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Applying Nonaka's "Wisdom" to Product & Process Innovation Standards

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Abstract

To apply the type of practical "Wisdom" postulated by Ikujiro Nonaka in his recent Kindai Management Review journal paper presents us with a severe innovation challenge in today's emerging techno-market world – one to which the concept of "*wickedness*" may well apply. After identifying dimensions of today's complex and highly uncertain global innovation world, our paper then offers the seemingly mundane and generally under-considered field of product and process Standards as a valuable practice opportunity to expand on Nonaka's wisdom concept as well as the wise leadership/wise capitalism concepts of Hirotaka Takeuchi. In collaboration with NIST (National Institute of Standards and Technology) and our GATIC partner (Global Advanced Technology Innovation Consortium), we are seeking to increase attention and capability in business and engineering schools on Standards through pursuing studies, industry-academic workshops and evolving a serendipitous learning and proactive website. In conclusion we draw on the early Nonaka Ba concept, noting its value for the development, adoption and productive utilization of Standards for *wicked* contexts. Global partners for our endeavors are solicited.

Keywords: *wisdom, innovation, (product-process) Standards, wicked problems, anticipatory, serendipitous learning*

THE INNOVATION WISDOM CHALLENGE: A WICKED PRACTICAL PROBLEM

Ikujiro Nonaka in his introductory essay for the new *Kindai Management Review* journal (Nonaka, 2013) took us on a journey going from his period of thinking in terms of Information Processing through Knowledge Creation and Innovation to a "special kind" of Practical Wisdom. He offers Aristotle's term *Phronesis*, defined as – "prudence, (practicality), ethics or practical rationality……. (namely) the ability to determine and undertake the best action and specific situation to serve the common good" (p. 13). Though inspiring, it takes considerable effort to translate the declaration into practical action implications. This is especially the case as the concepts are manifest in the now highly complex and rapidly changing innovation contexts: As, for example, when they are pursued by globally distributed teams and where the connections with *who knows what* may be as or more important than *what you believe you know*. And, determining what might define "best action" in conjunction with which innovation problem situation is the "specific" - can also be difficult.

