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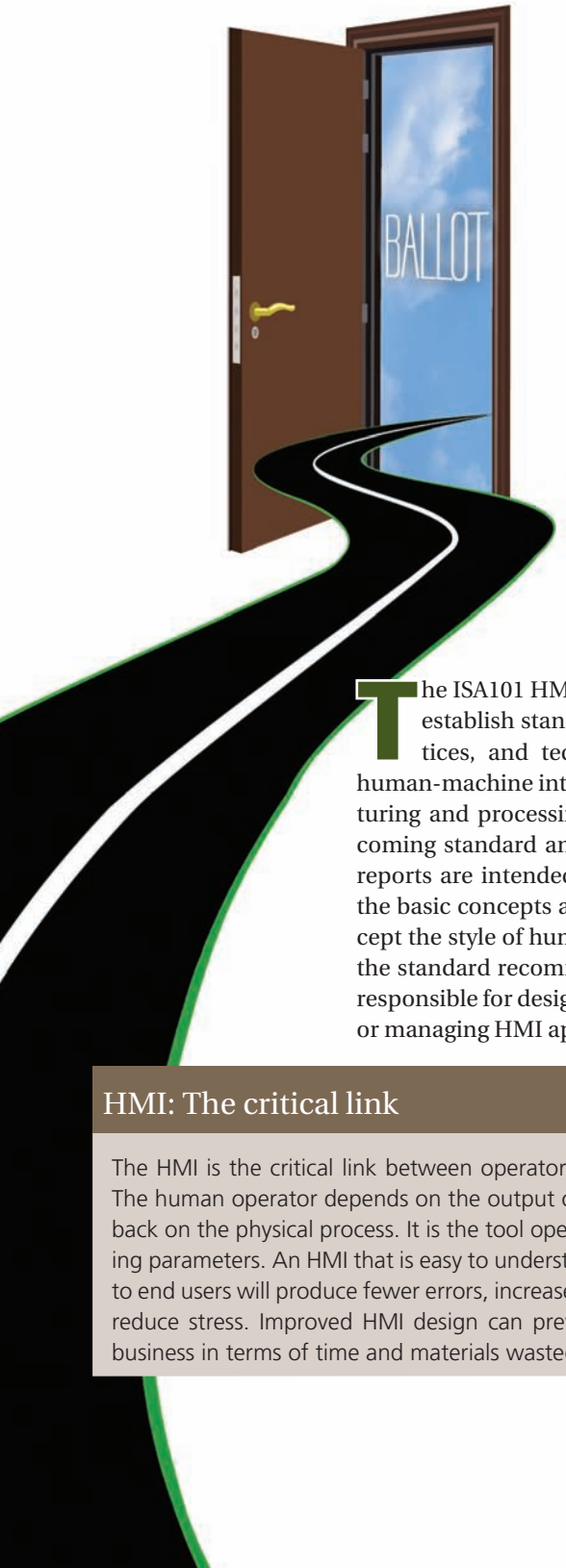

ISA101 HMI standard nears completion

The end of a challenging, windy road

By Greg Lehmann and Maurice Wilkins

The ISA101 HMI committee was formed to establish standards, recommended practices, and technical reports relating to human-machine interfaces (HMIs) in manufacturing and processing applications. The forthcoming standard and accompanying technical reports are intended to help users understand the basic concepts as a way to more readily accept the style of human-machine interface that the standard recommends. It is aimed at those responsible for designing, implementing, using, or managing HMI applications.

HMI: The critical link

The HMI is the critical link between operators and automation systems. The human operator depends on the output of the HMI to provide feedback on the physical process. It is the tool operators use to adjust operating parameters. An HMI that is easy to understand and gives clear options to end users will produce fewer errors, increase operator productivity, and reduce stress. Improved HMI design can prevent significant losses to a business in terms of time and materials wasted.

The standard defines the terminology and models to develop an HMI and the work processes recommended to effectively maintain it throughout its life cycle.

Use of the standard should:

- Provide guidance to design, build, operate, and maintain effective HMIs that result in safer, more effective, and more efficient control of a process, under all operating conditions.
- Improve the user's abilities to detect, diagnose, and properly respond to abnormal situations.

If the standard, recommended practices, and methodology are followed, the result should enable the users to be more effective in yielding improved safety, quality, production, and reliability.

