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Prospects for Knowledge Policy

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The maxim that the business of everybody is the business of nobody applies with special poignancy to knowledge. There are no ministries of knowledge. Knowledge lacks the cachet of technology and innovation. It lacks the specificity and urgency of information. Knowledge is diverse, complex, and context dependent—and rarely a topic of public discourse.

The transformative effects of information technology and the global economic environment are changing the nature and uses of knowledge—and challenging the policy domains in which it plays a critical role. The generation and management of new knowledge is linked to innovation, wealth creation, and economic growth. Europe has conspicuously embraced the goal of becoming the world's most competitive knowledge-based economy.

However, linking knowledge to economic growth is difficult. The value of knowledge can lie in its "infinite expansibility"—or in its novelty and enforced scarcity. The multifaceted and multivalent nature of knowledge makes it opaque—for academics and policymakers alike. There is too much to know about knowledge to be able to make intelligent decisions about it.

Rapidly changing technological and economic conditions make the problem worse. Knowledge is more important, more multifaceted, more multivalent than ever. In relative terms, we know less and less about more and more. Yet specific changes show the growing significance and need for informed policy perspectives on knowledge. One can point to

- The rise of information technology and the Internet as *knowledge infrastructure*,
- The Internet-enabled *explosion of codified knowledge*,
- Emergence of *innovation policy* as an essential tool for economic growth,
- The growing scope and significance of *intellectual property*,
- Recognition of *intangibles* as sources of value and liability,

- Disaggregation of the firm and the emergence of *markets for knowledge and technology*,
- Emergence of *knowledge management* as a practical discipline, and
- Increasing movement, sharing, and use of knowledge *across boundaries*.

While these developments challenge us to come to grips with the fabric of "knowledge policy," they also show that our understanding of knowledge is changing in ways that are exceedingly difficult to keep in focus. Knowledge policies remain balkanized and isolated under different institutions and areas of expertise. Unlike the information revolution, the knowledge transformation has no analog-to-digital shift and no discrete units like bits and bytes. Unlike other products of the information revolution, the transformation of knowledge cannot be readily priced and measured.

The unspeakable complexity of the knowledge economy is reflected in the struggle over how to understand, represent, and account for intangible sources of value.[1] But this specific and technical debate is only the most visible and persistent manifestation of the problem of generating usable knowledge about knowledge—a challenge whose infinite recursiveness seems to consign it to philosophy rather than social science.

We do understand pieces of the transformation from personal experience. Our knowledge about people, firms, and institutions has come to be constructed and framed by websites. We know the extraordinary power of search engines for extracting approximations of contextual knowledge. The success of open source software development offers graphic evidence of the economic power of knowledge networks operating outside (but adjacent to) priced markets and incentives.

Knowledge policy, such as it may be, remains widely dispersed in areas as diverse as intelligence and security, K–12 education, healthcare, patents, agency rulemaking, research funding, and the dissemination of agency information. It is hard to imagine a relationship between the established knowledge and basic skills taught in elementary school and the quest for new knowledge in science and technology. Yet K–12 education creates human capital that will serve the knowledge needs of the future.

The balkanization of knowledge policy was less at issue in the past because knowledge moved more slowly. Patterns of dissemination were institutionalized and stable. Without digital technology, knowledge did not readily transcend geographic location or institutional boundaries. National boundaries were less permeable, private knowledge was confined within vertically integrated firms, and intellectual property controls were more limited. Higher education was successful as a bridge between fundamental knowledge and new knowledge, but students rarely

came in contact with proprietary knowledge. In universities and the public sector, knowledge was presumptively public unless it was classified. (This presumption was especially strong in the United States, which rejects the notion of government copyright and, since 1974, has had a strong, broadly applicable Freedom of Information Act.)

The appeal of cyberinfrastructure lies in enabling users to overcome barriers of space, discipline, and institutional practice—and to liberate knowledge from original context. While it arises from the needs of scientific research, its greatest potential is as boundary-spanning general-purpose knowledge infrastructure available to school, work, and home. Like the Internet and the Web, it should bridge all sectors of the economy, public and private, facilitating the flow of knowledge within and across them.

The debates over privatization and commercialization of the Internet 15 years ago were resolved by defaulting to openness and interconnection among heterogeneous networks and users. Today, there is concern that security must be addressed in future generations of information infrastructure. How does this concern translate beyond technical requirements and to higher-level knowledge infrastructure?

Behind the enabling vision of cyberinfrastructure lies an expanding shadow infrastructure of rights-based contracts, practices, and institutions. Controls on intellectual property encourage disclosure and sharing of specific knowledge, at least within limited contexts such as business relationships or joint research projects. Yet in the aggregate these controls seem to become too trivial and commonplace, too hard to identify, and too easy to trip over.

