Asia-Pacific
Economic Cooperation

2018/SCSC/WKSP1/007
Session: Panel 2

Training/Teaching for Standards Careers

Submitted by: United States

APEC 2018
PAPUA NEW
GUINEA

APEC-IEC-ISO Joint Workshop on Developing Competence Requirements and Career Path for Standards Professionals
Singapore
23-24 January 2018

APEC-IEC-ISO Joint Workshop on Developing Competence Requirements and Career Path for Standards Professionals Singapore
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TRAINING/TEACHING FOR STANDARDS CAREERS

Jeffrey Strauss

Erik Puskar

CHANGING CONTEXT FOR STANDARDS DEVELOPMENT

- Globalization; Shifting active players and leaders
- Rapid emergence/convergence of technology crossing traditional boundaries; uneven understanding of target technologies and development paths
- Growth of consortia

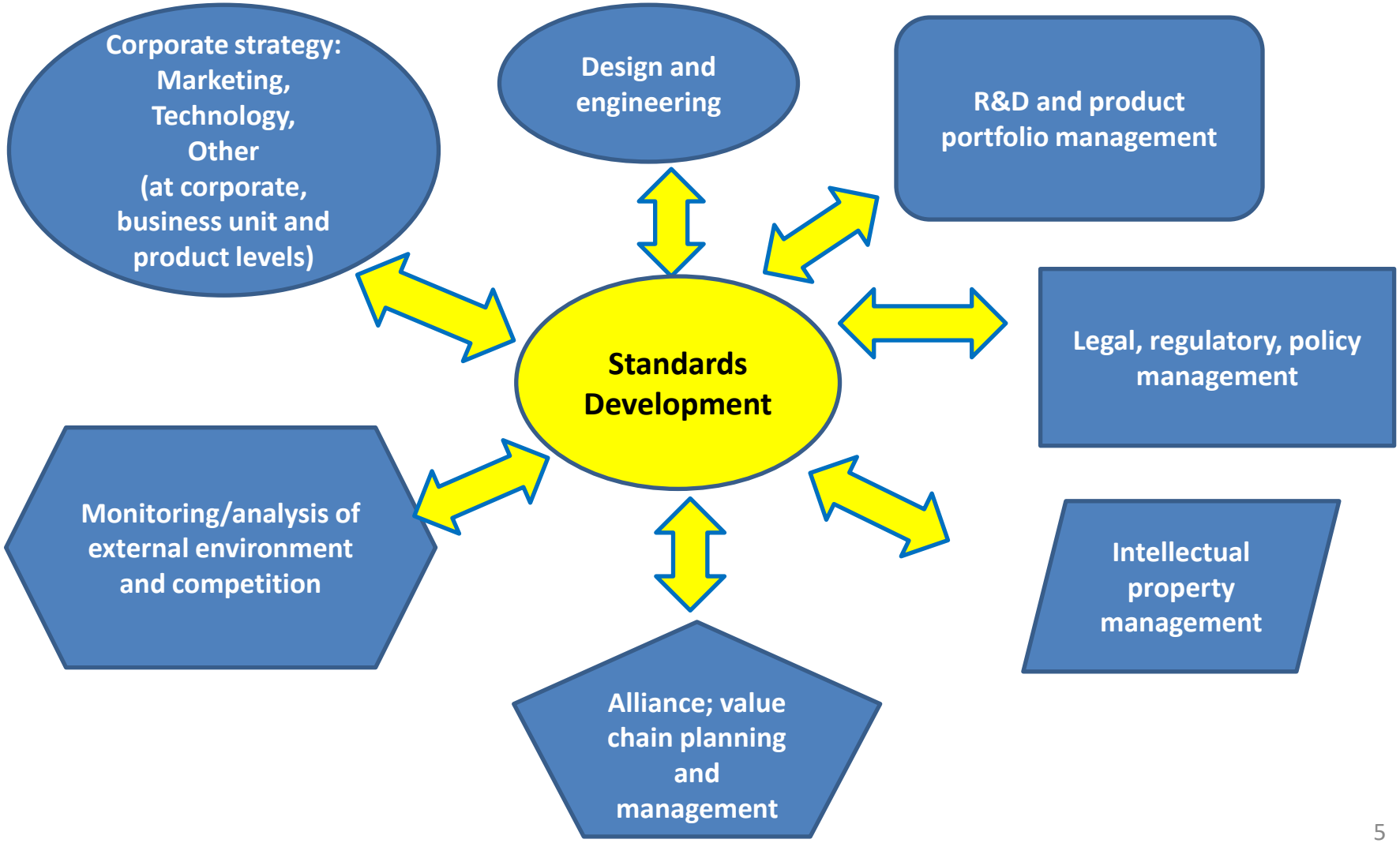
REQUIREMENTS FOR SUCCESS IN INTERNATIONAL STANDARD-SETTING

- Establish authority to negotiate within organization
