A Rockwell Automation Perspective

ICES 2013 Conference - What Does Industry Expect from Standards Education?

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Agenda

Introduction

Subject Matter Expertise

Global Standardization Infrastructure

Participation Skills

Summary
Introduction

Principle Standardization, Academic and Industry Affiliations.

- Vice-President Technical, IEC United States National Committee
  - US Representative to IEC Standards Management Board
  - ANSI Board and International Policy Committee Member
  - NEMA Policy Committee Member
    - Government Affairs; Standards & Conformity Assessment
- North Western University / Kellogg School of Management
  - Project Participant - Center for Technology Innovation Management (CITIM)
  - Member Global Advanced Technology Innovation Consortium (GATIC)
- Director, Global Standards & Trade, Rockwell Automation
  - 45 Years in the field of Industrial Automation
  - System Engineering, R&D, Business Strategy, Marketing & Sales
Rockwell Automation Serving You Around the World

North America:
300 sales & support locations
9,000+ employees

Latin America:
30 sales & support locations
3,000+ employees

Europe, Middle East & Africa:
90+ sales & support locations
50+ countries
3,800+ employees

Asia Pacific:
60+ sales & support locations
20+ countries
3,200+ employees
Consumer-Driven Industries Include…

**Automotive**
Increase flexibility & responsiveness while reducing costs & improving quality.
- Bridgestone
- DaimlerChrysler
- Ford
- GM
- Goodyear
- Hyundai
- JCI
- Lear
- Magna
- Michelin
- Toyota

**Food & Beverage**
Satisfy consumer demand, while reducing costs, minimizing waste & improving asset performance.
- Anheuser-Busch
- Coca-Cola
- Kellogg
- Kraft/Nabisco
- M&M Mars
- Nestlé
- PepsiCo/Frito-Lay
- SABMiller

**Household & Personal Care**
Meet regulatory challenges & improve quality, consistency, flexibility & time-to-market.
- 3M
- Beiersdorf
- Colgate-Palmolive
- DuPont
- Henkel
- Kimberly-Clark
- L’Oréal
- Procter & Gamble
- Unilever

**Life Sciences**
Reduce costs while meeting the demands of ever-changing regulations.
- Abbott Laboratories
- Johnson & Johnson
- Merck
- Pfizer
- Sanofi
- Wyeth-Ayerst

**Consumer Packaged Goods**
Heavy, Resource-Driven Industries Include…

**Water / Wastewater**
- Achieve low long-term cost & on-demand engineering expertise with scalable solutions.
  - A & E Firms
  - Consultants
  - Design Engineer Firms
  - Design Institutes (Asia)
  - Global Municipalities
  - Privatizers (Europe)
  - Pump OEMs
  - System Integrators

**Mining / Metals / Cement**
- Execute real-time control & maintain critical process parameters to respond to customer demands.
  - Alcoa
  - BHP Billiton
  - CEMEX
  - Holcim
  - Lafarge
  - Rio Tinto
  - US Gypsum
  - Vulcan

**Oil & Gas**
- React to changing production conditions while maintaining operations at peak efficiency.
  - BP
  - Chevron
  - ConocoPhillips
  - ExxonMobil
  - Shell

**Semiconductor / Electronics**
- Increase yields while reducing risk & total cost of ownership by using a single automation control & information infrastructure.
  - Agilent
  - Applied Materials
  - ATS Automation
  - Axcelis
  - IDC / CH2M
  - KLA-Tencor
  - Novellus
  - Praxair
  - Seagate
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Subject Matter Expertise - Evolution Of Standardization focus over time

- Material
- Component
- Product
- System
Manufacturing Center Focus

- Combined product-process design
- Advanced process control
- Flexible, modular automation

- Integrated safety solutions
- Smart devices with energy monitoring
- Waste & emissions optimization

- Modeling and simulation
- Unified information between plant & enterprise
- Production optimization to meet real-time global customer demand

- Secure Ethernet
- Wireless

- Agile, demand-driven
- Sustainable
- Supply Chains
- Production
- Plantwide
Industrial Energy Management

- **Generation**: Conventional: Coal, Nuclear, Oil / Gas, Hydro
  - Renewable: Solar, Wind

- **Transmission**: Smart Grid

- **Distribution**: Substation

- **Utilization**: Residential/Commercial

- **Industrial Energy Management**
  - Econometric models
  - Low-cost “embedded” energy sensors
  - Machine / process level energy sensing, measurement, analysis, optimization, control
  - Integrated control & energy management
  - Standards for process equipment energy

Transform from passive to active energy management
Manufacturing - A Smart Node on a Smart Grid

- Supply Chain
  - Constrained Utility
- Factory
  - Optimize Energy Consumption
  - Logically connect the Utility to the Factory
  - Cost, Productivity, Safety
- Headquarters
  - Cost, Productivity, Optimization
  - Global Standards & Risk Mgmt.
  - Intelligent Load Shedding based on Power Company Input
  - Communications between the Utility and the Factory control system
- Distribution Center
  - Customized Products
- Multiple Product Transformations
- Customer

