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## ***Staying Competitive: Links to Manufacturing Technology Networks***

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# Staying Competitive: Links to Manufacturing Technology Networks

By Dr. H. Fred Walker, CQE, CSIT, Dr. Teresa J.K. Hall, CMfgE & Dr. Loren Faeth, CQE, CMfgT, GICJ

Information can be a powerful competitive tool when it is timely, relative, and is used effectively. Access to information and expertise is particularly important to practicing Industrial Technologists with a need to stay abreast of leading edge technological innovation and/or expertise that may not be readily available within the immediate organization. However, the variety of knowledge sources for manufacturing professionals and academics is as diverse as the quality of that information. Sifting through the literature, both printed and electronic, is oftentimes inefficient and usually frustrating for time-pressed individuals.

With these issues in mind, we have identified three primary sources of information designed to assist manufacturing professionals requiring fundamental or in-depth information. Each source has unique strengths and capabilities, depending on your needs. The purpose of this article will be to characterize these manufacturing-related information resources and illustrate effective uses for this practical knowledge.

## Source 1: Web-based Information Networks

There are a number of web-based information networks available to manufacturing professionals such as search engines, bulletin boards/news groups, and collaborative software. Unfortunately, these sources are not unlike a complex maze of interrelated facts, ideas, and data that take on the qualities of a bottomless pit of links and hits in your quest for specific information. The following gateways should prove fruitful for individuals seeking fundamental or unique information related to manufacturing.

## Search Engines

Search engines come in many forms, with some of the more popular being the global Internet search engines Altavista ([altavista.digital.com](http://altavista.digital.com)), Excite ([www.excite.com](http://www.excite.com)), Lycos ([www.lycos.com](http://www.lycos.com)), and Yahoo ([www.yahoo.com](http://www.yahoo.com)). The most important key to successful use of these, and related, search engines is learning how to use the logical operators, **and**, **or**, **not and**, and **not or** to refine searches. Unfortunately, each engine has its own syntax form for logic that requires users to familiarize themselves with program-specific language conventions. For instance, using Altavista, literal phrases must be surrounded by quotes, and words or phrases to be included are preceded by a "+" while words to be excluded are preceded by a "-" sign.

A useful search tool is *Search4it*, a web site that offers a variety of general and specific search engines at one location (<http://home.earthlink.net/~stellarprod/search4it/noframes.html>). For instance, global netsearch links such as *Altavista* and *Webcrawler* are also found at the *Search4it* site. Additionally, the AT&T 800 phone directory, a business directory, email address search engines, a peoplefinder directory search, and a software search engine are paths for locating specific manufacturing companies or professionals in the field.

Major university home pages also offer access to an array of global search engines for general or specific subject areas. Similarly, some web sites offer modified national search engines to search only their site. One such example is <http://habenero.cnde.iastate.edu/Excite/> AT-

[CNDEquery.html](#) that uses the Excite search engine to scan a host site at the Center for Nondestructive Evaluation at Iowa State University. Numerous other search engines for specific topics, such as manufacturing related topics, are also available at this site.

### **Bulletin Boards/News Groups**

Bulletin boards are one of the oldest forms of internet-based information exchange, originating in the text-only world of early computing. Bulletin boards and news groups allow users to post messages or queries, and check back for responses from other users. Usenet news groups originated to automatically send postings from a bulletin board to a subscriber. The lines between bulletin boards and news groups have been blurred, however, by the advent of Internet browsers and search engines that allow non-subscribers to access information from a news group. One of the best Bulletin boards or news groups currently in the manufacturing arena is the *Agility Forum* (<http://www.agilityforum.org.Board/subject.html>). The Agility Forum site features worldwide discussion of topics related to agile manufacturing — a comprehensive, or organization-wide, approach to manufacturing technology, management, and deployment of resources. If you are interested in establishing a bulletin board for a unique topic, several software packages are available including Shareware.com ([www.shareware.com](http://www.shareware.com)) and First Class Bulletin Board Server ([www.softarc.com](http://www.softarc.com)).