- Understanding of current/future/emerging targeted product/technology /service and advantages, disadvantages of position; ability and processes to monitor and assess dynamic conditions
- Ability to bridge strategy and technology (cross-function/discipline
- Recognition of own personal and organizational strengths and weaknesses and those of others at the table; willingness “teach” or challenge appropriately
- Recognition of goals and ability/willingness pursue appropriate strategy persuasively (support or block/delay standard; alliance etc.)
- Think globally, act locally; Cross-cultural comfort and communication skills applied to formal and informal interaction
- Reputation; credibility – patience/willingness build through participation, committee support
- Tolerance/appreciation for technical detail/process and for ambiguity and uncertainty

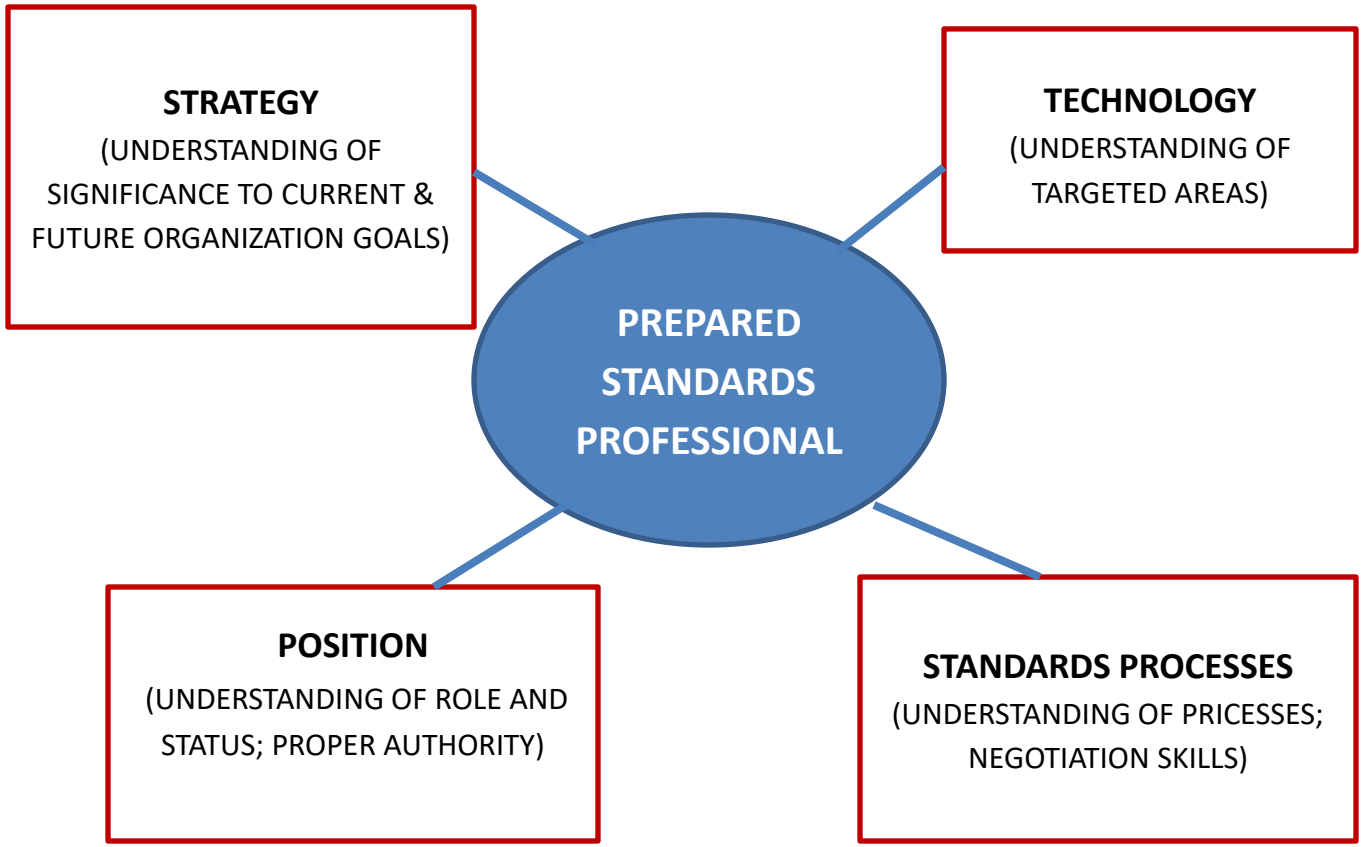
POOR CAREER POTENTIAL IN US CORPORATIONS

