designated mission(s)? Referring to Figure 2, the top portion of the HOQ represents this area of activity, or the "HOWs" in design. According to Sullivan, *"These (engineering) characteristics are the product requirements that relate directly to the customer requirements and must be selectively deployed throughout the design, manufacturing, assembly, and service process to manifest themselves in the final product performance and customer acceptance."* [4] The selected design-

dependent parameters should be tangible, describe the system configuration in measurable terms, and directly affect customer perceptions. In essence, they guide the analysis and evaluation of design concepts, configurations, and artifacts during the conceptual, preliminary, and detail design phases. [1][2].

3. Develop Correlation Matrix (Figure 1, block 3)

Referring to Figure 2, the center section of the HOQ constitutes a "correlation matrix," where the relationship(s) is established between the design attribute(s) and the customer requirements. The question is -- do the selected DDPs (attributes/characteristics in design) directly relate to the specified customer requirements, and how strong is this relationship? In other words, *do the* "**HOWs**" *adequately respond to the* "**WHATs**" *as specified?*

Each DDP is analyzed in terms of its influence on customer requirements, and the extent (or level) of influence is so noted and reflected in the *rows* and *columns* of the correlation matrix. In an actual example, the degree or level of correlation is so noted by a designated symbol, and the various categories of correlation include *very low, low, medium, high, and very high*. Obviously, there should be a strong correlation between the characteristics in design and the initially specified customer requirements. Upon inspection at the completion of this exercise, *empty rows in the correlation matrix* signify unaddressed customer requirements, and the designer needs to revisit the design. On the other hand, *empty columns in the correlation matrix* imply redundant or unnecessary system-level design requirements. In other words, the design team may have included some design requirements which cannot be traced back to any given customer requirement which, in turn, could result in an unnecessary added cost.

4. Define Technical Response, Technical Performance Measures (TPMs), Benchmarking, Design Goals, Customer Feedback, And Future Planning (Figure 1, blocks 4 and 5)

The results from the QFD process (Figure 2, blocks 1, 2, and 3) constitute a series of prioritized *Technical Performance Measures (TPMs)* such as those presented in Figure 3. Referring to the figure, the critical TPMs are noted, along with the applicable metrics and the degree or level of importance of each in the design process. Depending on the type and complexity of the system in question, there may be any number of TPMs specified and, of course, the specific metrics may vary depending on the nature of the system and its mission objective(s). In any event, these TPMs represent the suggested **requirements** for system design. Given such, it may be

Technical Performance Measure	Quantitative Requirement ("metric")	Current "benchmark" (competing systems)	Relative Importance (customer desires) (%)
Process time (days)	30 days (maximum)	45 days (system M)	10
Velocity (MPH)	100 mph (minimum)	115 mph (system B)	21
Availability (operational)	98.5% (minimum)	98.9% (system H)	21
Size (feet)	10 feet long 6 feet wide 4 feet high (maximum)	9 feet long 8 feet wide 4 feet high (system M)	17
Human factors	Less than 1% error rate per year	2% per year (system B)	5
Weight (pounds)	600 pounds (maximum)	650 pounds (system H)	6
Maintainability (MTBM)	300 miles (minimum)	275 miles (system H)	9
			100

**Figure 3. Prioritized Technical Performance Measures -- An Example
(source: Blanchard, B.S., Logistics Engineering And Management,
5th Ed., Prentice Hall, NJ, 1998, Figure 3.16)**

desirable to compare these requirements with those for other similar systems by establishing some **benchmarks** as realistic goals. The results of this analysis should then be "fed back" to the customer for the purposes of verification -- *are the requirements as specified consistent with the initially-defined requirements as perceived by the customer?*

Application Of The QFD Model

Thus far, the QFD model has been applied primarily in defining the basic requirements at the system-level, and the discussion has been oriented to a single HOQ as shown in Figure 2 above. System requirements are established as an **input** to the HOQ, and the **output** results in a set of TPMs as presented in Figure 3. These system-level requirements now need to be extended and allocated down to the subsystem-level, the unit/component level, and to all of the various significant elements of the system. There must be a *traceability* of requirements from the beginning, through the design and development of the system, production/construction, and impacting the design of the maintenance and support infrastructure. To facilitate the implementation of this concept, one may wish to establish a series of HOQs, as illustrated in Figure 4, where the "output" from one will constitute the "input" for another. Multiple-linked HOQs are often used to maintain "traceability" and to sustain the "Voice of the Customer" throughout the design and development effort. With this in mind, it is essential that the integration of logistics and supportability requirements be established from the beginning, that the appropriate representation for such be

included in the design team implementing the QFD process, and that there be a complete traceability of supportability requirements from the system-level, and down through the various HOQs (as applicable).

