Functional Packaging, Partitioning, And Requirements Allocation

*Ben S. Blanchard, CPL, Fellow, Professor-Emeritus,
Virginia Tech*

Preamble

The March *SOLEtech* briefly covered the subject of *functional analysis* and the description of the system in "functional" terms.

The basic thrust is to describe the "WHATs" (versus the "HOWs") in terms of life-cycle activities, mission scenarios, and so on. Accomplishing a functional analysis constitutes an iterative process commencing with the "needs" analysis and evolving through the development of system operational requirements, the maintenance concept, and the identification and prioritization of the technical performance measures (TPMs) — refer to the system engineering process in Figure 1, March 2002 *SOLEtech*. The next step is to select, group, and combine the various functional identities into specific and discrete elements of the system, and then to allocate (or apportion) the appropriate design-to requirements for the system down to its various elements.

Functional Packaging And Partitioning

Given a top-level description of the system in "functional" terms, it is now appropriate to combine, or group, similar functions into logical subdivisions, identifying major subsystems and lower-level elements of the overall system; i.e., the development of a functional packaging scheme for the system. An *open-architecture* approached is used where the functions, and the functional interfaces, are well defined. At the same time, the "whats" are converted into the "hows," various
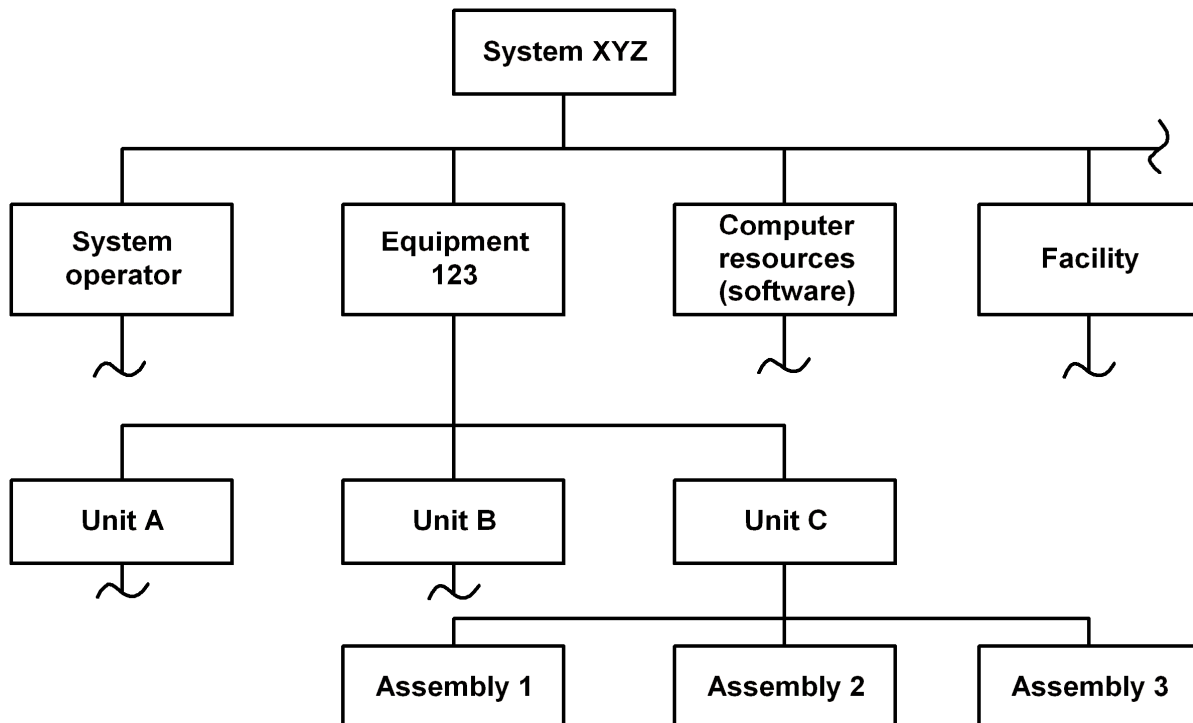

Figure 1. The functional breakdown of the system into components

combinations of resources are identified and evaluated, and the ultimate system configuration is broken down into components such as illustrated in Figure 1. Note that the breakdown of components in the figure represents only one example of such, as one needs to consider ALL of the elements that are required for the system to accomplish its intended mission objective(s) — e.g., equipment, software, people, facilities, data/information, real estate, elements of support, and so on.