- Lack of appreciation in corporations of the importance of standards and standards management
- Lack of organizational fit; inadequate inclusion in planning

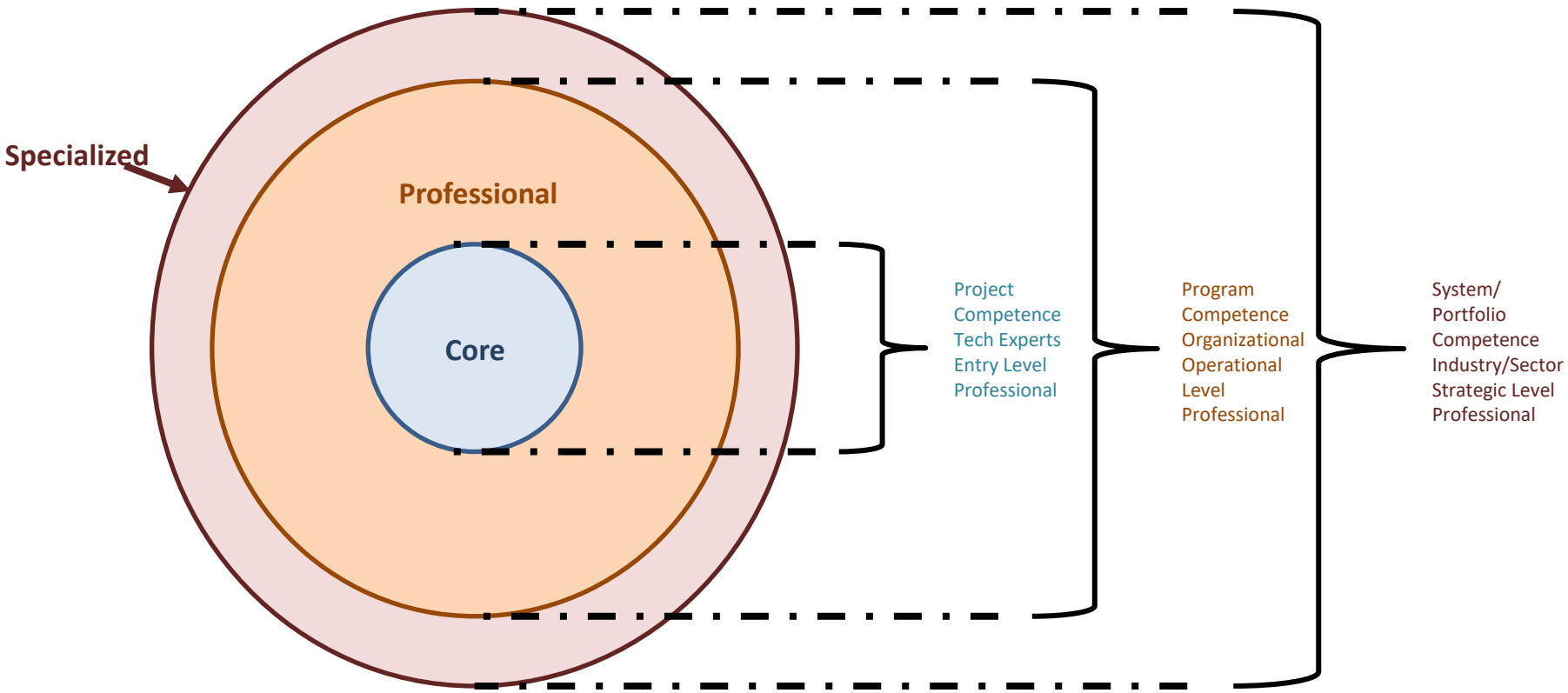
INTERPLAY OF STANDARDS DEVELOPMENT