Rockwell Automation
Specification of a system domain

- Shall be open and not be restricted to specific technologies, personnel, services or process attributes, but encompass all requirements required by the system.
- Shall include all stakeholders at the table including product and system design authorities, customers, installation providers, testing laboratories, regulators, maintenance services, certification bodies.
- Shall address the complete life-cycle of a system from concept to installation to upgrade, maintenance and ultimately end of life.
- The specification of the system shall provide system level requirements and not prescribe any particular technical solutions for products, systems, services or conformity assessment.
System Specification Deliverables

- **System Functional description** specifying scope, functionality, performance requirements and exclusions addressing complete life cycle from concept to end of life.

- **System Inventory** specifying system elements in terms of sub systems, products, services, personnel skills, and processes included in scope, listing of current standards or specifications, responsible organizations and projected future revisions with time-line.

- **System reference architecture or model** showing interrelationship of system elements.

- **System roadmap** showing planned and potential evolution of system elements over time.

- **Conformity assessment requirement specification** for elements within the system or for sub system and/or specific system test implementations. It is recognized that 100 % testing and certification is not economically feasible at the installed system level.
Specifying a control element in the smart system

The following aspects should be covered in an individual standard for the complete life cycle of the control element and entire system

- Safety – of individual machine and integrated system
- Security – of individual machine and integrated system
- Sustainability – environmental considerations for design, operate and decommissioning of the plant
- Energy Efficiency – of the individual machine and integrated system
- Data Collection and Management
  - To perform control function of the machine or process
  - To monitor performance of the resources, capital assets or personnel
  - To monitor attributes of products and bi-products from the machine or process
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- Global Standardization
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Global Standardization Infrastructure

An organized infrastructure to support the standards development process and maintain the deliverables for the life of the system.

- Standards Developers - formal international / national organizations, consortia, open source initiatives, application library development etc
- Is a new infrastructure and organization model needed for smart system standardization?
- How can next generation IT/Multi-media facilitate smart system standards delivery?
- Is there a new interactive media opportunity for publications of applied research linking standards interaction with emerging new business / engineering systems?
- What is a tenable business model for future standardization programs?
Global Infrastructure Challenges

A Global process and sustainable operational implementation that supports multi-lateral collaboration, consensus building, standards delivery, maintenance and support.

- Many formal standards developing organizations depend on standard sales to support their operations.
- There is a market view that standards should be freely available especially if referenced in regulations.
- Standards are a result of subject matter experts contributing their knowledge (IP) for free.
- Industry purchase standards to support their operations having donated the IP in development.
- Developing nations find it difficult to participate in current processes which utilize globally distributed face to face meetings.
- Participation costs are rising, participation of new SME is rare.
Participation Skills

Participation in development of standards deliverables requires respected subject matter experts with appropriate business awareness and negotiating skills

- Skills include consensus negotiation, leadership, facilitation, listening, observing, summation, risk assessment / mitigation, thriving in a multi-lateral and multi-cultural environment.
  - Are these skills readily available from stakeholder entities?
  - Are these skills being taught in college and universities?
- Is the strategic value of standardization to Governments and Industry being taught in advanced educational institutes?
- Are the academic silos of focused disciplines a barrier to development of industry ready employees?
- Not many junior employees have been exposed to or experienced many of these subject areas or skill developments from education.
An Industry – Government – Education Partnership is needed

Here are some initiatives that I am aware of

- IEC has a very successful Young Professionals program
- ANSI has introduced a standards boost business campaign
- ANSI and the USNC have a focus on Education and are reaching out to engage the educational community.
- Northwestern University / Kellogg include standardization elements in select post grad masters programs
- GATIC / CTIM include standards as a tool in the technology management portfolio of their projects and programs especially in new technology domains and markets
- NIST is supporting industry / academia workshops to address the topic of standardization in education
- GATIC / Northwestern / NIST have each developed simulations as educational tools
Summary

**Smart domain specifications that have the commitment and support of industry and government stakeholders to develop and sustain standards deliverables are required to facilitate the implementation of smart domains.**

- Smart Grid, Smart Manufacturing, Smart Transportation, Smart......
- An Architecture, platforms and applications approach represents an interesting path forward but requires current SDO to rethink their scopes and models.
- How to create the domain goal and then conduct the orchestrated participants to deliver a set of integrated deliverables that can be maintained and updated over a period of time is a global technology, social and behavioral challenge.
- Smart system (regulatory) compliance. Demonstration of compliance to systems standards through recognized conformity assessment processes and tools is required to create confidence in a multi vendor market place.
- There are opportunities to engage the next generation of employees to assist in the development and implementation of the necessary standardization processes and services to support the technological, and societal challenges of the next century.
Smart, Safe, Secure, Sustainable, Efficient
Next Generation Manufacturing can be a competitive market differentiator.