The overall process is illustrated (in an abbreviated form) in Figure 2. The objective is to identify and combine similar functions into a packaging scheme where the external "interactions" between the individual packages are minimized and where the "complexities" are internal within the various packages. From a support perspective (for example), an objective is to design the system such that when a malfunction occurs, one could quickly and positively isolate the failure down to a specific package, and then be able to remove and replace the faulty package with a spare and without requiring a lot of subsequent alignments and adjustments. Additionally, when a system "upgrade" is required and a new technology is being considered for insertion, it would be nice to be able to replace the old with the new technology through the interchange of a functional package (or two) and without requiring a redesign of the entire system configuration. In other words, the objective is to design the system with an "open-architecture" approach in mind.

Through the process of functional packaging (or partitioning), trade-off studies are conducted in evaluating the different design approaches that can be considered in responding to a given functional requirement (i.e., the "how"). Referring to Figure 4 in the March 2002 *SOLEtech*, it may be feasible to accomplish a designated function through the use of hardware (equipment), software, facilities, people, information, or various combinations thereof. The proper mix is established, and the respective system elements are viewed in terms of an ultimate packaging configuration. In accomplishing such, one should address the questions — *should any of these elements be combined (integrated) and, if so, how and to what extent? In a deployment situation, where will these elements be located and for how long?* In essence, there are numerous factors that will ultimately influence the system packaging configuration which include geographical location, environment, security, safety, whether a COTS item is incorporated, availability of a support capability, cost, and so on.

Given the identification of the system elements, the next step is to *allocate* or *apportion* the requirements specified for the *system* down to the level desired to provide a meaningful *input* to the design of these elements. This involves a top-down distribution of the quantitative and qualitative criteria developed for the overall system (i.e., the technical performance measures/TPMs discussed in the February 2002 *SOLEtech*) to the subsystem, unit, assembly, module of
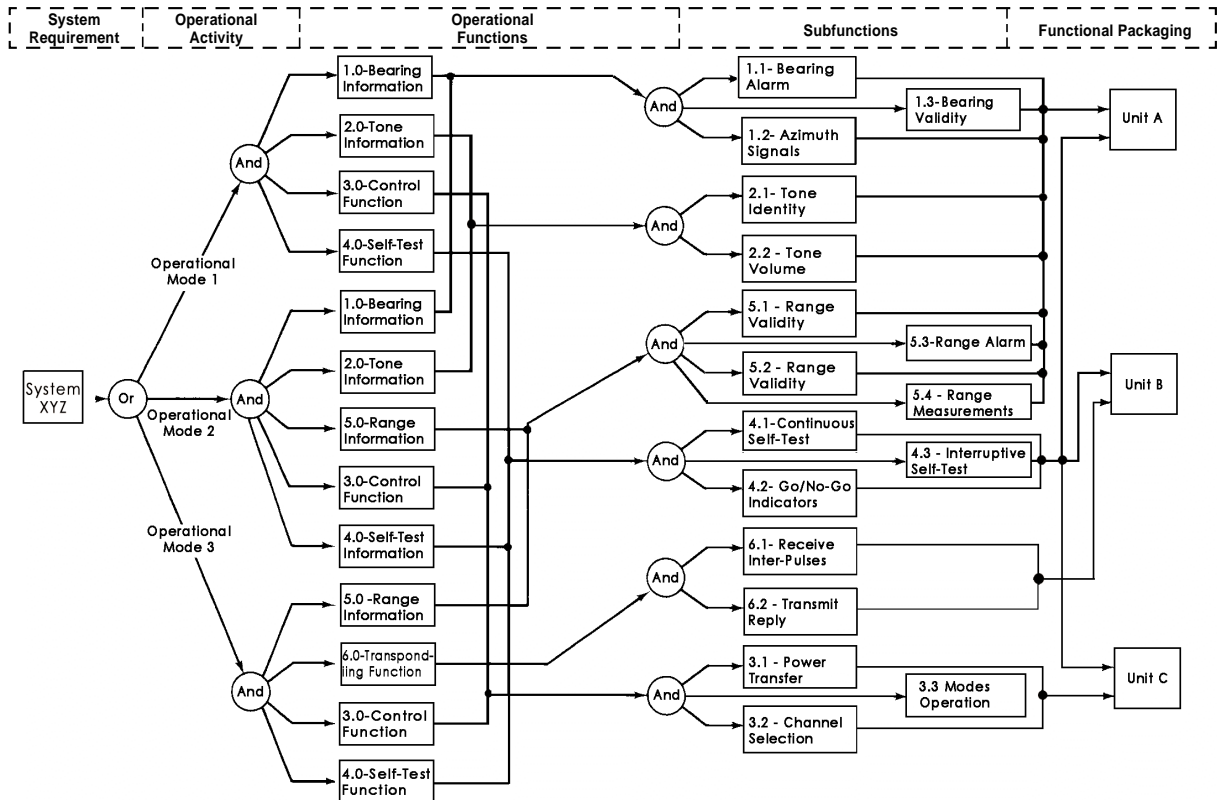

