

NIST Standards Services Education Challenge Grants

Workshop for 2012-13 Grant Recipients

November 8, 2013
NIST, Gaithersburg, MD

Context-based Modules for Teaching of Standards and Standardization

Northwestern University

BCICS Center for Technology and Innovation Management
(CTIM – university wide)

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Objective

To upgrade the depth and breadth of recognition and coverage of the growing importance of standards and the potential value from participation in standards development in US educational institutions.

Premise: weak coverage is in large part due to how standards and standards development is presented

Focus:

- strategic and operational implications of individual existing standards but also standards evolving in anticipation of requirements associated with emerging technologies
- emphasis on the strategic importance of participation in standards development
- modules that ***position standards in critical planning and operational decision contexts*** (e.g., smart systems – grid, manufacturing, cloud computing)

beyond feasible scope of \$25,000 project (and appetite of faculty)

To push further: actively supported separate initiative undertaken by the multiple industry-university Global Advanced Technology Innovation Consortium (GATIC) -

Did create a basic module and, particularly, developed - a standards negotiation exercise that we tested/applied in a wide and growing range of courses and other settings.

This was built on student assessments of concepts, review with faculty teaching innovation, supply chain, operations, engineering design, entrepreneurship, negotiations as well as review of existing exercises.

Courses using module/exercise

Past/current

Summer 2012 (early concept pre-test: grad seminar style course)

Kellogg MORS *Practice-based Tools for Emerging Technology Markets*

Winter, Spring 2013 (full: undergrad, grad and continuing ed)

Business Institutions Program (BIP) *Managing Wicked Global
Innovation Problems*

Kellogg MORS *Practice-based tools for Emerging Technology Markets*

School of Continuing Studies *Technology Planning for Leadership in
Volatile Times*

TOTAL: 77

Upcoming

(in addition to repeats of grad, undergrad and continuing ed courses
in Winter)

NU McCormick School of Engineering and Applied Science – new courses

Spring 2014

Masters in Engineering Management (MEM): NuVention Analytics

Master of Science in Analytics: Smart Grid

Summer 2014

MEM: Engineering Law

Exercise conducted at GATIC Faculty/Industry Workshop

Hosted by UCLA, with contextual focus on smart systems, particularly smart manufacturing. Audience: **26 faculty, 17 industry and consortia** (plus 2 from NIST)

And,

In discussion with ISO to use in training for standards committee leaders and others

Sample course approach

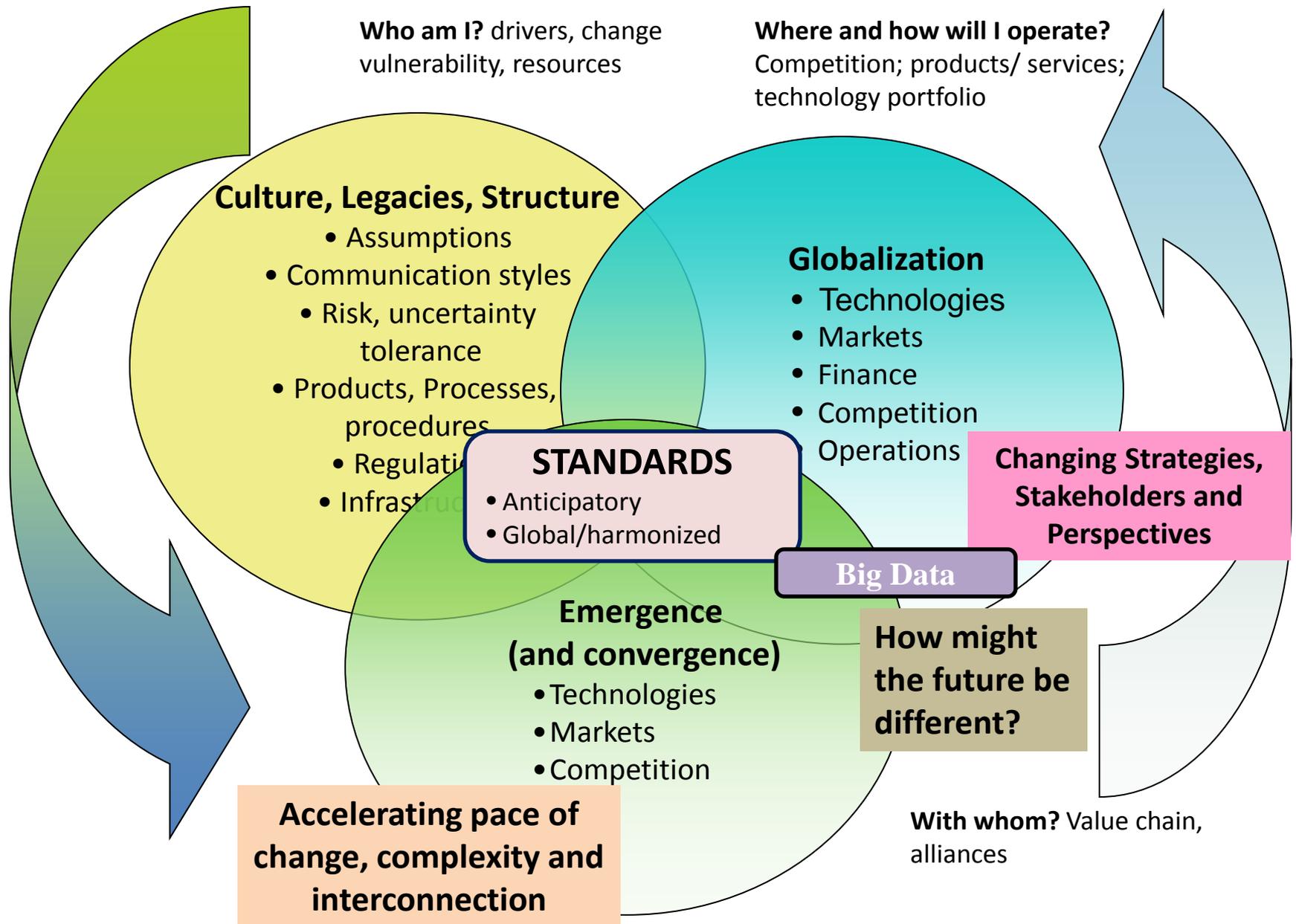
MORS 927 Practice-based Tools for Emerging Technology Markets