### **Collaborative Software**

Just as the distinctions between news groups and bulletin boards have blurred, the differences between these and other forms of collaborative software are also less discrete. Live audio-video collaboration has been available for years with *CUSeeMe*, and other MacIntosh-based software. PC users now have versions of *CUSeeMe* as well as many other choices for audio-visual collaboration. Most audio-visual capable software programs provide for some form of “whiteboard” for text and graphics to also be displayed as part of an interactive discussion.

Another example of collaborative software is *Speakfreely*, a live audio software product. This software package permits use of voice communications between two or more users with appropriate hardware setups. Other audio packages are available from Intel, Microsoft, Apple, and many other companies. For manufacturing individuals in the academic arena, *SoftArc* markets a software package geared to student collaboration and publication on the Internet or Intranet. Called *First Class Collaborative Classroom*, it is an example of a new type of collaborative product.

For educators and professionals with limited budgets, it is not necessary to purchase commercial software to have a collaborative Internet experience. A group can meet on an Interactive Relay Channel (IRC) moderated by the instructor or group leader. The IRC solution can be very effective for academics and professionals interested in distance learning. The IRC program provides a venue where anyone can set up a channel to exchange messages in real time with multiple collaborators from the same building or around the world. Although the operator establishing a channel can control who is on the channel, it should be noted that the IRC is not considered secure. Nevertheless, it is possible to send private messages that are relatively secure to others on the same channel.

*Parachat* ([www.parachat.com](http://www.parachat.com)) makes available chat room programs that can be installed on a web site in a private or public mode. This Paralogic Software Corporation program allows users to join in a real time discussion in a text or html mode and is also an effective tool for collaboration. *Parachat* is extremely useful for discussions, work distribution, and progress reports.

Another very effective approach to collaboration is email for sending text documents to fellow collaborators. Most email systems are now capable of handling attached files so that a document in progress can be sent to collaborators for additions, editing, and proofreading. At present, there are some problems exchanging files between word processing programs,

but the notepad feature on most personal systems can enable file exchange and access.

## **Source 2: Professional Societies**

One of the best sources of information specifically tailored to technical areas of interest is through professional societies. The Society of Manufacturing Engineers, American Society for Quality, and the American Production and Inventory Control Society are three organizations that have a strong web presence. These institutions typically focus their publications, research support, training sessions, and conferences in discrete areas of manufacturing technology. An overview of these professional societies follows:

### **Society of Manufacturing Engineers (SME)**

SME is an international organization based in Dearborn, Michigan that seeks to promote and enhance the profession through information sharing networks, products and services for manufacturing practitioners, and educational programs. SME has built an impressive web site ([www.sme.org](http://www.sme.org)) that serves as a gateway to information for conferences, print and electronic media, professional certification, specialty associations in manufacturing, research support, and an extensive library on a variety of manufacturing topics.

The society is especially involved in training and education for manufacturing professionals through seminars, workshops, and on-site training programs. Specialty seminars and workshops are offered by SME at a variety of locations across the nation. These educational events are one to five days in length and are taught by educators, professionals in the field, or consultants to industry. SME also coordinates training sessions in conjunction with manufacturing expositions such as AUTOFACT, FABTECH, and the International Machine Tool Show (IMTS) to enable persons to update skills while attending trade show activities. Information on these events, upcoming educational activities, and newly published technical reports can be found at the SME web site.

Publications from SME include *Forming & Fabricating*, *Manufacturing Engineering*, *Integrated Manufacturing Solutions*, and *Molding Systems*.

Selected articles from these magazines have been archived and are available online for members. Technical papers in specific manufacturing disciplines can be purchased from the society from its website. Its scholarly journal, *Journal of Manufacturing Systems* is available via subscription only.

Also located on the SME home page is a link to the Global Manufacturing Network (GMN). This web site was developed to support manufacturing professionals through dissemination of information on technology applications, vendors of products, videos, magazines, books, and a posting for job openings in manufacturing. Abstracts of technical papers are available to the public at this site, and complete text is available to SME and GMN members.

Recently, SME has added a new site to entice a younger audience to consider careers in manufacturing on their new 'Manufacturing is Cool' site ([www.manufacturingiscool.org](http://www.manufacturingiscool.org)). This site identifies post-secondary institutions with programs in manufacturing-related areas, projects, educator resources, and plant tour video.