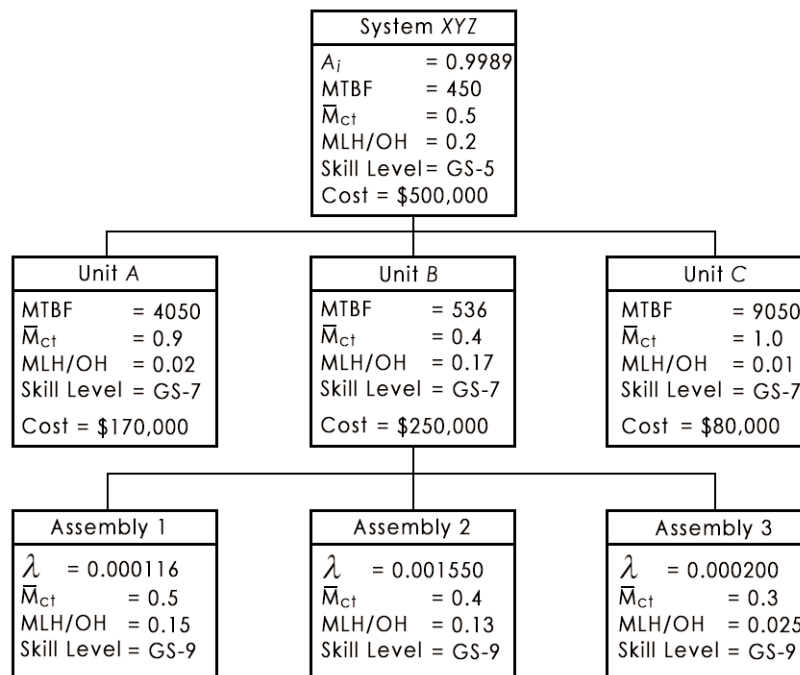**Figure 2. The functional packaging of the system into major elements**

System *XYZ*
- A_i = 0.9989
- MTBF = 450
- $\overline{M}_{ct}$ = 0.5
- MLH/OH = 0.2
- Skill Level = GS-5
- Cost = $500,000

Unit *A*
- MTBF = 4050
- $\overline{M}_{ct}$ = 0.9
- MLH/OH = 0.02
- Skill Level = GS-7
- Cost = $170,000

Unit *B*
- MTBF = 536
- $\overline{M}_{ct}$ = 0.4
- MLH/OH = 0.17
- Skill Level = GS-7
- Cost = $250,000

Unit *C*
- MTBF = 9050
- $\overline{M}_{ct}$ = 1.0
- MLH/OH = 0.01
- Skill Level = GS-7
- Cost = $80,000

Assembly 1
- λ = 0.000116
- $\overline{M}_{ct}$ = 0.5
- MLH/OH = 0.15
- Skill Level = GS-9

Assembly 2
- λ = 0.001550
- $\overline{M}_{ct}$ = 0.4
- MLH/OH = 0.13
- Skill Level = GS-9

Assembly 3
- λ = 0.000200
- $\overline{M}_{ct}$ = 0.3
- MLH/OH = 0.025
- Skill Level = GS-9

Figure 3. The allocation of requirements for System *XYZ* and its elements
Allocation of System Requirements

software, element of support, etc. For instance, and referring to Figure 1, *what requirement(s) should be specified for the design of Unit "A," Computer Resources (software), and the Facility in order to meet the overall requirements for the system?* While there may be some "trade-offs" between the various elements of the system, the combined result must be compatible with the overall requirement at the system-level.

Figure 3 shows an extension of the functional breakdown of the system into the three *units* identified in Figure 2, and the results of the allocation of some of the *design-to* requirements for Unit *A*, Unit *B*, and Unit *C*. Additionally, it was considered necessary to provide some design goals for the three assemblies within Unit *B*. While the results presented in the figure reflect primarily reliability, maintainability, personnel, and life-cycle cost requirements for the equipment only, ALL of the requirements for the system must be addressed (e.g., weight, size, performance), ALL of the elements of the system must be considered (e.g., software, people, facility), and ALL of the operational and support activities that are applicable throughout the system life cycle should be evaluated in terms of "design-to" requirements. For example, *what requirement should be specified for the transportation of an item from the supplier to an operational site (e.g., time, reliability, cost)? What requirement should be specified for the processing of an item for maintenance (e.g., turnaround time, cost)? What requirement should be specified for a maintenance test station in the intermediate-level shop (e.g., reliability, accuracy)? What requirement should be specified for an integrated*

information processing capability (e.g., access time, accuracy, reliability)? As all of these various factors are closely interrelated, one must address all of the system elements and activities reflected by both the *forward* and *backward (reverse) flows* shown in Figure 4 in the November ***SOLEtech***.

