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Review: *Wellsprings of Knowledge*

Dorothy Leonard-Barton, *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation* (Harvard Business School Press, 1995, 334 pages, $29.95)

Barton's book is itself a "wellspring" for subsequent books and articles on knowledge management. Along with Nonaka and Takeuchi's The Knowledge Creating Company, it is one of the most frequently cited works -- and justly so. The book dissects the product development processes of different companies to reveal the factors that promote and inhibit innovation. In so doing, it uncovers a treasure trove of knowledge base publishing possibilities. Although the focus is on scientific and engineering innovation, the principles described are applicable to other kinds of businesses.

Two sides of a coin: core capabilities/core rigidities

In Part I of the book, Barton examines the capabilities along which all organizations must innovate: skills and knowledge base, physical systems, managerial systems, values, and norms of behavior. She shows how these capabilities can both support and inhibit knowledge creation using case studies from Chaparral Steel, NCR, World Aluminum, and others. Her discussion of why it is so easy for "core capabilities" to become "core rigidities" is particularly illuminating. Among the factors cited are:

• *Power of the past* - the disciplinary and functional specialties that helped a company grow inevitably find it difficult to integrate their different knowledge bases. Managerial systems which reward certain kinds of knowledge and bestow status on certain functions, disciplines, and roles inevitably shortchange others.

• *New tools and methods* - for a variety of seemingly rational reasons companies decide not to invest in new technology.

• *Limited experimentation* - technologists cannot easily conceive of experiments outside the realm of their expertise.

• *Screening out external knowledge* - this includes biased evaluations of new technologies and "listening to customers too hard."

While Part I is interesting, Part II contains the book's "meat and potatoes." It's here that Barton provides insights into key innovation activities: shared problem solving, implementing new tools and techniques, experimenting and prototyping, absorbing external knowledge, and learning from the market. Here are some gems.

Developing shared problem solving

Individual and organizational creativity is limited by background, training, and personal preferences. By rewarding specialists for pursuing their signature skills in depth, organizations create enclaves of specialized skills emotionally tied to people's egos and identities. Barton maintains that it's critical to integrate these enclaves. The first step in this task is what Gerald Hirshberg, director of Nissan Design International, calls creative abrasion -- conflict caused by the interaction of people with diverse signature skills and different areas of specialization. (A signature skill is an ability by which a person prefers to identify himself or herself professionally.) For example, Nissan Design hires people in pairs. A strongly rational, logical, and analytical designer is balanced by one whose enthusiasm centers on color, aesthetics, and pure form.

Other techniques for managing specialization include:

• Developing people with both deep theoretical knowledge and broad practical experience.

• Recruiting and promoting people with multi-disciplinary skills (e.g. music and computer science) , as well as "multi-lingual" capabilities

(e.g. able to operate in more than one specialized realm or utilizing more than one learning style).

• Retaining trained facilitators from the outside to mediate disputes.

• Managing "religious wars" about methods and technology by introducing philosophers and anthropologists into disputes.

Getting more from experimentation and prototyping

Barton maintains that organizations cripple their innovative capability when they ignore or mismanage failure. She suggests that companies make a conscious effort to force failure and then examine the reasons for it. Other techniques include creating expert users (project "guinea pigs") and conducting project audits ("post mortems") to identify failures and the reasons for them.

Absorbing knowledge from outside the firm

This section examines the effectiveness of various methods for acquiring new knowledge and/or technology: observation, licensing, R&D contracts, co-development, joint ventures, mergers and acquisitions. Barton cites a study (Link & Bauer, Cooperative Research in US Manufacturing, Lexington Books, 1989) showing that the rate of return for cooperative research is nearly 150% greater than that for internal research among non-cooperative firms, but she points out that there are many difficulties in managing technology-based "pre-competitive" agreements. Among her suggestions for increasing the odds:

• *Create porous boundaries*. Companies need to expose themselves to "bombardment" of new ideas from the outside, particularly the vast amount of knowledge in the public domain.

• *Scan broadly*. Examples are attending conferences and assigning staff to research posts at leading universities and research institutes.

• *Provide for continuous interaction*. Successful firms continually check the external status quo, not only at the beginning of a project, but during and after it.

• *Nurture technological gatekeepers*. Certain self-selected individuals expose themselves to more sources than their colleagues and become critically important nodes for filtering and disseminating knowledge.

• *Nurture boundary spanners*. These people understand both the world of the information source and the information receiver and can translate between the two. Boundary spanners are particularly helpful in framing the risk of a small company's technology in terms of the structured, formal analysis used by a big-company joint venture partner.

• *Fight not-invented-here*. To overcome often tacit and subtle opposition, some companies give a "Gold Thief Award" to encourage employees to look outside the firm for good ideas.

Learning from the market

Of all the external information available, none is more important than knowledge of the market. Barton largely ignores classic "market research" in this section (because she says it's so well understood) and concentrates instead on other techniques, such as:

• *Dialogue with lead users* --those that face needs that will be general in the marketplace, but face them months or years before everyone else encounters them AND those that are also positioned to benefit significantly by having a solution to those needs.

• *Empathic design* -- creating products or services based on an understanding of unarticulated user needs. This usually involves observing user behavior combined with direct interaction with technology designers.

• D*eveloping "market intuition"* -- Some technologists develop a feel for what the market wants now and will want in the future.

• *Nurturing "user-developers"* -- Many successful products and services were developed by users because the need was great and no other solution was available. In some cases, companies innovate by partnering with these users.

• *Anthropological expeditions* -- Next to converting users into develop-

ers, Barton maintains that this fulltime immersion in the customer environment is the most powerful aid in empathetic design.

Innovating in developing countries

The final section of the book deals with the special challenges of transferring product development capabilities into developing nations. Barton shows how this works in each of four stages: 1) turnkey factory, 2) adaptation and localization of components, 3) product redesign, and 4) independent product design. This section is valuable, not only because of the many case histories but also because global knowledge management is an area neglected by other writers. The bottom line is that innovation in a global context requires a long term commitment and the development of some new management skills.

Barton's book is valuable in two ways. First, it gives a detailed rationale for knowledge management and a guided tour of the terrain to be covered. Second, it shows through examples and case histories how real companies have grappled with the issues. It's a must-read for knowledge managers and knowledge base publishers. ❑