Seeking a next useful step for consideration of

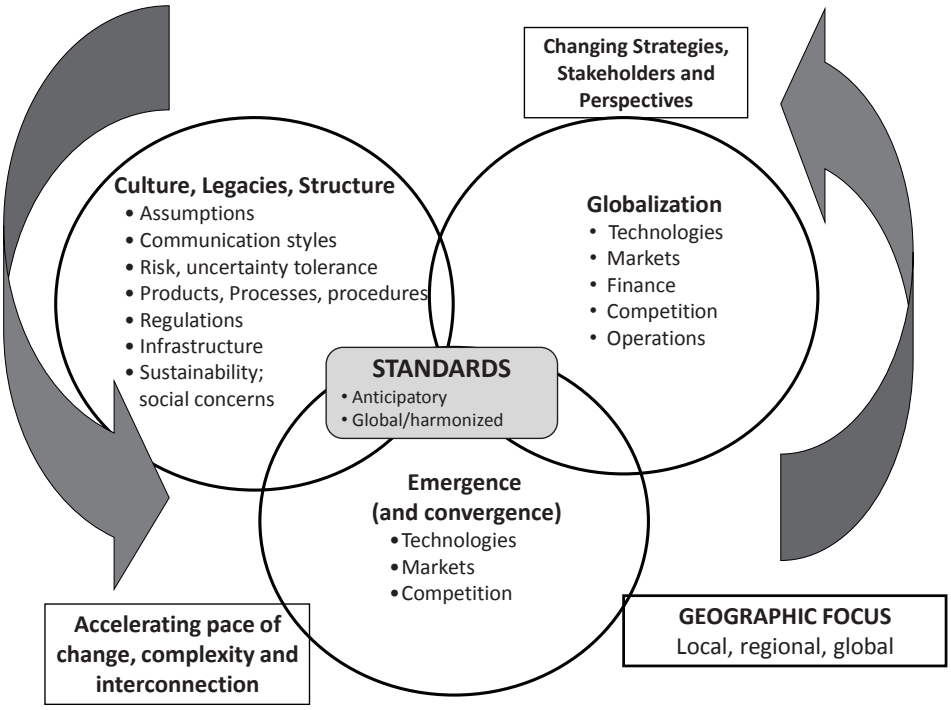

Figure 1: The Changing Innovation and Knowledge Environment

practical innovation that builds on Professor Nonaka's conceptual journey, we reach out to the notion of problem "*wickedness*" – a perspective that forces consideration of solutions beyond specific foci and towards situations reflective of complexity and evolving contexts. Such decision challenges are often described[1)] as being ones in which there are no "correct" views of the problem's nature and context; for which solutions are not generally right or wrong – at best maybe "better or worse or good enough"; where solutions inform problem definitions that need to be assessed simultaneously or iteratively; where problems interweave with others and an apparent solution to one reveals, exacerbates or creates another. And information is often inaccurate, uncertain or misleading and subject to many hidden aspects, with much accepted knowledge selectively faded from memory or forgotten over time or no longer applicable.

Such wicked problems pose severe challenges for identifying, managing and solving the key aspects of achieving and managing productive change and innovation on a practical basis. Not least is the fact that outcome benefits have to be evaluated in comparison to what local and increasingly globalized competitors have, or could have, and with respect to varying stakeholder expectations and hopes. Culture based, the subject is also inherently interdisciplinary, legacy-prone (sticky); and, with typically unintended cascading consequences and hidden risks as new technologies emerge and the therefore wicked innovation context evolves. Figure 1 illustrates aspects of this complex context including the interacting dimensions of Globalization, Culture (with legacies and structure) and Emergence (and convergnce), noting that responsive changes in strategy, relevant stakeholder identification and perspective and accelerating pace of change and complexity must be considered, with geographic focus variation.

Reaching into practice, we need to consider how such considerations play out in real world domains, especially those subject to very severe techno-social innovation application challenges. As a useful "test" for this purpose that links back to Nonaka's wisdom conception, we offer a demonstration, namely the task of determining, establishing, negotiating and sustaining global innovation changing product and

process *Standards*.

STANDARDS FOR INNOVATION: AN INCREASINGLY IMPORTANT AND USEFUL ILLUSTRATION

On its face, the subject of Standards for innovation seems mundane, but when explored it is anything but that and, as practitioners (though maybe not yet academics) are well aware, the subject is becoming ever more wicked. There are multiple ways to define "Standards". We use the following: a technical Standard is a documented agreement containing uniform engineering or technical guidelines to ensure that materials, products, processes, practices and/or services can be consistently produced and used and remain adequate for their purpose within a given context. This includes ensuring safety and enabling required interoperability with other materials, products, etc.

Standards are increasingly important determinants of domestic and especially global competitiveness, with the emergence of more complex and more integrated innovation-demanding systems offering new potential and new threats. Related products and systems can generate increasingly uncertain development paths that challenge planning and investment decision-making. Standards more often than previously need to anticipate and even guide development rather than simply validate market trends. Moreover, since competition is also increasingly global, the process of Standards setting may intensify tensions across political, cultural, and operating condition differences, as well as varying levels of technical readiness and understanding.

The above cited Standards impacting macro changes are increasingly on the view screens of business, and business and engineering schools must recognize and give research and teaching attention to the key underpinnings of success and impact, namely:

- A deep understanding of the evolution and character of enabling Standards.
- The growing competitive importance and complexity of participation in the actual Standards development and negotiating processes (instead of living by Standards and markets set by others, including competitors.)

While it would be gratifying to report that the academic world is giving such consideration to what can be anticipated and, in consequence to what will be demanded and then (hopefully), move on to introduce changes in the educational preparation of business and engineering students – this is not the case and remains perhaps the greatest among the challenges to be overcome!

The above has particular relevance when considering complex emerging systems as reflected in the IBM promoted "*Smarter Planet*" concept and writings on Smart manufacturing and other such systems. This extends to smart supply chains and incorporates new analytic software, sensors as well as innovation thought, design and action[2)] (and in consort perhaps with Nonaka and Takeuchi, we could seek to include *wise* as an aspect of smart). These concepts have also become focal for our own inter-linked Standards and Innovation work.