Traceability Of Requirements

Having defined the basic requirements for the applicable elements of the system, one must determine the various possible sources of supply for each. *Can a given requirement be satisfied through the selection of an existing commercial off-the-shelf (COTS) item; or can a requirement be satisfied through the selection and modification of item that is currently in the inventory and available through multiple suppliers; or can the requirement only be satisfied through a new design and development effort?* Further, there are questions pertaining to whether such activities can be accomplished within a contractor's or manufacturer's facility, or whether the effort should be "outsourced" to one or more external suppliers? In any event, and depending on the selected course of action, the specific quantitative and qualitative design requirements for the item in question must be appropriately stated in a *specification* that states the technical requirements and is contractually applied in the procurement and acquisition of such.

Figure 4 shows a partial breakdown of requirements in the form of a *specification tree*. Referring to the figure, all *system-level* requirements must be included in the Type *A* Specification, all elements requiring new design and development must be

included in a Type *B* Specification, all commercial off-the-shelf (COTS) items must be covered by a Type *C* Specification, and so on. The specific requirements that must be included in each specification (as applicable) stem from the results of the allocation/ apportionment process described earlier which, in turn, are supported by the results of an earlier QFD analysis (refer to Figure 4, "Family of Houses — Traceability of Requirements," February 2002 ***SOLEtech***). The key objective here is to ensure that there is a *traceability* of requirements from the top-down and from the bottom-up! The system-level requirements must lead into the requirements at the subsystem level which, in turn, lead into the requirements at the unit level, and so on. Conversely, the requirements at the component and assembly levels must, when combined, support the requirements at the next higher level and ultimately at the system-level. While all of this may appear to be rather "basic," it is not unusual to find a poorly prepared "system" specification (Type *A*), supported by a group of lower-level "detailed" specifications with each being prepared by a separate organizational entity and on an independent basis — *resulting in a group of specifications that are not well-integrated,* *conflicting in some areas, and not completely supportive of the requirements for the system overall!* Again, the message is that a *top-down/bottom-up "traceability" of requirements must be maintained throughout!*

Summary

Thus far (through this series of articles), I have addressed: (1) *Systems, Systems Engineering, Logistics, And Product Support*, October 2001; (2) *Logistics In The Context Of The System Life Cycle*, November 2001; (3) *Logistics: A Major Consideration In The Systems Engineering Process*, December 2001; (4) *Logistics Requirements: Established From The Beginning*, January 2002; *Developing System Requirements*, February 2002; (5) *Functional Analysis: Developing A "Functional" Description Of The System*, March 2002; and (6) this issue which covers *Functional Packaging, Partitioning, And Requirements Allocation*. It is hoped that, if you have been reviewing these articles on a month-to-month basis, you have acquired a good feeling as to the importance of addressing logistics requirements from the beginning. It is also hoped that you have pursued some of these areas further by reviewing
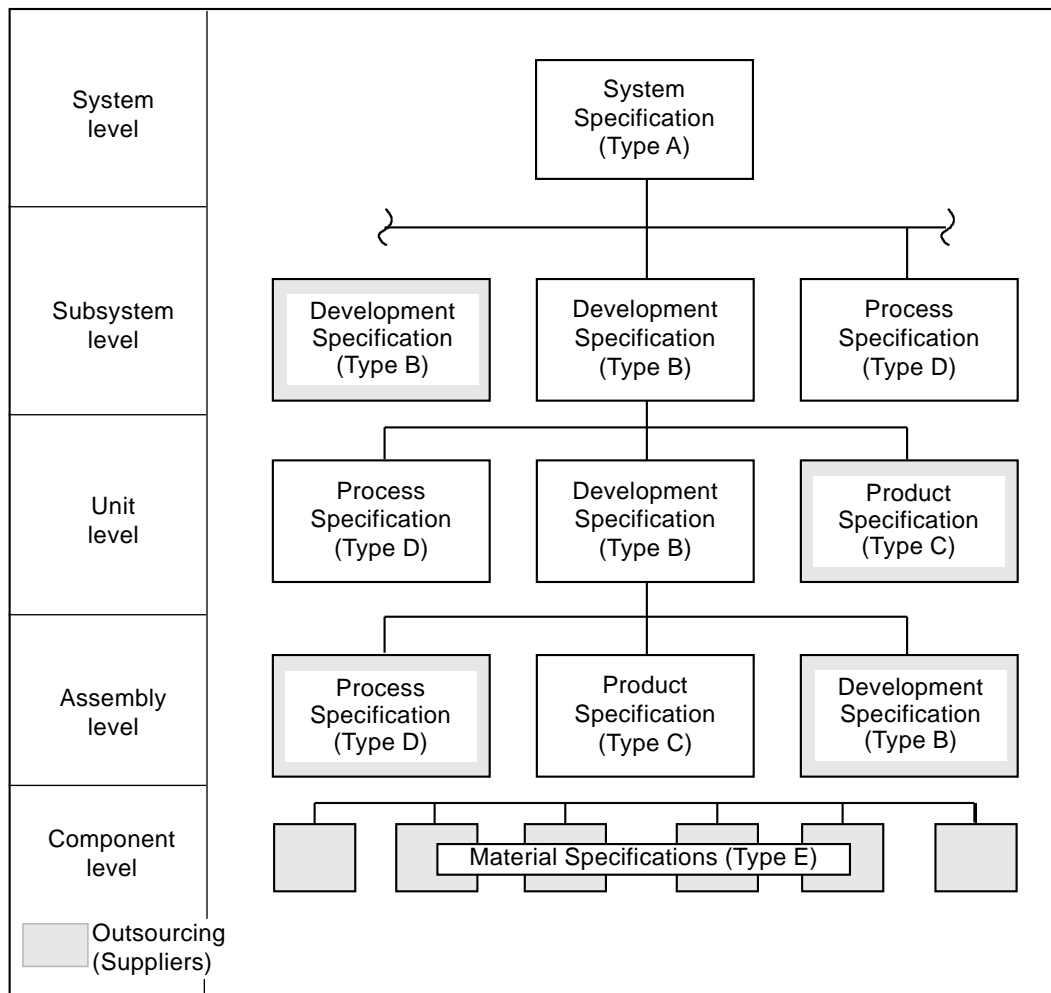
Figure 4. A "specification tree" showing supplier requirements (example)

