

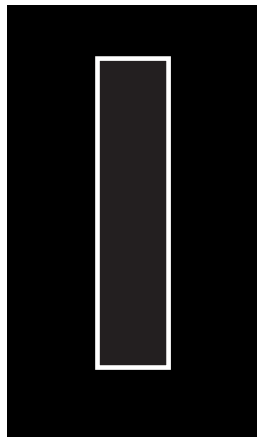


# SEMI: The Standards-Setting Organization Behind the Trade Show Association

Xavier Pucel

SEMI N.A. STANDARDS PROGRAM,  
MOUNTAIN VIEW, CALIFORNIA

Today, demands for cost-effective semiconductor manufacturing create a greater need for standards and for a forum where users and suppliers can reach consensus on precompetitive requirements for future generations of equipment and materials. As global competition intensifies, the need to integrate standardization into a company's business strategy increases. Strategic standardization, effectively managed, can open new markets, increase sales, reduce trade barriers, and enhance a company's competitiveness and profitability. Because standards profoundly affect a company's way of establishing business, their development and use must be sustained at the highest executive level.



In 1970, several equipment and materials manufacturers for the semiconductor industry founded Semiconductor Equipment and Materials International (SEMI). SEMI is an international not-for-profit association for semiconductor and flat panel display equipment and materials suppliers. SEMI's primary goal is to help members expand global marketing opportunities and improve access to customers and industry, government, and civic leaders. SEMI's mission is to help its members achieve their common corporate objectives by providing a means to collectively address semiconductor and related technology industry issues. SEMI pursues this mission by:

- organizing international and regional trade exhibitions and activities;
- supporting its international standards-setting organization;
- collecting and disseminating member-supported business, technical, and educational information;
- advocating the adoption of government policies that meet members' needs, including free and open market access;
- responding to new business opportunities identified by members and promoting these opportunities with appropriate activities.

## SEMI

The SEMI Standards Program continually evolves to meet the changing needs of the semiconductor community, as do the standards it creates. Historically, SEMI standards have sustained current manufacturing practices. In 1991, the program recognized the need for a strategic approach to standards development that would enable standards to drive future manufacturing practices. The SEMI standards program began to focus on providing a forum where users and suppliers could establish pre-competitive requirements for future generations of equipment and materials.



## The need to integrate standardization into a company's business strategy is increasing.

For instance, 300 mm was accepted by the industry in 1994 as the next wafer size, and because some fabs are expected to be in production as early as 1998, a full prototype tool set will be needed by late 1996 or early 1997. In the past two years, the industry has come to realize that in next-generation factories, standards will be a key factor in reducing the substantial costs of construction, capital procurement, installation, and improved yield. Industry-wide application of those standards will be required on a global basis to realize the potential savings afforded by standardization.

The SEMI Standards Program served as a catalyst for this industry-wide momentum. By embracing a strategic approach to standards development, the program identified industry's needs for standards related to large wafer manufacturing as early as 1989. The first standards for the 300-mm wafer were published in 1992. Although no correlation has been established, we like to believe that the SEMI standards community's efforts spurred today's industry momentum. In fact, a brand new standard has been established as a guideline for 350–400-mm silicon wafers. We will see if the industry will follow the lead!

SEMI's International Standards Program is designed to provide companies with a worldwide network geared toward strengthening their competitive positions. The program is the culmination of efforts by industry volunteers from a number of corporations in Europe, Japan, and the United States, addressing common challenges facing the semiconductor industry worldwide. The key to the program's success is ongoing cooperation and communication among regional committees. Cooperative exchanges of ideas produced hundreds of standards that improve compatibility, efficiency, and quality.

By using standards, companies lower costs and increase reliability and productivity. By participating in the Standards Program, companies benefit by having influence upon new specifications and by learning about customers, suppliers, peers, and global market trends.

Standards are developed within the structure of the SEMI International Standards Program by a voluntary consensus process. A draft document is balloted to a worldwide audience and critiques are solicited. The program is organized into three regional groups representing Japan, Europe, and North America. Regional offices in Europe and Japan provide direct member interface, while the publication and distribution of ballots is handled by SEMI headquarters in Mountain View, California. The program focuses on the user/supplier relationship, and efforts are made to

maintain a membership balance between semiconductor and display manufacturers (users) and equipment and materials communities (suppliers).

Each regional program is managed by industry volunteers serving on a Regional Standards Committee (RSC). Representatives from each RSC report to the International Standards Committee (ISC), the main governing body of the program. The program operates under a formal set of regulations and maintains an ongoing interface with other standards-setting organizations worldwide.