Winter, 2013 (3-hour weekly sessions) Syllabus

UNIT 1: INTRODUCTION AND OVERVIEW; THE PROBLEMS	
GOALS AND QUESTIONS	<p>This unit introduces the focus on enhancing capability to address management challenges associated with emerging technology markets. The following questions apply throughout the course.</p> <ol style="list-style-type: none"> 1. How do emerging opportunities differ from those in the past? What are specific problems that need to be addressed? What are implications for strategy and market planning and for organizational/ecosystem design? What are related limitations in traditional analytic approaches? 2. Though they will certainly vary across sectors and operations, what/who are key business contexts/stakeholders and how are these changing – or might change and why? 3. What might be the range of meaning of <i>innovation</i> for a business? How can this interact with other business drivers? 4. What are underlying internal (strategic) and external drivers of the push for innovation? What are key constraining and enabling factors and how might they impact? How does globalization both enable and challenge success in the targeted emerging domains? What are the implications of “Big Data”? 5. How can the implications of evolving contexts and decisions/trade-offs be captured and conveyed to stakeholders? How can internal and external players be dynamically aligned to support operations? 6. How do standards and participation in standards development support or constrain technology development, transfer, innovation and strategic success?
SESSION	TOPICS
1. Jan 10	A. Course overview; independent work description B. Exercise (NUGRO handout) C. Defining innovation D. External contexts: global, technology, regulatory/standards social/cultural/developmental E. Organizational context; stakeholders, ecosystem F. Standards (much more later)
UNIT 2: NEW PROBLEMS SOLUTIONS: TOOLS & APPLICATION	
GOALS AND QUESTIONS	<p>This unit introduces a range of integrated frameworks and tools largely derived from industry practice that may complement analytic and planning approaches from other courses. They will help you to recognize frequently overlooked factors and expose cascading and interrelated impacts. Though you are free to use variations or other approaches, we will use these tools to address specified problems through exercises and casework throughout the course to help you gain comfort in the desired analysis.</p>

SESSION	TOPICS
2. Jan 17	A. Course framework B. Tools overview; value, issues and limitations C. Underlying factor analysis, mindmapping, causal mapping, domain mapping; risk management D Global Warming/Climate Change tool application E. Roadmapping, exercise
3. Jan 24	Tools (continued): A. Stakeholder analysis Case Discussion: (distributed in class or posted): Oxfam B. Scenario planning; Scenario planning case: Eli Lilly C. Challenges and issue in scenario planning D. Exercise: NuGro (revisited); E. Readings discussion
4. Jan 31	Tools (continued): Multi-scenario taskmapping Open discussion on tools STOPSEM TOOLS EXAM (continue at home on honor system) Project proposals due
UNIT 3: ADDED PERSPECTIVES; ILLUSTRATIVE APPLICATION DOMAINS	
GOALS AND QUESTIONS	<p>For illustration, we will look at issues in two domains reflecting targeted challenges: “smart” manufacturing/renewable (alternative) energy (particularly the interface between these) and healthcare. The challenge in evolving appropriate standards (and for companies to manage standards development) will be used as a focus for discussion applying the tools and self analysis/strategic orientation analysis we have been working on to this point. This will culminate in teamwork on a standards development negotiation exercise developed with support from the National Institute of Science and Technology (NIST).</p> <ol style="list-style-type: none"> 1. Particularly in these domains, what are important underlying and contextual drivers, strategic trade-offs, limiting and enabling legacies, timing and resource implications and stakeholder positions? 2. What is the potential impact of emerging technologies and related management challenges? 3. Why are standards so critical and so difficult in these emerging domains? How can companies strategically manage standards development?
5, 6. Feb 7, 14	Standards development and management; overview: strategic and innovation implications, case discussion and exercise
7. Feb 21	Illustrative application domains: smart manufacturing/smart grid; healthcare
8 (Feb 28) INDEPENDENT WORK (interaction with instructor on appointment basis)	
10. (March 7)	Project presentations (papers due next week); Course wrap up