some of the referenced literature. In any event, I have attempted to provide an incentive for some of you who are practicing logisticians to become involved from the beginning! Further, this can best be facilitated through an understanding of the system engineering process. From this point and on, I am planning to address a number of different topics that all fit within the context of the material that has been presented through the past six months.

Elsewhere …

Systems Engineering, The Journal of the International Council on Systems Engineering (INCOSE)
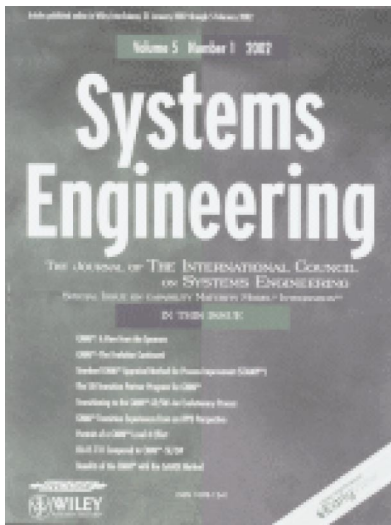
The February 2002 Journal (Vol. 5, No. 1) constitutes a special issue on *Capability Maturity Model Integration.* Referring to the March 2002 **SOLEtech**, the January and February issues of *CrossTalk-The Journal of Defense Software Engineering* included a number of interesting articles dealing with both the history and current status of such models as the *CMM, SE-CMM,* and the *CMMI.* In view of the recent release of Version 1.1 of the *CMMI,* the interest continues through the development of this publication. Included are the following articles that may be of interest: *Special Issue On Capability Maturity Model Integration* by Joan Weszka; *Capability Maturity Model Integration (CMMI): A View From The Sponsors* by Robert C.Rassa, Vitalij Garber, and Delores Etter; *CMMI-The Evolution Continues!* by Pamela Curtis, David M. Phillips, and Joan Weszka; *Standard CMMI Appraisal Method For Process Improvement (SCAMPI): Improvements And Integration* by James Armstrong, Richard Barbour, Richard Hefner, and David H. Kitson; *The SEI Transition Partner Program For CMMI* by Judy A. Vernick, Purvis M. Jackson, and William R. Thomas; *Transitioning To The CMMI-SE/SW - An Evolutionary Process* by Winifred Menezes; *CMMI Transition Experiences From An Integrated Product And Process Development (IPPD) Perspective* by Warren A. Schwomeyer, Deborah J. Barner, Valerie Gundrum, Wilmon McCray, and John R. Vogel; *A Portrait Of A CMMI Level 4 Effort* by Craig Hollenbach and Doug Smith; *EIA IS 731 Compared To CMMI-SE/SW* by Ilene Minnich; and *Realizing The Benefits Of The CMMI With The CeBASE Method* by Barry Boehm, Daniel Port, and Victor Basili. This Journal is published quarterly by John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012 (the printed ISSN is 1098-1241 and the online ISSN is 1520-6858).