Wide scope, wide input

The scope of the committee was to include menu hierarchies, screen navigation conventions, graphics and color conventions, dynamic elements, alarming conventions, security methods and electronic signature attributes, interfaces with background pro-

gramming and historical databases, pop-up conventions, help screens, and methods used to work with alarms, program object interfaces, and configuration interfaces to databases, servers, and networks.

Committee members include end users, integrators, and suppliers. At present, the committee is comprised of 230 members from many different industries and countries. Our members bring lessons learned from many years of designing, integrating, and using various HMI applications.

Over a series of initial face-to-face and virtual ISA101 meetings, several topics were identified, and appropriate clauses for the first draft were formed. Strong clause editors volunteered, and the draft began to take shape.

Presently, the draft standard is organized as follows:

- Clause 0: General
- Clause 1: Scope
- Clause 2: Normative References
- Clause 3: Definition of Terms and Acronyms
- Clause 4: HMI System Management
- Clause 5: Human Factors/Ergonomics
- Clause 6: Display Types
- Clause 7: User Interaction
- Clause 8: Performance
- Clause 9: Documentation and Training

Terminology and definitions

As with all standards, establishing a common set of terminology and definitions was vital. You cannot have a standard until you all speak the same language. The ISA101 committee came up with an easy-to-understand diagram showing what was meant by terms, such as graphic, symbol, and so on (figure 1).

Having done that, progress lagged until a pivotal decision was made at a face-to-face meeting in Indianapolis, Ind.

Life cycle is the key

During that meeting, the committee decided the work that had been done to date was good, but the standard needed to flow. After further discussions, we homed in on a life-cycle approach similar to those used by ISA84 on functional safety and ISA18.2 on management of alarm systems. The HMI life cycle (figure 2) would allow for new system implementation as well as changes to existing systems. It would follow the system from its planning and startup to its eventual decommissioning. System standards were also included as a basis for the whole life cycle. Once the life cycle was agreed upon, progress on the standard accelerated.

FAST FORWARD

- The ISA101 HMI committee includes a diverse group of users, integrators, and suppliers.
- The new standard will help organizations design, build, and operate effective HMIs.
- Users will be better able to respond to abnormal situations.

From life cycle to ballot

The first real draft was issued for review in June 2010 and received 699 comments. Since then, the committee has issued four more drafts and one requirements survey for a total of 3,786 comments. It became apparent that because HMI is such an "emotive" topic, we could review the standard ad infinitum, when we all knew that what we had was worthy of a standard and could be put to ballot. So, one final cleanup was done by a small team of clause leaders under the guidance of Bridget Fitzpatrick, after which the other clause leaders and chairs agreed to issue the committee