Summary

The QFD model provides a framework for defining and clarifying system requirements. The intent is to foster the development of a logical step-by-step process, providing early visibility and structure, and resulting in a more complete and compatible output than what has been experienced in the past in attempting to define the requirements for various systems. Further, through application of this process, an objective is to consolidate and integrate the various data inputs from different sources. Hopefully, any unjustified input and emotionally-based reasoning will be minimized (if not eliminated) from the beginning. Finally, the QFD model can be applied in the development of any type of system but must, of course, be "tailored" to the depth necessary.

In this article, I have attempted to provide an "overview" of the QFD process in order to acquaint you with approach and the benefits that can be derived through the application of such. However, the content herein is very cursory in nature, and I highly recommend that you delve further into some of the literature on the subject. You might start out with reference [2] which includes a more indepth treatise of the process, and the other references should be reviewed at your convenience. After having done so, I suspect that you will be anxious to try it out sometime.
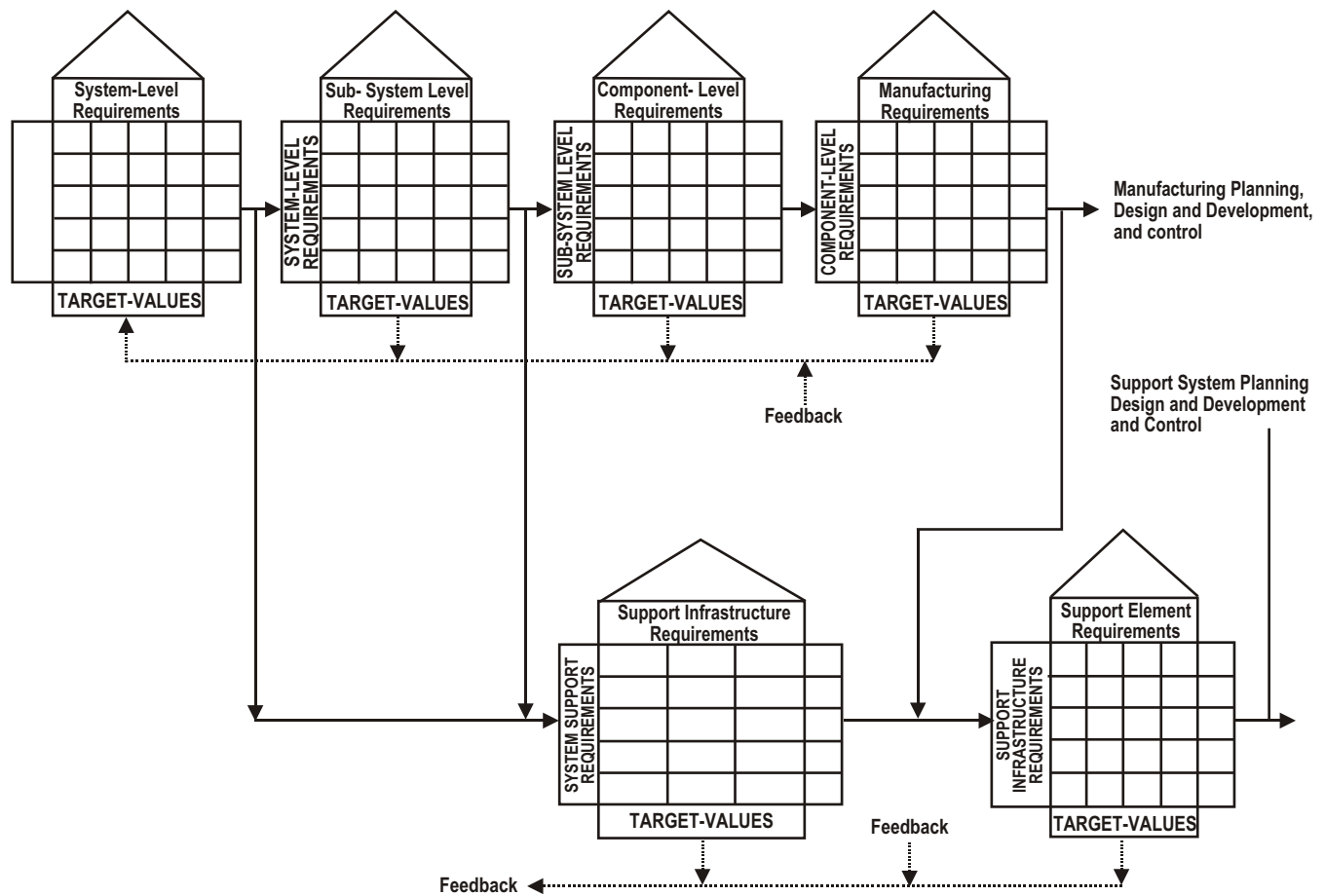
**Figure 4. Family of Houses -- Traceability of Requirements
(source: Blanchard, B.S., Logistics Engineering And Management, 5th Ed.,
Prentice Hall, NJ, 1998, Figure 3.18)**