3rd Annual Life-Cycle Costing in Defence Conference

This annual conference, jointly sponsored with SOLE participation, is scheduled to be held at The Hatton, London, United Kingdom, June 17-18. Included in the program will be technical presentations on *logistics in defence, emerging issues in defence equipment life-cycle costs, serial number tracking, life-cycle caosting, cost in cost-effectiveness, whole life costing, challenges of life-cycle costing, an event-based approach to whole life costing, influencing/assisting design for cost and operational effectiveness, the concept of "supply" in the product life cycle, reliability and maintainability,* and *life-cycle cost modeling of electronic technical publication systems and catalogues.* Special presentations will be given by Brig. (Ret.) Frank Steer (member of the SOLE Board of Advisors) who will address "Commercialization: Being Commercial In Defence Acquisition;" and Dr. J. Mirce Knezevic (Director, MIRCE Akademy) who will speak on "Reliability And Maintainability." For online registration, visit web site **www.smi-online.co.uk/lcc2.asp** or contact Teri Arri at tel: +44(0)20 7827 6162 or e-mail **tarri@smi-online.co.uk**.

A Leadership Workshop: *The Fusion of RMS And Logistics for Commercial/Defense Applications*

This workshop, sponsored the American Institute of Aeronautics and Astronautics (AIAA), is scheduled to be conducted at the Inn and Conference Center, University of Maryland at College Park, MD, May 30th. The objective is to bring together prominent players in both the commercial and defense sectors to address shared concerns, new initiatives, opportunities, and challenges related to the fusion of reliability, maintainability, supportability, and logistics. The workshop will be led by Dr. Russell Vacante (Chairman, RMS Partnership and member of SOLE's Board Of Advisors), and will include a Keynote Address by Louis Kratz, Assistant Deputy Under Secretary of Defense (Logistics Plans and Programs). For additional information, please contact AIAA, Dept. 4260, P.O. Box 85080, Richmond, VA 23285-4260 (tel: 800-639-2422 or 703-264-7500); or visit their web site at **www.aiaa.org**.

Book Review

Advanced Supply Chain Management: How to Build a Sustained Competitive Advantage

by Charles C. Poirier, Berret-Kohler Publishers, Inc., 1999 (ISBN: 1-57675-052-3)

Dr. Lloyd H. Muller, CPL, SOLE Director Of Education

This is another book review in a continuing series of works on commercial logistics management. Previous reviews have addressed the establishment of an e-commerce business and of concepts that senior leadership needs to understand about supply chain management. *Advanced Supply Chain Management* is essentially a leadership text on building an effective supply chain network for a major firm. Mr. Poirier breaks this process into four levels that lead firms through a reorganization from mid-management levels in logistics to an integration of customer-driven inter-enterprises. Each step of the way is explained in clear detail with plenty of examples to illustrate various points.

What makes this book so interesting is Mr. Poirier's analysis of what usually impedes the development of a good supply chain network. Chapters three and five are devoted to this issue and are replete with examples of failed leadership. Generally, failed leaders can't get their people to commit to a vision that extends beyond individual parochial interests. "It's not invented here" is a typical refrain. A lack of trust permeates the attitudes of subordinate directors and, without trust, no integration that involves sharing closely held secrets is possible. Mr. Poirier makes this latter point very clear when he wrote - "lack of trust causes potential supply chain allies to withhold expertise and initial cooperation."

To create this trust, he recommends that first steps center around a pilot study conducted by committed people. Their experience and successes will tend to attract the "Doubting Thomases." Still, he counsels, progress will not be easy. He cites one case where a retailer "balked," contending that the purpose was to improve its own profits, not those of suppliers and distributors. The effort was "hopeless."

For those leaders who persevere, the rewards of success are very sweet. Even in the earliest stages, cycle times can drop, inventories can be slashed, and errors reduced. In fact, Mr. Poirier says that getting past these impressive improvements to think in ever larger terms is often an obstacle for moving into Stages III and IV. But, again, as leaders progress through these stages, even more efficiencies can occur ultimately resulting in excellent customer support that leads to "higher shareholder value."

Customer support receives a lot of attention in the later chapters of this book. I would suggest that it become a starting point for any manager wanting to embark on this journey. Today's consumer has become very knowledgeable about what can be provided in the way of gratifying demands now. For example, during my childhood, mail order houses used to deliver goods in six to eight weeks. Now, next day delivery is a typical standard. Therefore, any entrepreneur needs to keeps these new standards of consumer support in the forefront if he or she intends to survive. Supply chain management provides a pathway.

Advanced Supply Chain Management did not deal largely with an issue that can be important to second tier suppliers. These are the firms who are intermediate providers of goods and services that are melded into bigger operations. Providers of electrical parts for Ford or specialty cosmetics for Wal-Mart are typical of these smaller firms. This omission is unfortunate because they comprise a critically important part of this emerging management philosophy.

Mr. Poirier correctly wrote, ".... the new supply chain game is becoming competitive between supply networks rather than individual corporations ...." So, the smaller firms that operate lower in the "feeding chain" often find themselves faced with a difficult decision. Which supply chain should they join?