STANDARDS AND INNOVATION

It is frequently said that Standards can inhibit innovation by placing boundaries on what can be conceived and done. But, increasingly it is recognized that value-producing innovation is not only to be seen in the disruptive mode, and consequently Standards can also support innovation. They can do so by giving innovators confidence that their new components, products, technologies and processes will be compatible with legacy systems, infrastructure and vendor capabilities, and hence be accepted in the market. Moreover, Standards can enable manufacturers to move ahead on procurement and implementation decisions; as such, well-developed and well-selected Standards can be influential in determining which technologies and approaches lead. Ho and O'Sullivan illustrate the interplay of innovation and standards with the case example of the evolution of photovoltaic technology as a viable alternative energy. They note the early role of standards in enabling consolidated government and legislative support and later in encouraging PV commercialization (moving from technology development to application) and user acceptance through the establishment of quality

and safety standards[3]. This innovation-Standards nexus has been the long-time focus of research and policy making in the European Community of Berlin professor Knut Blind and his doctoral team with which we collaborate[4].

A particular recent illustration of the innovation-Standards nexus in smart system can be seen in relation to the growing field of *Cloud Computing* services. Loosely defined, cloud computing can provide for ubiquitous, virtual on-demand internet/network-based access to storage, servers, software and applications. As such, they significantly reduce capital expenditure and the need for in-house expertise and can increase flexibility in terms of media, work location and collaboration. Cloud computing is growing rapidly, but lingering concerns over migration paths, participation and choice, security, implied interoperability and portability across varying global infrastructure and regulatory frameworks all call for carefully designed Standards.

PROCESSES OF STANDARDS SETTING: THE HOW/WHO AND FOR WHAT?

At least as much as in their content, the processes by which Standards become established also demonstrate their inherent wickedness:

1. *Multi, differentiated and changing contexts specificity*: Generally with respect to the innovation-Standards nexus, and consistent with the Standards definition given earlier Standards need to fit with current and emerging/shifting contexts. These include converging technologies crossing traditional industry boundaries, and must take account of legacy systems and potentially incompatible extant Standards stemming from previous contexts. Standards must also address the differing cultural, national/regional, organizational and time-dependent conditions. Attention to such variation is crucial to enable proper and useful communication, interoperability, assessment and regulatory compliance. Standards are ultimately intended to offer essential common data formats, controls and performance measures across devices, systems, sensors and organizations (including for multiple vendors) but given the range of application contexts, as they will occur in varieties of ways.

2. *Standards setting as a Social Process*: Implicit and alluded to in point 1 is the recognition that the setting of Standards is inherently a social process, at the minimum requiring a relationship between a Standards setter and a user. But this goes much beyond that. Other than for pure monopolies and monopsonies, and especially with respect to global Standards setting, and given ongoing attempts to establish *harmonized* cross-national Standards, many players are likely to be involved. In such cases the required knowledge and wisdom will derive from highly diffused and culturally and institutionally complex sources generating conditions in which negotiators are mismatched, may differ in types of organizations they represent – governmental, by firm size and other types of stakeholders, level and standing of the individual representatives, and the extent of knowledge and experience related to the technologies being considered. Negotiators may have prior relationships or recognize that they will face each other again in other negotiations. At the global level it is generally only during such Standards negotiations sessions that we see how company and governmental representatives seek to harmonize and balance their potentially differing organizational, cultural, strategic and operational requirements. Also, often not recognized, negotiation will also have taken place and continue to go on (often with relatively similar differences as those indicated above) within home organizations. These complicating and often most difficult to resolve differences can show up across operating divisions and departments, each with their separate missions, constraints, skills, knowledge and cultures and frequently today, across great geographic separation. Finally, the success of a Standards development process is only evident in the extent to which the standard is actually used by indus-