References

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[4]   Sullivan, L.P., "*Quality Function Deployment,*" **Quality Progress**, June 1986.

[5]   Pugh, S., *Total Design: Integrated Methods for Successful Product Engineering*, Addison-Wesley Publishing Co., NY, 1991, Chapter 11 (ISBN 0-201-41639-5).

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[7]   Revelle, J.B., J.W. Moran, and C. Cox, *The QFD Handbook*, John Wiley & Sons, 1997 (ISBN 0471173819).

[8]   Biren, P., *Review of QFD and Related Deployment Techniques*, **Journal of Manufacturing Systems**, Vol. 17, No. 3, 1998.

[9]   Verma, D., R. Chilakapati, and W.J. Fabrycky, *Analyzing the Quality Function Deployment Matrix: An Expert System Based Approach to Identify Inconsistencies and Opportunities*, **Journal of Engineering Design**, Vol. 9, Issue 3, 1998.

[10]   Blanchard, B.S., *Logistics Engineering and Management*, 5th Ed., Prentice Hall, NJ, 1998, Chapter 3 (ISBN 0-13-905316-6).

Defense Logistics And Procurement Strategies To Facilitate World-Class Frontline Support (Defense Logistics 2001)

James C. Sharp, CPL, VP - Professional and Technical Development

Sarah James, SOLE's Executive Director, and I had the opportunity and pleasure to participate in the *Defense Logistics 2001 Conference*, Ritz Carlton Hotel, Pentagon City, VA, December 4-6, 2001. Approximately 250 senior logisticians, program managers, and acquisition personnel (representing industry, government, and academia) were in attendance, and we were privileged to be able to participate in some very special and interesting topics of discussion.

Military Readiness, Remote Theaters of War, Collaborative Partnerships, and Technological Advances were among the topics of discussion. As we all know, these critical issues represent opportunities that will drive the conduct of logistics in the Defense sector for many years to come. I feel that **the** critical issue hidden in all of these discussions led to the question -- "*What is the real skill mix required of the logistician of the future?"* While this event did not specifically address this question, it did provide a framework for discussion and, hopefully, solutions. More specifically, the Conference highlights included:

1. Identifying new ways to support the frontline with streamlined and unified logistics.

2. Assessing the impact of collaborative partnerships on defense logistics strategy.

3. Overcoming the challenges of providing multi-national logistics support.

4. Exploring the benefits and challenges of integrating web-enabled solutions into a defense strategy.

5. Improving logistics strategy in remote theaters of war.

6. Developing flexible logistics structures to meet future demands.

The first day of the conference consisted of workshops sponsored by SAP, Price Waterhouse Coopers, Honeywell, Lockheed Martin Naval Electronics and Surveillance Systems, and United Defense. These workshops covered such topics as *Exploring the Role of Public/Private Partnerships in Driving the Development of a Truly Collaborative Defense Environment* and *E-enabling the Defense Environment.*