The big firms such a ConAgra, Du Pont, Montsanto, K-Mart, etc., will offer smaller firms the opportunity to join in on the benefits of their chain. This invitation will also demand that expensive improvements be implemented that will lead to ever increasing efficiencies. These expenses can be so high that they cannot be repeated in order to join two or more supply chains. Thus, these business alliances can be looked upon as monogamous marriages. Be careful!

Mr. Poirier is fully aware of this problem. In an interview with him, he described at length how the giants can virtually dictate how a supplier's business will be operated. Further, he has since written a sequel to this book (*E-Supply Chain*) that describes some of the pitfalls that supply chain management can create. But, even in *Advanced Supply Chain Management*, he describes how "some firms reach a point where they become arrogant in their progress ...."

So, to these smaller "feeder" firms, a final word of caution. Be careful when selecting a partner because the chains will become very strong and they should not choke. Mr. Curt Scott, a Professor at the University of Puget Sound and President of Applied Business Intelligence, strongly recommends that a duly diligent competitive intelligence analysis be performed before making any irrevocable decisions. Questions dealing with such as long-term growth, reliability of the senior partner, freedom to contribute to the partnership, etc., should be well examined for clear answers. Efforts less than that can ruin a growing firm.

In conclusion, *Advanced Supply Chain Management* is an excellent book on leading a large, primary firm into the new competitive practices now exemplifying current, global business. Leaders of smaller firms would be well advised to continue reading beyond this book as they have additional decisions to make before embarking in these new directions.

Calendar of Events

1. *25th Annual Warehousing Education and Research Council (WERC) Conference*, Hyatt Regency Hotel, Chicago, ILL, April 28-May 1. For further information, contact WERC, 1100 Jorie Blvd., Suite 170, Oak Brook, ILL 60523-4413 (tel: 630-990-0001; fax: 630-990-0256; e-mail: **werc@werc.org**).

2. *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 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 additional information, visit the web site **www.stc-online.org** and/or call 800-538-2663.

3. *Institute of Industrial Engineers (IIE) Annual Conference 2002*, sponsored by the IIE, Hilton Hotel, Walt Disney World Resort, Orlando, FL, May 19-20. For additional information, contact **cs@iienet.org** and/or visit web site **www.iienet.org**.

4. *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 (e-mail: **info@supply-chain.org**).

5. *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 the 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**.

6. *EUROMAINTENANCE 2002: 16th International Maintenance Congress*, sponsored by the European Federation of National Maintenance Societies (EFNMS) and hosted by the Finish Maintenance Society, Helsinki, Finland, June 3-5. For additional information, contact Hannu Vallanen (tel: +358-9276-7688; fax: +358-9290-0081; e-mail: **hannu. vallanen@ kunnossapito.fi**). Also, visit **http:// www. kunnossapito.fi/ Congress/call-pap. htm**.

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

8. *3rd Annual Life-Cycle Costing in Defence Conference*, co-sponsored with SOLE participation, The Hatton, London, United Kingdom, June 17-18. For additional information, refer to the material presented earlier in this newsletter and contact Teri Arri at tel: +44(0) 20 7827 6162 or e-mail: **tarri@smi-online.co.uk**. For online registration, visit web site **www.smi-online. co.uk/lcc2.asp**.

9. *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**.

10. *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**.

11. *2002 International Military And Aerospace/Avionics COTS Conference, Exhibition, and Seminar*, Mission Valley Marriott, San Diego, CA, August 7-9. For further information, contact Edward B. Hakim (tel: 732-449-4729; fax: 775-855-0847; e-mail: **ebhakim@bellatlantic.net**.

12. *37th Annual International Logistics Conference and Exposition (SOLE-2002)*, sponsored by the International Society Of Logistics (SOLE), 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)** and/or SOLE Headquarters (**solehq@erols.com**). Also, visit the SOLE web site **http:// www.sole.org**.

13. *15th International Congress and Exhibitions on Condition Monitoring And Diagnostic Engineering Management (COMADEM)*, University of 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**.

Calendar of Events *(Concluded)*

14. *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. Eskey, 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/conf2001/confinfo. asp**.

15. *18th International Logistics Congress And Exhibition (ILC-2002)*, sponsored by SOLEurope and hosted by the Munich Chapter, Gasteig Arts Center, Munich, Germany, October 6-9. The Conference theme is "Outsourcing Life-Cycle Support: Sharing The Opportunities, Sharing The Risks." Topics will include: *the challenge of changes to support policies for "global players;" long-term warranty and contractual obligations; legal and economic aspects; economic risks, analysis, and risk management; scientific and engineering methods; design to life-cycle cost and support opportunities; geographical distribution of facilities and stores; distributed stock management; optimized transportation; personnel and training; management organization; supply chain management; software support of business processes; network organization; electronic market places and portals, application of standards (e.g., AECMA);* and *future trends*. Refer to the article on the Congress included in the February ***SOLEtech***. For additional information, visit web site **www.sole-muc.de** and/or visit the SOLE web site **www.sole.org**.