WITH OTHER MANAGEMENT/ENGINEERING PROCESSES



STANDARDS PROFESSIONAL REQUIREMENTS



SES: Standards Development Body of Knowledge ("SDBoK")



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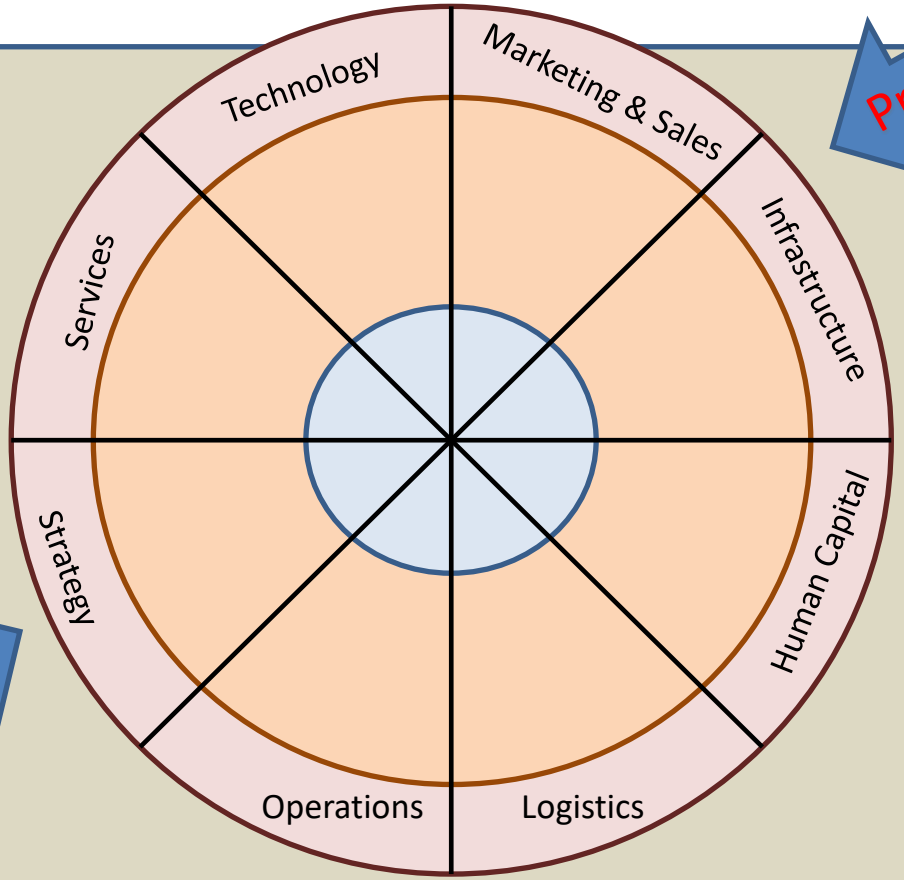