THE CHANGING PLANNING AND OPERATIONAL CONTEXT



SAMPLE COURSE MODULE SLIDES

NUTEK STANDARDS DEVELOPMENT EXERCISE (2)

You will be assigned to represent one of 6 countries (A-F) which have varying concerns related to a technology (which has a de-facto/ market determined standard) and have different goals in negotiations to develop a formal new standard (part of your job is to try to determine these goals and their foundation.) You will be given a briefing on your position and given time to prepare before beginning negotiations.

NEGOTIATION PROCESS AND INSTRUCTIONS

STAGES

1. 15 minutes preparation within groups

Use this time to review role assignments and consider strategy. You may select a spokesperson or any one of you may speak during the negotiation. While you cannot embellish or change the technology, you can and should be creative in anticipating other parties' positions (refining assessment as negotiations proceed), how you can address them (you may, for example, offer training – although this, of course, carries a cost, safety inspections etc.) and how they might respond. What is critical to you? What will you reveal - or not – and when about your interests and thinking? What do you need, how urgently? Who might be allies? Who might be enemies?

2. **20 minutes formal negotiation:** each group will make brief opening statements and then offer further comments and counterpoints/questions with permission of moderator. The moderator can call for a vote at any time. Voting will follow ISO rules with a consensus (approval of standard) determined by agreement of 2/3 of voting participants.

3. **15 minute break** (you may use this time for informal interactions with other groups)

4. **15 minutes formal negotiation**

5. **15 minute break** (you may use this time for informal interactions with other groups)

6. **10 minutes final formal negotiations**

NUTEK STANDARDS DEVELOPMENT EXERCISE (1)

This exercise is intended to help introduce through experience the multiple dimensions often involved in standards negotiation (that are difficult to convey otherwise.) The technology example is highly simplified.

Discussion after working through the exercise in a class setting might delve into deeper issues in emerging technologies/systems, as well as broader marketing, finance, political, organizational, design etc. considerations. Role descriptions might also detail varying culture-driven negotiating behavior.

TASKS

- Assess needs and concerns, define basic strategy – both ideal and fallback position
- Identify and assess positions and foundations of other participants, refine strategy
- Pursue strategy through both open session and, as appropriate and necessary, private interaction during the break

POTENTIAL STANDARD

- Very high-speed (“pull” accelerated development, potential applications)
- High-speed (allow high end application)
- Medium-speed (enable some new applications)
- Low- speed (current)

If a standard is not approved in the current session, it will be put off until at least next year

POST NEGOTIATION

Summary of exercise country characteristics and negotiation goals

Country	Market position	Negotiation goals
A	Leader (large)	Fast setting of moderately high standard
B	Follower (large)	Low speed standard (or sig. training and support)
C	Innovator (small)	High (<u>generic</u>) with ultimate standard (based on different approach that <u>might</u> have tech advantages); slow/block if standard based on high speed Country A approach is likely
D	Strong global position in industry which could apply technology – if it were further developed	Much higher (pref. generic) standard ASAP to pull development
E	Significant industry (same as D) but which is struggling globally	Block new standard (but keep in good graces with Country A)
F	Major consumer of the technology at the current speed configuration (and has significant influence) but worries about its safety at higher speeds	Push for stringent testing

A Vision for a new full decision context simulation

- follow the basic structure of simulations we have developed in the past.
- intended for **seamless integration** in existing courses and allow **easy modification by instructors**.
- Unlike typical cases, to stimulate interest and realism with common dynamic conditions, background information is deliberately incomplete reflecting still evolving conditions, and **“updates” are provided to users which could alter assumptions**.
- Background describes fictitious company and **context of evolving industry, technology and market challenges, and key strategic decisions needing to be made**.

- **leads into standards negotiation.** Existing standards are described and students are guided to **recognize gaps and relevance to strategic needs.**
- Background is also given on potential others at negotiation table
- Post negotiation, students must consider **implications of compliance** with new standards and **impact on strategy**

End product should include teaching notes and suggested variations (supply chain communication/alignment issues, application of analytic tools, range of possible updates) to allow use in different course settings and with varying available time.