[Editorial note: This will be the **18th ILC**. It might be interesting to note the year and location (host) for the first 17th ILCs: 1983 - Paris, France; 1985 - Vaxjo, Sweden; 1987 - Florence, Italy; 1988 - Luxembourg; 1989 - London, England; 1990 - Montreal, Canada; 1991 - Paris, France; 1992 - Madrid, Spain; 1993 - Planned But Not Conducted; 1994 - Exeter, United Kingdom; 1995 - Stockholm, Sweden; 1996 - Athens, Greece; 1997 - Jerusalem, Israel; 1998 - Sun City, South Africa; 1999 - Exeter, England; 2000 - Paris, France; and 2001 - Thessaloniki, Greece. Although not officially classified as an ILC, there were SOLE-sponsored Congresses held in London, England (1978) and Rome, Italy (1979) — BSB].

16. *28th International Symposium For Testing And Failure Analysis (ISTFA-2002)*, Phoenix, AZ, November 3-7. For further information, contact Donald D. Dylis at **DDylis@ IITRI.org** or contact **ISTFA@asminternational. org**.

17. *15th International Conference - Software And Systems Engineering And Their Applications (ICSSEA-2002)*, Paris, France, December 3-5. The theme is "Development And Globalization." For further information, contact Jean Claude Rault (**rault @cnam.fr**) and/or visit the conference web site **www. cnam.fr/CMSL**.

18. *2002 Winter Simulation Conference*, Hyatt Regency San Diego, San Diego, CA, December 8-11. The theme is "Exploring New Frontiers." For additional information, contact John M. Charnes (**jmc@ku.edu**) and/or visit web site **www.wintersim.org**.

19. *The International Symposium On Product Quality And Integrity (RAMS-2003)*, sponsored by 10 technical societies (to include SOLE), Tampa Waterside Marriott Hotel, Tampa, FL, January 27-30, 2003. For further information, visit the SOLE web site **www.sole.org**.

SOLE, SOLEurope and Munich Chapter

present the

18th International Logistics Congress and Exhibition

Call for Papers and Invitation of Exhibitors

October 6–9, 2002
Gasteig Arts Center, Munich, Germany

www.sole-muc.de • www.soleurope.org • www.sole.org

Conference Secretariat
INTERPLAN

Congress, Meeting & Event Management
sole@l-plan.de
Tel. +49 (0) 89 54 82 34 32 • Fax. +49 (0) 89 54 82 34 43

OUTSOURCING LIFE CYCLE SUPPORT
Sharing the Risks, Sharing the Opportunities

TOPICS INCLUDE

Evolution of Support Policies and Strategies

- The Challenge of Changes to Support Policies for "Global Players"
- Long Term Warranty and Contractual Obligations
- Legal and Economic Aspects
- Economic Risks, Analysis and Risk Management
- Scientific and Engineering Methods
- Design to Life Cycle Cost and Support Opportunities
- Geographical Distribution of Facilities and Stores
- Distributed Stock Management
- Optimised Transportation
- Personnel and Training
- Management Organisation
- Supply Chain Management

Enabling Technologies

- Software Support of Business Processes
- Network Organisation
- Electronic Market-places, Portals
- Application of Standards (e.g. AECMA)
- Future Trends

SPEAKERS AND EXHIBITORS

Authors wishing to present their work at the conference are requested to submit an abstract in the English Language to the Conference Secretariat, no later than

May 31st, 2002

The abstract should not exceed 500 words and may include lecture topics, issues addressed, work carried out and results achieved or expected. Please include a short CV in paragraph format and the full mail and e-mail address for further contacts. Abstracts will be reviewed by the programme committee. Upon acceptance, authors will be asked to prepare and submit the full paper which will be required in Winword 97/2000 or MS-Powerpoint format, no later than **May 31st, 2002**. The submission of materials must be in electronic format, and use of e-mail will be the principal means of communication.

Exhibitors wishing to present their products or services are invited to make the reservations for their booth with the Conference Secretariat, no later than

June 28th, 2002

There are two standard sizes offered:
   a) 6 square meters
   b) 10 square meters
Individual requirements will be negotiated.

Numerous Advertising Opportunities with SOLE are Now Available!

SOLE has established a central point of contact for all SOLE advertising, including advertising in the *SOLEtech* newsletter and the *Logistics Spectrum*.

For additional details and pricing information, please contact:
SOLE HQ: (301) 459-8446   Fax: (301) 459-1522   Email: solehq@erols.com