What was once a relatively clear-cut distinction between open/public and controlled/private knowledge has been blurred. Boundary-spanning economic activity flourishes: joint ventures, alliances, standards consortia, open source development. . . . Ownership of knowledge is crafted to varying degrees of centralization and different configurations of openness and control. Just as a variety of financial instruments have proliferated, the benefits and risks of knowledge can be allocated and modulated ad infinitum by creative contracting. The excessive variety of open source licenses is evidence.[2]

At the same time, markers of intangible value are increasingly articulated and costly to interpret. Patents have more claims, embrace a much greater range of subject matter, and are written with a wider variety of strategic interests in mind. Unlike real property, a patent is not prima facie a right to exploit, it is a right to exclude, and its value depends greatly on the scope and strength of its exclusionary power. It may be very costly to determine who owns what knowledge with confidence, taking into account interpretation, other patents, ambient interests, and the likelihood of finding prior art that invalidates the patent. What are the values of

complementary knowledge assets? What are the owner's interests in asserting or sharing the property? Must these questions be addressed now or can/should they be deferred until later, when more may be known about technological potential, market demand, or competitive conditions? How should business relationships, industry norms, and the high cost of legal analysis and litigation be factored in? Like intellectual property, real property may be unique, but there are time-tested ways of determining its value with reasonable accuracy at a low cost. The problem is compounded by the fragmentation of the "owner." As the Enron debacle shows, institutional and firm boundaries can be obscured or confused by the proliferation of partially controlled entities and privately contracted ownership interests.

The fragmentation and blurring of ownership interests in elemental knowledge is disconcerting because it promotes the fragmentation of knowledge and its uses. A profusion of property interests cannot be managed with due attention, understanding, and deliberation on a cost-effective basis, especially when the interests are of low or indeterminate value. We see a number of market-based responses to this problem, such as:

- Patent pools—Rights to technologies needed to perform well-defined functions are assembled with a specific royalty and allocation of the revenue stream to patent holders.
- Cross-licensing—Rights to use portfolios are traded, often with side payments that compensate for aggregate differences in value.
- Nonassertion agreements—Mutual promises are made not to sue for patent infringement.
- "Mutually assured destruction"—There is an implicit understanding not to sue because infringement is commonplace and likely to be mutual.

Patent pools are both knowledge-intensive and rights-intensive, but the fact that both enabling knowledge and knowledge about rights to control are involved compounds the problem. It took longer to negotiate the MPEG 4 patent pool than it did to develop the standard in the first place. Patent pools also raise antitrust problems when a choice is made among substitutable technologies.

While patent pools may be quasi-public because of the competition policy implications, the other mechanisms operate privately with little accountability. Furthermore, they seem to undermine the exclusivity and disclosure that the patent system is supposed to provide.

Opacity does not merely inspire efforts and mechanisms to reduce the costs and risks of navigating highly distributed, poorly defined rights. It leads to asymmetries of knowledge that can be exploited to perpetuate market advantage or dominance. Those who lack sophistication in knowledge management, who lack resources to as-

sert or defend themselves, or who have sunk investments based on incomplete information are the most at risk. The nascent "patent troll" is a knowledge arbitrageur who is able to take advantage of opacity, asymmetries, surprise, and the vulnerability of sunk investments.

Judicious avoidance of knowledge is not necessarily a bad thing. Human attention and absorptive capacity are scarce. Opportunity costs may be high. We may do better to leave the details to trained professionals who have the epistemological and experiential frameworks needed to process knowledge. Users of knowledge and technology do not want to be overwhelmed by choices and the demands of decision-making that is peripheral to their core business. They want to trust their suppliers, and they want enduring relationships with both suppliers and customers. They want to reserve their attention for when and where their attention and action can have the most impact.

In the words of Alfred North Whitehead:

> It is a profoundly erroneous truism, repeated by all copybooks and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilisation advances by extending the number of important operations which we can perform without thinking about them.[3]

The same holds true for firms and institutions—all the more so when competition demands conservation and strategic allocation of business focus. Tools for performing without thinking are increasingly diverse and sophisticated. Just as writing obviates time spent memorizing, software drastically reduces the time spent on repetitive tasks of informing and learning. Firms buy off-the-shelf software because they do not want to expend the time and attention to develop their own word processors and spreadsheets.

Policymakers know well the necessity of making decisions based on incomplete knowledge abstracted under severe practical constraints from staff and outside experts. They know, as do writers and editors, that impact is not based on volume of expression but on the ability to connect with an audience that may have little patience and many competing demands.

Yet we have also become skeptical and distrustful of politicians, lawyers, the media, and other knowledge intermediaries. Businesses have become increasingly wary of being locked in to particular consultants, technologies, and sole-source solutions.