The morning sessions of the second and third days were spent listening and learning from such renowned speakers as RADM Raymond Archer III, Vice Director, DLA; LTG Roy E. Beauchamp, DCG US Army Materiel Command (and SOLE BOA member); LTG Daniel G. Brown, Deputy Commander in Chief, USTRANSCOM; MG Dennis Haines, Commander, Warner Robins Air Logistics Center, USAF; Lou Kratz, ADUSD Logistics Plans and Programs (and SOLE BOA member); LTG Hawk, OSD Deputy Chief of Staff for Logistics; and many others. Topics presented included *Joint StrikeFighter: A New Paradigm to Military/Industry Relationships, The Impact of Commercial Involvement on Operational Logistics, Exploring the Impact of New Trends for Transportation and Distribution in Providing Frontline Support,* and *Adopting Strategic Alliance and Commercial Partnerships to Support New Defense Logistics Initiatives.*

The afternoons were filled with "tracked" sessions and one could choose from a variety. Some of the sessions included *Collaborative E-Hubs for Logistics Modernization* (presented by the National Director, Logistics Solutions, ORACLE Corp.); *Maximizing the Impact of the Logistics System on Equipment Readiness* (by Eric Peltz, RAND Corp.); *Extending Commercial Support to the Australian DOD Through Private Investment In and Ownership Of Defense Capability* (by Steve Hyland, Defense Acquisition Attache, Embassy); and *Leveraging Private Sector Enterprise as Capital to Reduce Cost and Improve Performance of the Military Supply Chain* (by Jeffrey Jones, Director, Defense Energy Support Center). Other areas of interest included *Developing a Technology Infrastructure which Supports the Need for Flexibility in Military Logistics Strategy* (by Mae De Vincente, Director of Information Operations, DLA); *Building Innovative Logistics Support Solutions Through Public/Private Partnerships* (by James Brunke, Boeing Co.); and S*atisfying the Operational Information Requirements of the Joint Task Force Warfighter* (by BG Henry Obering III, Director of Information Dominance, USAF).

It gave me great pride to know that there are still logisticians who have the ability, experience, and vision to "paint the picture" for the future logistician. Now, it is our time to meet the challenge in our support of the "Warfighter."

Book Reviews
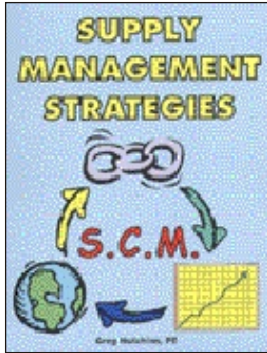
Supply Management Strategies for Improved Performance

Hutchins, Greg, Quality Plus Engineering, Portland, OR 97232 2001

This book is an update of *Purchasing Strategies for Total Quality*, authored by Greg Hutchins, McGraw Hill, NY, 1991. As the title suggests, the material included covers the current state of supply management, present best practices, and provides guidelines on how to jumpstart your supply chain initiative. More specifically, the author explains how to:

1. Integrate the disparate elements of supply-chain management into a competitive business system;

2. Align supply management systems with strategic initiatives and goals;

3. Select and develop suppliers according to cost, quality, flexibility, system responsiveness, and overall performance criteria that go beyond traditional cost-per-unit considerations;

4. Certify suppliers and partners to establish a common language for communication;

5. Use technology to improve supplier partnerships;

6. Refine and enhance the manufacturing processes in the supply chain to ensure critical partners' focus on core processes and core strengths;

7. Foster better communication between partner organizations by using electronic communication tools and methods;

8. Emphasize the mutual benefits of supply-chain partnering;

9. Move beyond a price-focused relationship to a value-added relationship; and

10. Prepare supply-chain executives and managers for their new emerging roles, responsibilities, and authorities.

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The book includes 15 interesting chapters: Chapter 1: *Introduction;* Chapter 2: *Competitiveness Fundamentals*; Chapter 3: *Supply Chain Management*; Chapter 4: *Customer Focus*; Chapter 5: *Supply Chain Strategies*; Chapter 6: *SCM Leadership*; Chapter 7: *SCM Tools and Technique*s; Chapter 8: *SCM Process Maturity Models*; Chapter 9: *Supply Development Process*; Chapter 10: *Supply Development - Certification*; Chapter 11: *Supply Development - Continuous Improvement*; Chapter 12: *Supply Development*; Chapter 13: *Introduction to Supply Risk Management*; Chapter 14: *Process and Product Innovation*; and Chapter 15: *The Supply Chain Management Future.*