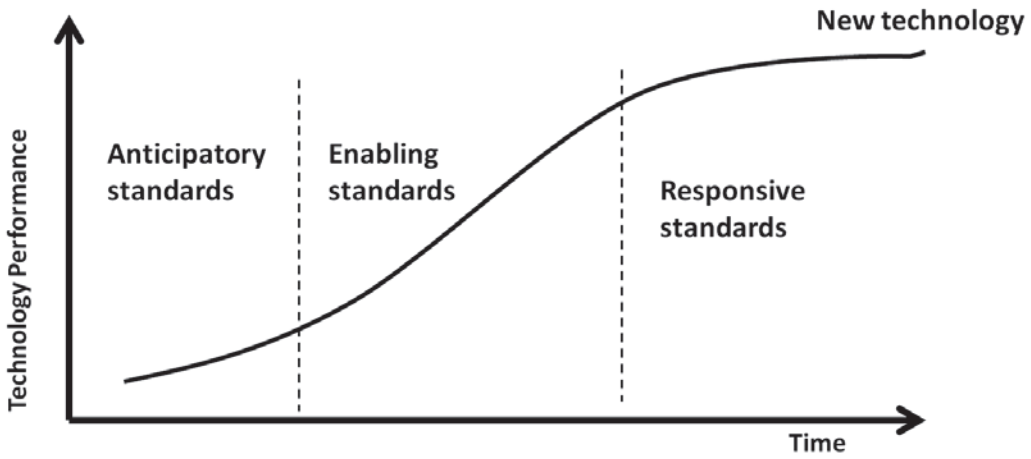

Figure 2: Standards and Technology Lifecycle[4]

try and society. Northwestern University Center for Technology and Innovation Management (CTIM) has developed a Standards negotiation exercise designed to bring out these challenges and strategic implications.

3. *Time-horizon and futures perspective differences*: Increasingly, and going beyond the above negotiation-demanding resolution differences, is the question of "for what time frames are the Standards to be actualized"? Thus, consistent with the increasing global nature of manufacturing operations and worldwide economic as well as environmental/energy pressures that are driving innovation, there is an early trend in Standards practice to push as mentioned above towards more *Anticipatory* – with sophisticated knowledge foundations and guidance for new and uncertain industry futures. Figure 2 illustrates how anticipatory (alongside enabling and responsive) Standards figure in technology life cycle.

   "Anticipatory" as opposed to the traditional "Backward Looking" legacy (or rear-view mirror) process of Standards setting tendency is just becoming evident in practice. But challenges facing anticipatory Standards include: How the transition from legacy systems and prior Standards will be facilitated; how innovation and flexibility will be enabled – avoiding a too soon lock into an approach; and, determining who should/must participate given that the Standard may cross knowledge and industry domains. The above discussion can be taken as a critical point of departure from Nonaka's "specific context" focus. Thus, while at a point in time a Standard has to be specific to a context if it is to be applicable, in today's world it must also have the capacity to evolve with changing contexts and also be "forward looking". In consequence, with a continuing and expanding playing field, the already wicked Standards setting and negotiating challenges become ever more so. And despite recognition that such Anticipatory Standards will need to become increasingly part of a norm, for the above hard-to-achieve reasons, they are rarely yet done or when attempted, done poorly.

4. *Standards setting skills requirements*: Implied by the above arguments, the capacity to set and/or accept a Standard compatible with own needs and goals but still be broadly acceptable across what a global industry group may demand is hard. It requires extensive but still deep (some describe as T-shaped) skills and knowledge of a company's or a nation's resources, cross-enterprise operations alignment requirements, competitive landscape and much more (i.e., of both practical

and likely interdisciplinary dimensions.) Moreover, Standards frequently embody considerable tacit knowledge that can be critical in enabling or constraining knowledge transfer, as those engaged in international Standards setting are well aware. In turn, they become significant long- as well as short-term success determinants in negotiating, about which participants need to learn. Included amongst other know-how, is the critical art of giving ground in the here and now to create a foundation of gain in the future. The educational and generally long-accumulated experience (again say "wisdom") requirements are obvious. Given the lack of formal Standards education opportunities and management difficulty in providing current generation employees with the fast upward mobile career paths that many seek helps explain the shortage in the U.S. of appropriately experienced candidates for such positions, and the consequential predominance of older practitioners.