In general, SME is one of the best sources for information on current or emerging manufacturing trends. Using either electronic or print media, anyone interested in this discipline will find a wealth of relevant information from this society.

### **American Society for Quality (ASQ)**

ASQ is a national organization based in Milwaukee, Wisconsin seeking to promote and diffuse knowledge of quality related principles and practices. Much like SME, ASQ is a large and comprehensive organization offering support to professionals in a variety of forms and media such as; information sharing networks, links to products and services for professionals in the field of quality, educational resources, a wide variety of reference materials, training events, and conferences/exhibitions. To support its

membership, ASQ has an extensive web site ([www.asq.org](http://www.asq.org)).

Additionally, ASQ offers a variety of professional certifications that are administered at the local level by members/representatives from various chapters. ASQ's certifications are supported via optional training courses available throughout the nation. Each certification examination is offered twice per year, and may be further investigated by contacting ASQ directly via their web site.

Publications from ASQ include the magazines *Quality Progress* and *Software Quality Professional*. Journals from the society include *Quality Management Journal*, *Journal of Quality Technology*, *Quality Engineering*, and *Technometrics*. These are available on a subscription basis.

### **American Production and Inventory Control Society (APICS)**

For manufacturing professionals and academics, the relationship between resource management and meeting strategic objectives is central to remaining competitive. APICS serves the business community through publications, seminars, professional certification, and conferences devoted to improving understanding supply chain issues. Their web site ([www.apics.org](http://www.apics.org)) provides links to a comprehensive list of related topics.

Of particular interest to manufacturing professionals is the link to their publications pages. Their trade journal, *APICS – The Performance Advantage*, is available online and covers current topics and supports links to archived issues. Buyer's guide, dictionary, and bibliography pages are accessible without membership. Their quarterly scholarly journal, *Production and Inventory Management Journal* can be purchased via the web.

APICS has eight Specific Industry Groups (SIGs) for persons interested the following areas: Complex Industries, Constraints Management, Process Industries, Remanufacturing, Repetitive Manufacturing, Small Manufacturing, Service, and Textile and Apparel. These SIGs have annual symposiums and workshops held at a variety of locations in North America.

### ***Source 3: Government Agencies and Universities***

Many branches of the U. S. Government support research, education, and information dissemination on the Internet — particularly as each of these relates to manufacturing. The Department of Commerce, Department of Energy, Department of Defense, Department of Agriculture, Department of Labor, and other governmental agencies have established web sites to showcase information, research initiatives, and services available to industry.

Research and outreach efforts from the academic sector can be accessed from the web. Depending upon the search parameters and the area of interest, Universities, community colleges, and campus-based research centers can be located easily. Samplings of sites specifically relevant to manufacturing technology are as follows:

#### **National Institute of Standards and Technology**

Oak Ridge Centers for Manufacturing Technology (ORCMT) is a network of research facilities that includes Oak Ridge, Sandia, Los Alamos, and Lawrence Livermore National Laboratories, in conjunction with the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership. ORCMT offers assistance in solving manufacturing problems in materials technology, machining, metrology, quality, and environmental issues and can be accessed on the web ([www.onml.gov/](http://www.onml.gov/)). Their network of scientists, engineers, and technicians can be accessed for prototype development, applied research, and training for any professional involved with manufacturing.

A second example of government assistance by the Department of Commerce and the NIST is the Manufacturing Extension Partnership (MEP). Competitive grants established this network of 70 centers in all 50 states and Puerto Rico nearly five years ago. These centers are charged with providing information and support to all sizes of manufacturing organizations through training, partnerships with education,

and management advising. The gateway to MEP via their web site at [www.mep.nist.gov](http://www.mep.nist.gov).

### **National Science Foundation**

The National Science Foundation (NSF) supports research and education through funding in its Division of Design, Manufacture, and Industrial Innovation (DMII) program. Linking industry, government, and education, outcomes of funded research are disseminated via the web from their main site at [www.nsf.gov](http://www.nsf.gov). Publications, grant programs, and related information are easily accessed from their homepage.