This book has received positive reviews by supply-chain experts in the Society of Manufacturing Engineers (SME), the American Society for Quality (ASQ), and several other professional organizations. APICS (the Resource Management Society) has picked this book and its predecessor for its supply management certification. For additional information, contact Quality Plus Engineering (tel: 503-233-1012; fax: 503-233-1410), or contact the author at **gregh@europa.com**.

Elsewhere . . .

4th Annual Professional Development Workshop And Technical Conference -- Mid-Atlantic LOG, Hampton, VA, April 11-14 -- Register Early!

The SOLE Chapters in District 2 are once again sponsoring and hosting, *Mid-Atlantic LOG*, scheduled to be conducted at the Holiday Inn, 1815 West Mercury Blvd., Hampton, VA, April 11-13. The theme is "Logistics: Beyond 2002." There will be a workshop and CPL training session included, along with the technical paper presentations. The Keynote Speaker for the Friday (April 12th) session will be Jay Mabe, Senior Partner, Accenture, and Saturday (April 13th) will feature MG Hawthorne Proctor, Director, Logistics Operations, Defense Logistics Agency, as the Keynote Speaker. April is a great time to visit the Virginia Tidewater area; so, please register early. For additional information, contact John Davids (tel:410-993-8172; fax: 410-694-2076; e-mail: **john_h_davids@mail.northgrum.com**) and/or SOLE Headquarters (**solehq@erols.com**).

18th International Logistics Congress And Exhibition (ILC-2002), Gasteig Arts Center, Munich, Germany, October 6-9 -- Plan Now To Participate!

An initial "Call for Papers" (and "Invitation for Exhibitors") has been issued for the forthcoming *18th ILC*, to be sponsored by SOLEurope and hosted by the Munich Chapter, and scheduled to be conducted at the Gasteig Arts Center, Munich, Germany, October 6-9. The proposed

Elsewhere . . .   *(Continued)*

theme is "Outsourcing Life-Cycle Support: Sharing the Risks, Sharing the Opportunities." *Commercial and Government Organizations are changing their business strategies and policies to set focus on their core business. . In conjunction, business processes, which are related to support of core processes, are outsourced and concentrated on service providers. This is visible in all branches and business areas, most evident with the transportation and just-in-time service of material to production lines, but also in other sensitive processes such as providing spares or maintenance service to airlines or the military organizations. Contractor Logistic Support or Full Industrial Support shifts risks from buyer to seller. Warranties and contractual obligations require the consideration of life-cycle aspects and the application of scientific and engineering methods to recognize, evaluate, and minimize economic risks*. Major topics to be discussed during the Congress will include "changes in support policies and strategies, changes in support organizations, and enabling technologies (B2B, e-commerce, etc.)."

Individuals wishing to present a paper at the Congress are requested to submit an abstract (not to exceed 500 words) in English, not later than March 28th, to the Conference Secretariat; Interplan; Congress, Meeting, and Event Management; **Sole@i-plan.de**; Attention - Elke Jaskiola (tel: +49 (0) 89 54 82 34 32; fax: +49 (0) 89 54 82 34 43). The submitted abstracts will be reviewed by the Program Committee and, upon acceptance, authors will be asked to prepare and submit the complete paper no later than June 28th. For additional information, please visit **www.sole-muc.de** and/or the SOLE web site at **www.sole.org**.

As an added (Editorial) note, if you haven't had the opportunity to visit Munich and beautiful Bavaria before, it would be highly worthwhile not only to participate in this Congress but to combine it with a few days of vacation as well. Just prior to the Congress will be Munich's famous annual *Oktoberfest*, an event which includes a lot of varied activities along with people, music, and exhibits from around the world. Additionally, there is much to see in and around Munich -- Nymphenburg Palace (where former rulers of Bavaria resided), Marienplatz and the Glockenspiel (a good place to gather and enjoy the environment), the Deutsches Museum (one of the World's largest "technical" museums with many hands-on scientific exhibits - great for families and kids), the famous Hofbrauhaus (large beer hall with a lot of good music and "local color"), and the Olympic Village (1972 Olympics). Not too far away (and definitely worth the short drive) are the Bavarian Alps and the Zugspitze (Germany's highest mountain at 2,963M), Neuschwanstein (King Ludwig's famous castle in the mountains), Oberammergau (where the Passion Play is held), and many small Alpian villages which are fun to visit. Plan now - it would be a worthwhile adventure!