Pressure

Environmental Influences
- Technological change
- Social change
- Innovation
- Market needs
- Legal effects
- Industry interests
- Consumer interest

Limited availability of:
- Ideas
- Experts
- Funding
- Time

Pressure

KNOWLEDGE AND SKILLS: APPLICATION TO TASKS AND STANDARDS WORK

(adapted from: ASTM Standardization News September/October 2015 Strauss, "Enhancing Your Role as a Standards Professional Part 4: Defining and Building Skills and Attributes")

TASK	KSAs	HOW TO GAIN OR ENHANCE
Support/assert role in strategic planning (roadmapping, scenario planning, etc.); apply input from across organization	GENERAL Identify dynamic operating environment needs and technical drivers; identify and assess technical alternatives and paths STANDARDS WORK Define underlying standards and issues and effectively communicate across functions COMPANY-SPECIFIC Understand and assess products and technologies	• In-house training and direct participation in initiatives • Commercial roadmapping training • Relevant technical events (or be informed by attendees) • Interact regularly with personnel in relevant corporate functions • Select appropriate standards • committees in which to participate • National Institute of Standards and Technology industry-university strategic standards management workshops
Participate in standards development	GENERAL 1. Negotiation KSAs Knowledge of company requirements, strategic position, pre-established relationships, products and technology, what can or cannot be shared, priorities — what is critical and what can be given up now and across negotiations: • Skills/attributes, including cross cultural communication, rapport building • Assertiveness (with constraint) • Ability to listen and learn • Assess underlying concerns of others and challenge assumptions 2. Leadership KSAs (committee) Organization, training, team building, dispute resolution, drive consensus STANDARDS WORK Variation from "normal" negotiation pushes additional KSAs, including: • Knowledge of standards setting rules and processes; Bridge technology and strategy • Wear multiple hats • Deal with highly mismatched parties; Teach (raise level of understanding of technology in others) • Informal and formal communication • Writing skills (wording is critical) • Tolerance for tedium and nuance; Need to build reputation COMPANY-SPECIFIC • Select appropriate company reps • Negotiate internally for travel/ participation budget (cost, time required and expectations)	• Work through experiential simulations • Take general negotiation and leadership training (recognizing standards variation)

TASK	KSAs	• HOW TO GAIN OR ENHANCE
Review current relevant standards and gaps; monitor relevant standards development initiatives; select committees and extent of participation	STANDARDS WORK Understand standards development organizations, consortia, national, regional and international processes COMPANY-SPECIFIC • Understand dynamic corporate needs and positions as basis for committee selection and strategy; • Negotiate internally for resources enabling appropriate participation in selected committee(s)	• Participate in standards development organizations and in SDO/consortia industry-specific and broader standards training • Work with standards databases • Review industry roadmaps and • reports from industry associations

Goal of NIST workshops

- Upgrade preparation for standards professionals by enhancing the depth and breadth of recognition and coverage of the growing importance of standards and the potential value from participation in standards development.
  - Present standards in the context of pressing problems and fields,
  - Engage faculty, industry and SDO's together
  - Demonstrate pedagogy (the discipline that deals with the theory and practice of education; the study of how best to teach) included working through simulations

And as a bonus

- Stimulate the evolution of an industry-academic community or relationships that would continue the dialogue and help to advance work on this topic

Past workshops

- Workshop 1 at Northwestern gave equal attention to **smart grid, cloud computing** and related supply chain.
- Workshop 2 at UCLA focused on **smart manufacturing**,
- Workshop 3 at University of Pittsburgh targeted **cybersecurity**
- Workshop 4 at Georgetown University considered **global supply chain**
- Workshop 5 at Harvard addressed the **digital economy**
- And this past May, at Michigan State University looked at **sustainability**
- Total participation: 295 including from some 60 companies and associations and over 50 universities (multiple departments and schools in each) as well as a few government