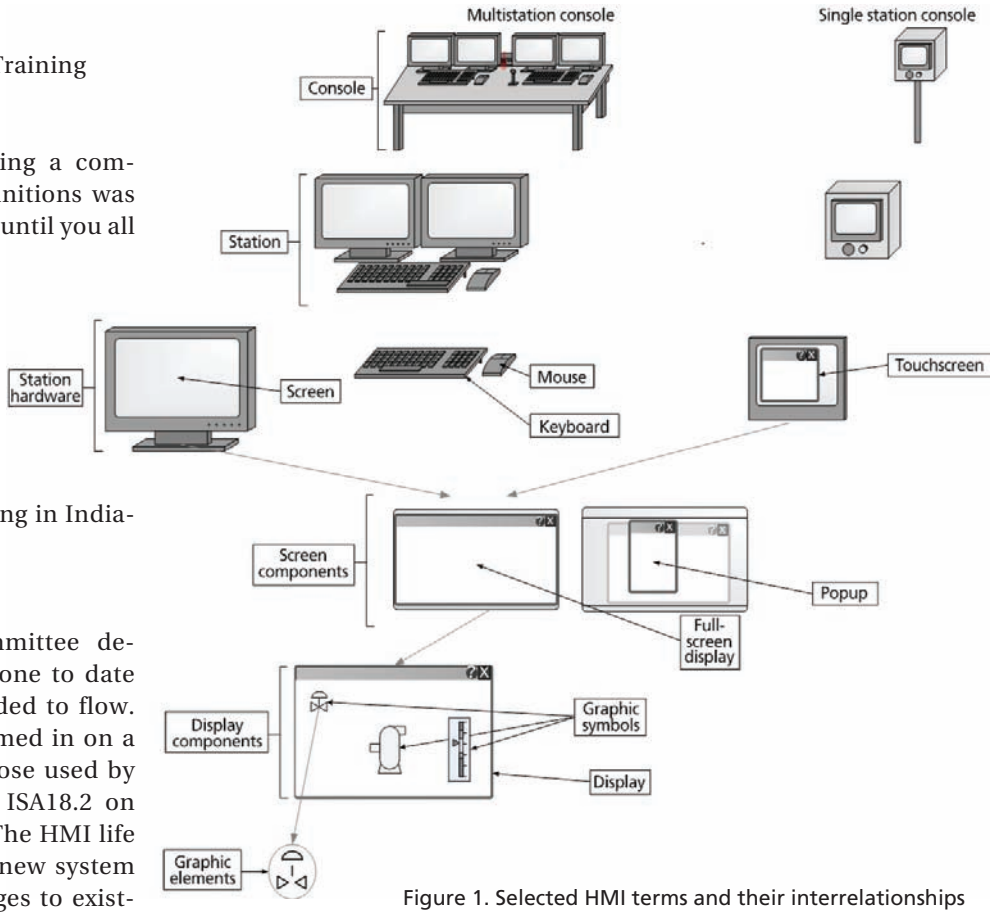

Figure 1. Selected HMI terms and their interrelationships

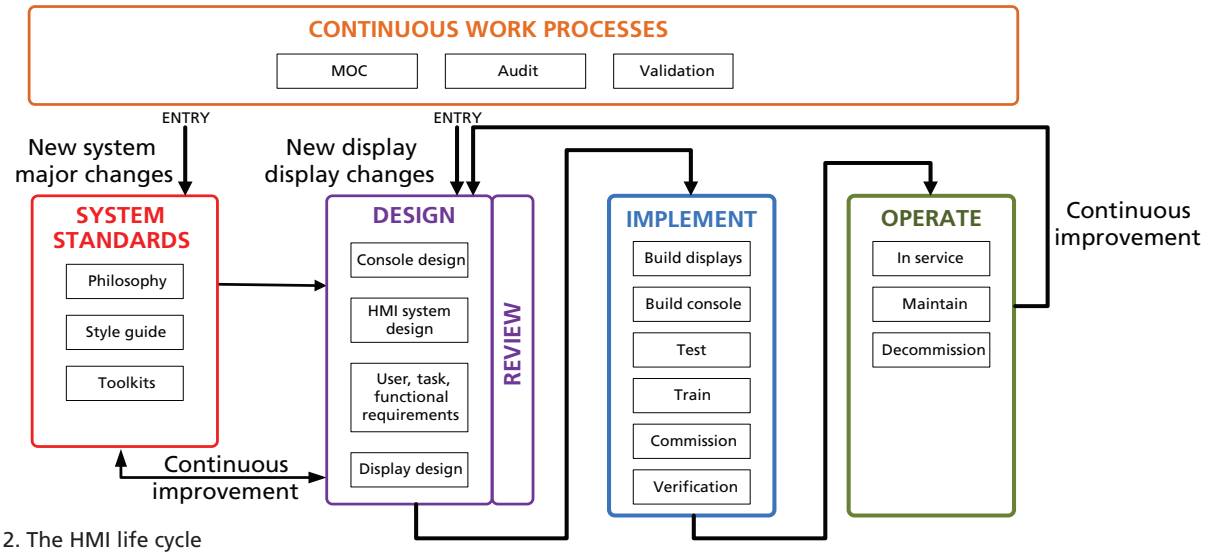

Figure 2. The HMI life cycle

ballot. The result of that ballot was overwhelming approval—but with several review comments that will have to be addressed.

What's next?

Additional changes are expected based on the comments from the first ballot, but are not expected to be extensive. Our expectation is that publication will be in the fourth quarter of this year.

During the process of putting the standard together, we moved some parts to annexes. These dealt with what a style guide might look like or how to put a purchase specification together and so on. We also need to address a topic that has come to the forefront: mobility. We now need to give guidance on how these may affect the design of future HMIs.

We plan to start work on ISA technical reports when the standard has been issued, covering topics including:

- HMI Philosophy Development
- HMI Style Guide Development
- HMI Design Guide Development
- HMI Usability and Performance
- HMI Purchase Specification
- Design Considerations for Mobile HMIs

We are approaching the end of a challenging road with many winds and turns in developing the forthcoming HMI standard, but believe firmly that the effort will have been worth it—and judging by the requests we are getting, so will the industry.

ABOUT THE AUTHORS

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