### The Strategic Approach

In the North American program, through the strategy-setting process, activity timelines are developed by and for each committee and compared with industry's trends and the new National Technology Roadmap for Semiconductors (NTRS). Closely coupled with this process are considerations of next-generation manufacturing needs (wafers, equipment, and processes). Similar "planning" efforts are initiated by our Japanese and European programs. The ultimate objectives are to establish a spirit of global cooperation among volunteers, improve the standards program's efforts to support industry's present and future needs, and define priorities. Current program management strategies include:

- enhancing international communications;
- ensuring alignment with industry's needs;
- improving the standards development process; and
- providing leadership training.

### INTERNATIONAL COMMUNICATIONS

Over the last four years a fundamental paradigm shift has occurred. Issues can no longer be defined only in terms of product orientation, but must be seen as an integrated whole on which any individual area of work can have a significant impact. Recognizing this interdependence raises a key concern: How do we organize to deal with it? As we have worked through these issues, it has become evident that the real key is not organization (the "boxes" we fall into), but communication; communication within this organization with our international counterparts.

Last year several organizational changes were made in the North American divisions and committees. These changes, useful in themselves, also made it apparent that clear and timely communication is critical. At times our international colleagues were confused by our changes and did not know how to



respond. To make sure we weren't creating more barriers, we suspended reorganization in February 1995 (one of our three annual sets of meetings).

We realized that we had focused on North America without considering the overall standards organization, and had made the paradigm shift internally but not externally. This is a key point, because we are truly an international organization. The boxes on an organization chart in which we put ourselves for convenience should not be seen as rigid boundaries. We must move among these boxes to have discussions with others. The organization merely provides the administrative framework; the people must do the rest.

The 300-mm wafer standardization efforts are a good example of communicating across the "boxes" to get the job done. The focus was on the output, not on the organizational structure.

First, so-called executive summit meetings attracted international attention and have facilitated international cooperation by promoting a sense of responsibility among companies. The summit meetings highlighted the fact that the success of standards and derived benefits depends on a commitment by suppliers and customers to implement and use the standards, because SEMI standards are a voluntary effort both in development and adoption. If a company spends time and money developing standards, that company should be willing and able to use those standards in tool designs, material specifications, and procurement.

International workshops were then held to explore and establish priorities and to reach early international consensus on the standardization process. They provided an important mechanism for international cooperation and information-sharing. Critical communication links were established and priorities set in various technical areas. Several task forces were chartered to address specific issues.

Standards committees and their task forces are responsible for formulating consensus-based specifications that, when voluntarily implemented, will enhance the efficiency of semiconductor manufacturing. Task forces were formed in Europe, Japan, and the U.S. to maximize resources and expertise. The different task forces worked cohesively and in a spirit of cooperation, fostered by the summit meetings and workshops. A task force developing a wafer specification will keep in close touch with the carriers task force, which in turn closely cooperates with the equipment loading port interface task force. No one does everything, but everyone knows what is being done.

We are seeing similar changes in companies. In the past, a company generally had only one product expert dealing with standards issues. Today, a number of companies have several standards persons, each with expertise in key functional areas, as opposed to product areas. These experts must communicate across their traditional "boxes." In the future, it will be very difficult for a company to have only one standards representative and still cover all key issues.

## ALIGNMENT WITH INDUSTRY NEEDS

The NTRS does not necessarily deal with all the issues that must be addressed, but it does identify most of them. The semiconductor industry faces tremendous challenges as it moves into the gigabit era, including the need for ever-increasing productivity improvements, complexity management on an unprecedented scale, and rapid technology development. And our cost-conscious society asks, "Where do we get the funding?"

The NTRS is still driven by DRAMS, but the microprocessor is becoming a driver of its own due to its unique interconnect needs. CMOS technology continues to be the dominant design, primarily because it is the only known circuit configuration that draws zero power when not switching. The roadmap has identified six cross-cutting technologies (none of which is a surprise to anyone involved in SEMI standards). They are: contamination-free manufacturing, materials, metrology, modeling, standards, and quality and reliability. The unique aspect of these cross-cutting technologies is that in most companies in the semiconductor industry there is no single owner for any of them; no one person or group has total responsibility. They impact everything; they are crucial to success, yet they don't have a specific budget allocation, and tend to be only loosely coordinated within organizations.

Here, North American standards activities are ahead of the rest of the industry, and the SEMI N.A. Standards Strategic Plan describes those activities to enable the industry as a whole to catch up. Although some gaps were noted between the NTRS and SEMI standards activities, none seemed overwhelming.