Key Insights from all workshops

- confirmed importance of presenting standards in context of business/engineering systems and decisions (in evaluations, majority cited target domains as what attracted them to attend compared to a much smaller proportion pointing to standards focus); teaching cases, etc. needed that reflect context and standards role

- also evident – value of actively involving industry as well as faculty

- exercises key to bringing out subtle issues and engaging audience, particularly faculty

Key Insights (2)

- as an aspect of context: challenges of emerging technologies and increasingly complex and interrelated systems with multiple legacies and convergence of domains with their own cultures and standards (such as manufacturing and IT), and the impact on timing, process and content of standards development

- standards is an inherently cross-disciplinary topic enhancing the challenge of incorporating into curriculum

- SDO's should engage faculty (visits, etc.)

NIST Curriculum Development Grant Program

Carnegie Mellon University

THE GEORGE WASHINGTON UNIVERSITY WASHINGTON, DC

UNIVERSITY OF PITTSBURGH

NORTH CAROLINA STATE UNIVERSITY

San José State UNIVERSITY

UNIVERSITY OF MICHIGAN

BGSU

The City College of New York

NORTHWESTERN UNIVERSITY 1851

EVERETT COMMUNITY COLLEGE

ROCHESTER INSTITUTE OF TECHNOLOGY R·I·T 1829

STEVENS INSTITUTE of TECHNOLOGY THE INNOVATION UNIVERSITY

PURDUE UNIVERSITY

Drexel UNIVERSITY

UNC CHARLOTTE

JSU

Penn UNIVERSITY of PENNSYLVANIA

MICHIGAN STATE UNIVERSITY Founded 1855

GEORGETOWN UNIVERSITY

OKLAHOMA STATE UNIVERSITY

UNIVERSITY OF HARTFORD 1877

CORPORATE STANDARDS CAREER ACTIVITY

John Deere

- Standards and safety closely aligned
- Central group informed by standards engineers in product groups as subject matter experts
- Encourage all engineers participate in standards development working groups and committees (Rockwell Automation *requires* all new engineers to participate)
- Stress on-the-job training but also in-house courses