Calendar of Events

1. *9th Annual Technical Conference - Florida LOG 2002*, sponsored by the Florida SOLE Chapters, Delta Orlando Resort, Orlando, FL, February 15-16. The theme is "New Logistics Visions." The Keynote Speaker will be Lawrence "Buzz" Milan, Director Of Maintenance and Support, Naval Air Systems Command; and the Banquet Speaker will be Neil D. Shuster, President and CEO, Intelligent Transportation Society of America. The program will include technical "tracks" covering *Lean Thinking, Lean Manufacturing And Six Sigma* (Dr. Beth Rivers, Chair), *Manufacturing Technology Dedicated To Ball Grid Array* (Corporate Executives), *Two Executive-Level Panels* (Key Government/Military/Corporate Executives), *Performance-Based Supportability* (Charles O. Coogan, Chair), *Two Multi-Track Sessions* (Selected Speakers), and a *CPL Tutorial* (Mike Osborne). The General Chair is Ray Hoopes (**rthoopes@aol.com**), the Technical Program Chair is Gaines Corbett (**gaines.w.corbett@lmco.com**), and the Registration Chair is Michele Smith (**michele. smith@ honeywell.com**).

2. *18th Annual DoD Logistics Symposium And Exhibition,* sponsored by the National Defense Industrial Association (NDIA), Jacksonville, FL, March 11-14. Contact Susan Campagna at (703)-247-2574, or call the Operations Department at 703-522-1820.

3. *European Safety And Reliability Conference (ESREL)*, Lyon, France, March 19-21. For additional information, contact Anne Nomand (**anne.normand@mfq.asso.fr**) and/or visit web site **http://www.polynome.fr/lm13/**.

4. *4th Annual Mid-Atlantic Professional Development Workshop And Technical Conference - Mid-Atlantic LOG*, sponsored by the SOLE Chapters in District 2, Holiday Inn, 1815 West Mercury Blvd., Hampton, VA, April 11-14. The theme is "Logistics; Beyond 2002." The General Chair is Richard Smith (**smithlog@att.net**), the Technical Chair is Eric R. Nelson (**ernelson57@hotmail.com**), and the Registration Chair is John Davids (**john_h_davids@mail.northgrum.com**). Also, visit the web site **www.mid-atlantic-log.org**. (see article earlier in this newsletter).

5. *Supply-Chain World-North America Conference And Exposition*, sponsored by the Supply-Chain Council (SCC), Hyatt Regency Hotel, New Orleans, LA, April 22-24. The theme is "Extending Collaboration To End-To-End Synchronization: Managing The Supply ChainNetwork For Competitive Advantage." For additional information, contact the Supply-Chain Council, 303 Freeport Road, Pittsburgh, PA 15215 (tel: 412-781-4101; fax: 412-781-2871; e-mail: **info@supply-chain.org**)..

Calendar of Events *(Continued)*

6. *11th Annual TACOM/Industry Logistics Symposium*, sponsored by the U.S. Army Tank Automotive And Armaments Command and NDIA, Northfield Hilton Hotel, Troy, MI, April 16-18. The theme is "Innovative Logistics - Achieving The Army Transformation." For additional information, contact Cherice Carter, TACOM Co-Chair (810-574-4175), or Ignacio Cardenas, NDIA Co-Chair (810-574-8150).

7. *14th Annual Software Technology Conference*, Salt Palace Convention Center, Salt Lake City, UT, April 28 - May 2. The theme is "Forging The Future Of Defense Through Technology." Scheduled for the "Opening General Sessions" are Congressman James V. Hansen (R), 1st District of Utah, and Lloyd K. Mosemann, Senior Vice President for Corporate Development, SAIC. There are eight tracks with a wide variety of technical paper presentations, eight tutorial sessions, and numerous panels. For further information, visit web site **www.stc-online.org** and/or call 800-538-2663.