## IMPROVING THE PROCESS

The N.A. RSC embraced a top-down approach to standards development. Its primary objective is to facilitate the standards development process by providing direction and removing barriers. To that end, we provide and manage organized open forums where individuals come together to discuss and document technical standards that continuously advance the semiconductor industry.

SEMI standards management has recognized that many current standards development activities frequently cross the boundaries between committees, divisions, and international regions. While the recent internationalization of standard activities has fostered the concept of a sponsoring region with ballots in all regions, a method of handling new standards that embraces the charters of more than one committee within and across regions has only lately become of concern. In specific instances separate committees have been formed (e.g. Traceability) and others may soon follow.

To effectively manage these seemingly random events and provide a consistent means of rationally and fairly allowing multiple committee interests to be represented on any individual task, a suitable management process was required. To that end, the N.A.



RSC formed a Regional Technical Architect Group (RTA) to review all new initiatives and provide guidance on potential cross-cut implications for other divisions or regions. For their review, the RTAs use SEMI New Activity Report Form (SNARF) as the primary source of information for coordinating standards activities. The main purpose is to clearly define an activity from the start and to address the misunderstandings, concerns, and questions that often arise when only an activity name is available. The small effort required to fill out a SNARF will pay off by preventing potential miscommunications. SNARFs provide detailed information to the parent technical committee that approves the new activity and serve as a reference to other committees (identifying cross-committee and/or cross-division issues). They are also used as a management tool by task-force participants, as they establish common goals and outline what the task force/subcommittee is to accomplish. SNARFs are also used by staff for historical archiving, promotion, and recruiting purposes, and to inform members worldwide.

Another major improvement in the standards development process relates to the dissemination of the final product. It does no good to develop a standard if that standard is not known and accepted throughout the industry. SEMI is optimizing the use of the newest technologies to publish the standards its volunteer members produce. SGML (Standard Generalized Mark-up Language—an ISO standard) is currently implemented in SEMI's Electronic Document Development System. This database system delivers full SGML-encoded documents (e.g. standards) as e-mail over existing networks like the Internet. Standards can thus be made available on CD ROM or through the SEMI Web site (<http://www.semi.org>). This also allows anyone in the industry to have access to an approved standard within two months of its approval, rather than waiting up to nine months for the annual publication. Improving delivery time to market—i.e., just-in-time publishing—is essential to meet the growing demand for timely information.

#### LEADERSHIP TRAINING

People are the essence of our organization and we recognize that they embody our organizational reputation. We endeavor to provide volunteers with an environment that encourages and rewards teamwork, commitment, contributions, and leadership; challenges each individual; stimulates open communication; and provides each individual an equal opportunity to participate. The standards we produce are a reflection of the SEMI International Standards Program and its people. We are dedicated to continuously improve the quality of those standards to meet

the needs of the semiconductor industry. It is essential to strive for excellence in everything we do. To achieve and maintain a leadership position in standards, we take a proactive approach to creating an environment for strategic planning and document development. To that end, the N.A. RSC intends to provide continuing training to leaders to enable them to effectively meet their responsibilities. Education of industry professionals is also essential to facilitate industry-wide acceptance of standards.

A program handbook was developed to clarify the roles and responsibilities of standards committee members in the formulation and approval process of SEMI International Standards. This manual should provide any participant in a leadership position with the basic information necessary to effectively guide the activities of his/her division, committee, subcommittee, or task force and to help pursue the international objectives of the SEMI Standards program.

In addition to developing standards, SEMI conducts educational programs, and technical programs that assist member companies by disseminating information on technology and manufacturing issues. In particular, the Standards Technical Education Programs (STEP) provides tutorials where technical experts share their insight and expertise on advanced processing technologies. These half-day to day-long programs focus on the development and implementation of specific standards. STEPs are an important element of the standards development process as they increase standards visibility and, most importantly, facilitate the industry feedback and critiques that lead to further enhancement of the standard.

#### Conclusion

We at SEMI have been working for several years to bring focus to the industry's pervasive and cross-cutting issues. The challenge is to manage the exploding complexity of these issues. To do so, we must stop relying on one-point, piecemeal solutions and start making consistent, top-down systems solutions. We must be careful not to sub-optimize the whole as we optimize the parts. Because standards strongly influence a company's way of establishing business, their development and use must be sustained at the company's highest executive level. This approach is basic to our strategic planning process. **SV**

---

Permission to make digital/hard copy of all or part of this material without fee is granted provided that the copies are not made or distributed for profit or commercial advantage, the ACM copyright/server notice, the title of the publication, and its date appear, and notice is given that copying is by permission of ACM. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or a fee.

---

© 1996 ACM 1067-9936/96/0300-052 \$3.50