5. *Impeding Standards knowledge dissemination limitations and solutions*: There are considerable written materials on Standards in the U.S. and abroad but these are largely limited to industrial Standards magazines or to be found in dedicated government sources. Faculty and managers not yet focused on Standards are unlikely to have much awareness of or make use of these. Notably though gaps are still evident, Europe and, particularly and increasingly China and Korea are substantially more advanced in Standards education than the U.S. In Korea, significant teaching can even be found beginning at the primary school level (Choi, 2009.) That the above picture represents a gap to be filled is indicated by industry pressure reflecting their recognition of the value of Standards and Standards education. Awareness of the implied need and of the potential for a joint and on-going community of industry and academic representatives helped drive the design of the two completed Northwestern University led workshops at which some 75 participated. These were supported by NIST and intended to attract faculty and managers with limited or no prior Standards familiarity. Accordingly, the importance of planning for Standards and active participation in their development was presented in the context of discussion of emerging smart system requirements. Selected because of its high priority and novelty, this focus made it more likely that participants would come with "open minds." Exercises and clinics addressing specific industry problems were offered[5]. Importantly, over 80% of the mixed industry-academic audience (see Table 1 below) expressed interest in continuing learning and in involvement, laying a foundation for further activity. Addressing these issues, a community generated website is in development with the goal of serving several audiences. The site will host and stimulate new Standards related papers (including highlighting papers that while devoted to other areas also address Standards.) And, most particularly, this site will seek to attract and support serendipitous learning.

An editorial panel of respected faculty and managers will provide quality control and help enable development, planning and materials review. *Proactive abstracts* will introduce and highlight the relevance of materials to problem and decision contexts. The website will also track usage and utilized pathways to help promotion, and 'legitimization" through established industry and academic vehicles such as conferences, and mainstream publications and the application of research on knowledge sharing, social media and vicarious/unplanned learning. Key initial website hubs will be selected from: Innovation, entrepreneurship; Engineering design (including dominant design); Marketing; Supply chain/value chain/alliances/ecology; Smart systems; Strategic planning (including platform strategies); Technical education, Negotiations processes and practice; and, Operations management.

V. CONCLUSION: STANDARDS, WISDOM AND BA

Returning to Nonaka's introductory essay in the

Table 1: Northwestern & GATIC with UCLA Standards Workshop Participants

Practitioner	Academic
Avery Dennison	California Institute of Technology
Corning	Georgetown University
Electric Power Research Institute	Harvard University
General Motors	Illinois Institute of Technology
IBM	Massachusetts Institute of Technology
Intel	Michigan State University
Korean Standards Association	Northwestern University
Kraft	Oregon State University
U.S. National Institute of Standards & Technology (NIST)	Purdue University
National Center for Manufacturing Sciences (NCMS)	San Jose State University
Rockwell Automation	University of California Berkeley
Smart Manufacturing Leadership Coalition (SMLC)	University of California Los Angeles
Underwriters Laboratory	University of Illinois
U.S. Department of Energy	University of Southern California
U.S. Office of Technology Assessment	Zhejiang University

Kindai Management Review, and the writing of Takeuchi also to be found there (Takeuchi, 2013), Standards seem to cross Aristotle's wisdom types, particularly when applied to emerging technologies that are increasingly science rather than engineering based and where the applications trajectory is all too often unclear. Under such conditions, appropriate Standards need to have delved into science at least as much as into technology/or manufacturing (*episteme* as well as *techne*). Ultimately intended to serve society the value of Standards is only evident if they are used, bringing *phronesis* into play. But challenging each of these and particularly *phronesis* are likely to be disagreements or disconnects among developers. The divergences derive, as discussed above, from the varying organizational as well as social/cultural backgrounds of Standards setters and negotiators, each drawing from different perspectives and agendas, and each with different levels of understanding of the underlying science and potential applications. This is particularly problematic in the wicked emerging technologies. Implicitly required is knowledge transfer {and, indeed Standards may embody deep knowledge} - but this is difficult.