8. *Institute Of Industrial Engineers (IIE) Annual Conference 2002*, sponsored by the IIE, Hilton Hotel, Walt Disney Resort, Orlando, FL, May 20-22. For additional information, contact **cs@iienet.org** and/or visit web site **www.iienet.org**.

9. 2nd Annual Supply-Chain World-South East Asia Conference And Exposition, sponsored by the Supply-Chain Council (SCC), Grand Hyatt Hotel, Singapore, May 21-22. The theme is "Collaborate, Trust, SCOR: Keys To Supply-Chain Success." For additional information, contact the Supply-Chain Council, 303 Freeport Rd., Pittsburgh, PA 15215 (info@supply-chain.org).

10. *International Conference Of Maintenance Societies (ICOMS-2002)*, organized by the Maintenance Engineering Society of Australia (MESA), Hilton Hotel, Brisbane, Queensland, Australia, May 21-24. The theme is "Changing The Future." The Conference will include a variety of workshops and exhibits, in addition to many technical paper presentations. Papers presented in Brisbane will be broadcast simultaneously to a conference venue at the Central Queensland University's campus in Gladstone. For further information, contact Sally Nugent, P.O. Box 634, Brentford Square, Victoria 3131, Australia (**icoms@corrprev.org.au**) and/or visit web site **www.mesa.org.au**.

11. *EUROMAINTENANCE 2002: 16th International Maintenance Congress*, Helsinki, Finland, June 3-5. For additional information, contact Hannu Vallanen (tel: +358 9276 7688; fax: +358 9290 0081). Also visit **http://www.kunnossapito.fi/Congress/call-pap.htm**.

12. *8th IEEE International Symposium On Software Metrics (Metrics 2002)*, Ottawa, Canada, June 4-7. Visit web site **www.software-metrics.org**.

13. *2002 Digital Human Modeling For Design And Engineering Conference*, Munich, Germany, June 18-20. For additional information, contact John R. Miller (**jrmiller@sae.org**) and/or visit web site **http://www.sae.org/calendar/gvmtgs.htm**.

14. *12th Annual International Symposium On Systems Engineering*, sponsored by the International Council On Systems Engineering (INCOSE), Riverina Hotel, Las Vegas, NV, July 28-August 1. The theme is "Engineering 21st Century Systems: Problem Solving Through Structured Thinking." For additional information, contact INCOSE Headquarters at **incose@halcyon.com** and/or visit web site **www.incose.org**.

15. *37th Annual International Logistics Conference & Exhibition* (SOLE 2002), Pointe South Mountain Resort, 777 South Mountain Parkway, Phoenix, AZ 85044, August 10-15. The theme is "21st Century Logistics: The Global Bridge." For additional information, contact John Davis, General Chair (**JDavisCPL@aol.com**) or SOLE Headquarters (**solehq@erols.com**).

16. *15th International Congress And Exhibitions On Condition Monitoring And Diagnostic Engineering Management (COMADEM)*, University of Birmingham, Birmingham, United Kingdom, September 2-4. For additional information, contact Professor B.K.N. Rao (**rajbknrao@btinternet.com**) and/or visit web site **http://www.comadem.com**.

17. *Council of Logistics Management's Annual Conference*, Moscone Center, San Francisco, CA, September 29-October 2. The theme is "The Rules Are Changing ....."The Keynote Speaker for the opening session will be Michael L. Eskew, Chairman and CEO, United Parcel Service. For further information, contact CLM Headquarters at **clmadmin@clm1.org** and/or visit web site **http://www.clmadmin@clm1.org**.

18. *18th International Logistics Congress And Exhibition (ILC-2002)*. Gasteig Arts Center, Munich, Germany, October 6-9. The Conference theme is "Outsourcing Life-Cycle Support: Sharing the Risks, Sharing the Opportunities." A formal "Call for Papers" has been initiated, with March 28th as the "target" date for the submission of abstracts - please refer to the article covering the Conference included earlier in this newsletter. For additional information, visit web site **www.sole-muc.de** and/or the SOLE web site at **www.sole.org**.

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