The Scientific and Advanced Technology Act of 1992 launched the Advanced Technological Education (ATE) program that is managed by the NSF. Consequently, 11 regional centers promoting and supplying technological education were funded. The National Center of Excellence for Advanced Manufacturing Education ([www.aimcenter.org/](http://www.aimcenter.org/)) at Sinclair Community College, Dayton, Ohio supports professional and educational services on a national scale.

### **University Web Pages**

Research and outreach activities performed by universities and colleges are an excellent source of information for industrial technologists and manufacturing professionals. There are several excellent websites devoted to current manufacturing issues that are worth a visit. The University of Michigan College of Engineering has built an impressive collection of hotlinks that are categorized by subject; general, education institutions, and commercial, government and non-profit organizations (<http://www.engin.umich.edu/prog/pim/resources.html>).

The University of Illinois, Urbana-Champaign supports the Machine Tool Agile Manufacturing Research Institute homepage (<http://mtamri.me.uiuc.edu>). This institute serves the manufacturing discipline through research and development of technologies that have value for education and industrial applications. Links to affiliated programs and other

outreach initiatives can be found at this site.

For educators interested in web courseware, DeLuca's TechnoSchool and North Carolina State University is an interesting place to visit (<http://courses.ncsu.edu/classes/ted430/intro.htm>). This is a web-based classroom for introductory information in manufacturing. If you are considering building webpages for student interaction, DeLuca has built an excellent example to emulate. Additionally, there are links to other areas of interest for educators in the manufacturing discipline.

### **Other Sites of Interest**

Innovative research and outreach can also be found in the private sector. General Electric Corporation has built a site for dissemination of information on manufacturing research and concurrent engineering (<http://ce-toolkit.crd.ge.com>). Their Corporate Research and Development Center (CRD) has posted papers, software code, and research results from their manufacturing technology research laboratory.

The Coalition for Intelligent Manufacturing Systems (<http://www.ims.org>) is an industry based research program linking advanced manufacturing R&D on a global scale. From this site, information and hotlinks can be accessed, including the Journal of Intelligent Manufacturing and European manufacturing research dissemination efforts.

### ***Summary***

Remaining abreast of advances in manufacturing technology requires that manufacturing professionals have access to relevant information. More importantly, it is imperative that manufacturing professionals and educators are able to glean meaningful information from the vast quantity of information that exists in both print and electronic media.

NAIT faculty can use these web links to bring current issues and research in manufacturing to the classroom setting, either through in-class web searches or integrating web-based information into course materi-

als. As we are all too aware, time is our most valuable resource, thus, the ability to access on-line journals, magazines and/or websites has the potential to benefit us by conserving time. The reasons are threefold: first, search engine results are displayed in hierarchical order, enabling the researcher to peruse related issues quickly. Second, the 'library' never closes, making it possible to access journal articles and other materials without leaving home or the office, and, third, disk or hard copies are easily generated, thus eliminating time spent searching for literature on library shelves and waiting on queue at the copy machine.

Beyond time management issues, the need to stay current with the evolutionary changes in manufacturing technologies and practices require NAIT faculty to be cognizant of the relevance and accuracy of the information obtained from the web. With little or no regulation of information posted to websites, it is expedient for faculty to rely upon professional societies, governmental agencies, education institutions, and well-known businesses for source material. The sites discussed in this article have proved beneficial to the authors and have been found trustworthy for accurate and timely information.

For NAIT faculty supervising undergraduate and graduate research, these websites can provide insight into research and outreach efforts at other institutions and guide fledgling student researchers on significant issues within the manufacturing discipline. The review of literature component for a research project can be inaugurated via the web, specifically targeting higher education postings and Internet dissemination of government sponsored research (now a requisite of the National Science Foundation). Time and effort spent searching websites, such as those noted in this article, helps nascent researchers find collateral issues to their chosen topic, and can streamline the literature review process for the experienced researcher. Calls for research proposals, conference presentations, and manuscript submission guidelines are increasingly posted

on web sites, an additional benefit for NAIT faculty seeking funding or publication opportunities for their research.

Electronic information networks are necessary links that serve the

manufacturing discipline in identifying essential knowledge that can be used to enhance productivity and competitive advantage. By utilizing web-sourced information in the classroom, to guide research, and to improve discipline

specific knowledge, the web serves as a powerful tool for manufacturing professionals and educators.