Reaching back with Takeuchi to another of Nonaka's contributions (Nonaka and Konno, 1998; Nonaka and Toyama, 2003), what appears to be needed for success in bridging such gaps and developing useful Standards in emerging areas is the creation of a *ba* (shared context.) Northwestern's current efforts may move us in that direction. It may even be that the emerging Standards field can be an opportunity example to persuade Western audiences to finally embrace the value of the *ba* concept.

We are grateful for the insights provided by Nonaka, Takeuchi and others. We hope that we have added value in illustrating how their concepts can apply to an important applied area as we have seen for the under-considered areas of Standards and Standards development, particularly in wicked contexts. As we move forward in our work in this domain, we invite discussion, input and collaboration.

NOTES

1) Rittel and Webber, 1973 - introducing the term "Wicked Problems" to describe social policy problems; and Conklin and Weil, 1990.
2) See for example Chand and Davis, 2013.
3) See Ho and O'Sullivan, 2013 including their very useful review of related publications.
4) See for example Blind, 2009; Also relevant is

Sriram and Allen, 2000.

5) Derived from Sherif, 2001 Standards.
6) A description and analysis of the workshops and outcomes can be found in Puskar, E and Strauss, J. (2013).

REFERENCES

Blind, K. (2009.) Standardisation as a Catalyst for Innovation, *Inaugural Address Research in Management Series*. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1527333.

Chand, Sujit and Davis, Jim. What is Smart Manufacturing (Time Magazine cover story.) last accessed October 10, 2013 at https://smart-process-manufacturing.ucla.edu/about/news/time-magazine-what-is-smart-manufactuing.pdf.

Choi, D. , de Vries, H and Kim, D. (2009). Standards Education Policy Development: Observations based on APEC Research, *International Journal of IT Standards and Standardization Research*, Volume 7, Issue 2, 2009.

Conklin, E. Jeffrey and Weil, William. (1990) "Wicked Problems: Naming the Pain in Organizations," in Guindon, Raymonde (1990) *Designing the Design Process: Exploiting Opportunistic Thoughts, Human-Computer Interaction*, Vol. 5, 305-344.

Ho, Jae-Yun and O'Sullivan, Eoin (2013). Evolving Roles of Standards in Technological Innovation - Evidence from Photovoltaic Technology. 35th DRUID Celebration Conference 2013, Barcelona, Spain, June 17-19, 2013. Available at: druid8.sit.aau.dk/acc_papers/dftxtpfir8g7gcyrs1j66arx9sin.pdf.

Nonaka, I. (2013). From Information to Knowledge to Wisdom: My Journey. *Kindai Management Review*, Volume 21 February 2013, pp. 11-16.

Nonaka, I and Konno, N. (1998). The Concept of "Ba": Building a Foundation for Knowledge Creation, *California Management Review*. Vol 40, No. 3 Spring, 1998.

Nonaka, Ikujiro, and Toyama, Ryoko. (2003). The Knowledge-creating Theory Revisited: Knowledge Creation as a Synthesizing Process, *Knowledge Management Research and Practice* 1.1, 2003, pp. 2-10.

Puskar, E. and Strauss, J. (2013). An Emerging Perspective on Standards Education in Business Schools: Insights from NIST Supported Workshops. Associação Brasileira de Normas Técnicas (ABNT) Bulletin, Summer, 2013.

Rittel, Horst W. J. and Webber, Melvin M. (1973.) Dilemmas in a General Theory of Planning, *Policy Sciences*, 4, pp. 155-69, 1973.

Sherif, M. 2001. A framework for Standardization in Telecommunications and Information technology, *Communications Magazine, IEEE*, (April), 2001 pp.94–100.

Sriram, R.D and Allen, R.H. (2000), The Role of Standards in Innovation. *Technological Forecasting and Social Change*, 64(2-3), 2000, pp.171–181.

Takeuchi, H. (2013). Wise Leadership and Wise Capitalism *Kindai Management Review*, Volume 21 February 2013, pp. 17-27.

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