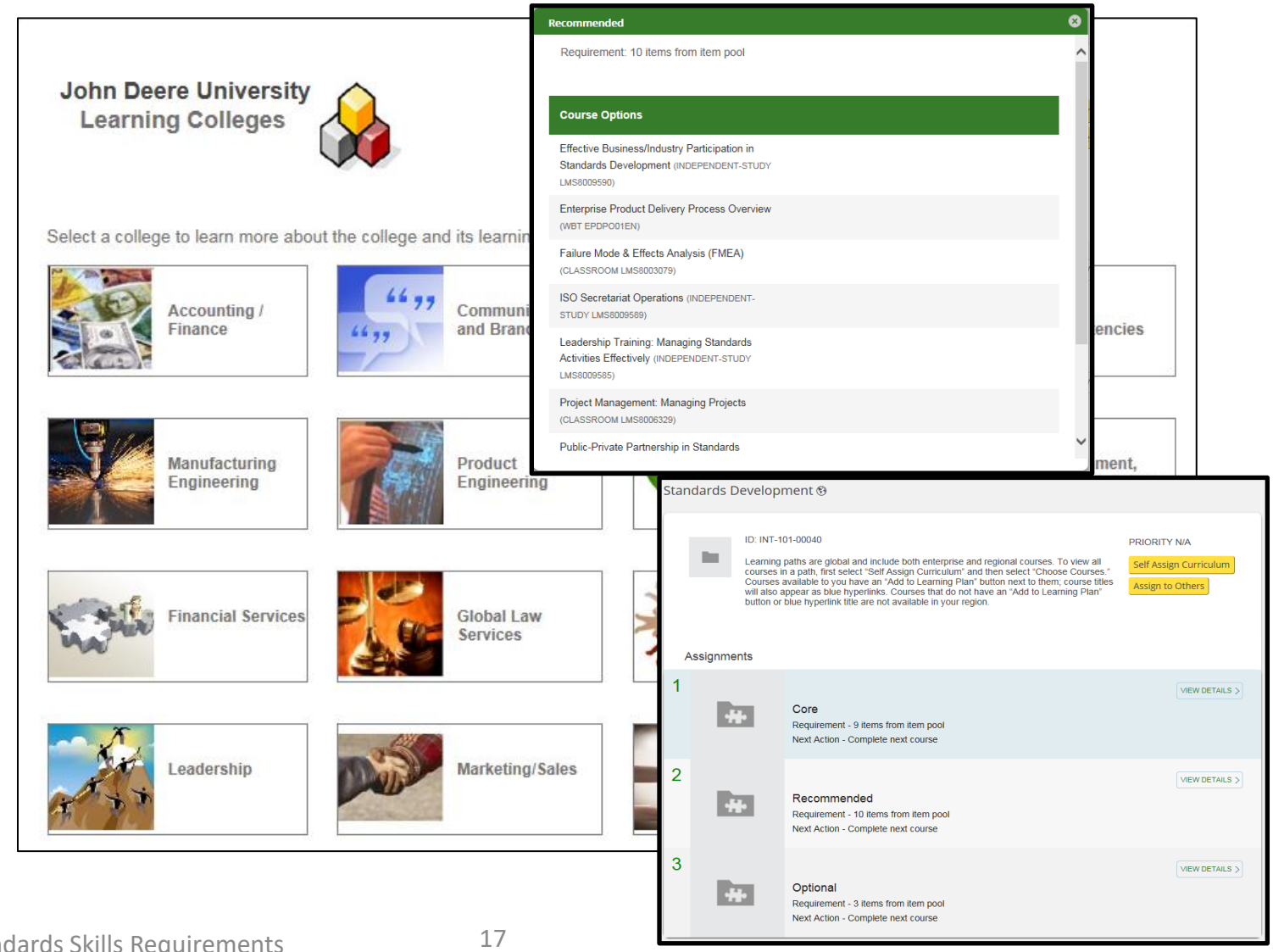
How Do We Train and Develop Skills ?

John Deere University

Product Learning Colleges

Product Engineering

Standards Development



SIMULATIONS AND COMPETITIONS

- Negotiation simulation in NIST workshops and ANSI competitions. Focused on undergraduate and graduate students as well as faculty.
- “minimal text” competition (pioneered this past November with student teams from San Jose State University (host), Texas A &M, University of Colorado at Boulder and City College of New York and each had a faculty mentor. 5 judges from ANSI/IAPMO, ICES/Purdue University, IEEE/Magma Design Automation and Deere determined the winning team came from San Jose State); plans to repeat during National Standards Week in Washington DC October, 2018

WHY MINIMAL TEXT?

- Most standards are text intensive and hard to follow - value in simplifying standards and reducing associated text
- Adapt to current/emerging social media orientation with minimal text
- Enhance understanding /communication across cultures/languages and varying levels of technical understanding

THE TASK

<u>Unambiguously capture and communicate</u>

- the purpose and need for the standard
- tradeoffs,
- use cases (applications) and
- content of the standard (use proposed standard omitting item 1)

using as few words as possible (TOTAL maximum 30 plus numbers/units)

2017 Focus: V2V communication to prevent accidents

Participating teams from

NEGOTIATION SIMULATION

- Intent: allow students (for NIST workshops, faculty) experience impact and complexity of standards development
- Pre- negotiation briefing on standards and negotiation, post-negotiation discussion of lessons learned
- Role playing – each role has primary and secondary objectives and result “to avoid”
- Focus has varied from industrial automation to V2V communication systems (potentially leading to autonomous vehicles)

POTENTIAL FOR COLLABORATION

- Refine simulations and “minimal text” exercise content
- Multi-country/region exercise?
- Further collaboration on a universal set of competencies. Are regional differences required?