But where to draw the line is continuous in any competitive or public operation, especially where fast-moving technology is constantly reframing and re-presenting the problem. Do we buy-in or preserve options? Buy or build? In what time frame? Do we invest in internal capacity and ownership—or somebody else's tools and skills? Intellectual property or freedom of action? Not only tomorrow but 5, 15, and 30 years from now?

As global markets and the quest for sustainable advantage grow, these become questions of national and regional strategy—and therefore of public policy. Today, concern about software dependency and local capacity to develop and customize software is a factor in policy debate over government use of open source software, a long-term policy problem outside the conventional "total cost of ownership" calculus.

At the same time, there is growing recognition of the economic complementarity of commonalities and property rights, especially in the ICT sector, where standards are an essential platform for innovation and market growth. The report of the National Innovation Initiative embraces a broad practical vision of intellectual property as both open and proprietary. A section entitled "Proprietary and Public Domain Intellectual Property" speaks of "intellectual property" as a knowledge asset that can be private or public, observing

> [T]he evolution of the innovation enterprise—the trend toward user co-creation, the need for interoperability in complex IT networks and revolutionary advances in understanding about human biological networks—is putting pressure on traditional IP models and strategies.

More explicitly:

> From an intellectual property perspective, open and proprietary IP models should not be seen as mutually exclusive; rather the IP framework must enable both approaches. Because collaborative innovation is relatively new, however, the structure and processes to accommodate ownership, openness and access are evolving. New creative models are emerging across sectors. A mature, balanced understanding of the purpose and practice of standards, including the important role of open standards and global harmonization, is essential to further interoperability, spur technological innovation and expand market applications.[4]

Instead of a bright-line dichotomy between exclusive and a pure public domain, we now have a growing variety of models and strategies, often shared by multiple entities, for mixing openness and control. This mix not only involves degrees of control, but it reflects the importance of complementarity—the need to examine the context that grounds new knowledge in shared understanding and common language.

This is nothing new. Basic science has long provided a nonproprietary platform from which proprietary technology can be derived. However, the Internet and the Web have greatly expanded recognition of the importance of freely usable platforms into the realm of applied technology and services. Complementarity is an essential characteristic of systems technologies. Its nonproprietary/proprietary variant has become pervasive and important—in the ICT sector, in market-oriented innovation, and in free Web-based services such as Google.

At the same time, institutional and economic forces have pushed the legal boundary between proprietary and nonproprietary in the opposite direction. Standards of

utility and inventiveness have been lowered, making patents easier to get. At the same time, patents have become easier to assert—and, at least in the United States, available in all fields of human activity.

ICT-based systems of enablement and legally based systems of control do not pull against each other directly. Indeed, technology can be used to control, and law can be used to enable. Both are fed by the explosive growth of information and knowledge. In fact, these seemingly antithetical developments extend orthogonally, defining an exponentially expanded strategic space that offers vast new opportunities for combination, interaction, and complementarity.

While not necessarily antagonistic, these two dimensions of knowledge management remain rooted in two fundamentally different perspectives on the value of knowledge. One says that value lies in scarcity, the other that value lies in ubiquity. Scarcity-based value can be linked to priced markets; ubiquity-based value does not show on the books but helps create and maintain markets. Businesses in the digital economy must be able to work with both with sustained focus in the design of competitive offerings.

Policymaking by contrast is concerned with environments and how different enterprises and institutions may compete and evolve within future environments. The vision of cyberinfrastructure promises coherence and integration, but we know now that digitization brought far more differentiation than convergence, and that complex environments do not extrapolate well. Knowledge itself is increasingly protean, proprietary to infinitely varying degrees—promising access but demanding protection and inviting arbitrage. And policymakers, inured to acting on incomplete information, are already overwhelmed by the demands on their attention.

Politicians recognize the ascendance of knowledge, but what can they do about it? The exploding scope, volume, and significance of knowledge in the global economy now exceeds the more slowly developing analytic frameworks and statistical bases on which informed public policy can be made. Inherited models of the physical world —assembly lines, pipelines, hierarchies, ledgers, warehouses—die hard and slowly.

We know from software that knowledge can quietly encode and extend itself into infrastructure. We know from living that knowledge extends backward into its roots in the human psyche. We know that it spans the world outside and the world within.

We may be slipping into the riddles and paradox. Perhaps we are revisiting an earlier era when men and women tried to make sense of a world in which they had been thrust—a world with plenty of signs but without coherent explanation, except whatever stories they could conjure up to string the fragments together.

Today we test our stories against each other. We hope that these stories are compelling enough to carry beyond this book. We hope they speak to a world where

value is increasingly accorded to the creation, management, and distribution of what remains unknown.

Notes

1. For example, Margaret M. Blair and Steven M. H. Wallman, *Unseen Wealth: Report of the Brookings Task Force on Intangibles* (Brookings Institution Press, 2001).
2. http://www.opensource.org/licenses/.
3. *An Introduction to Mathematics* (London: Williams and Norgate, 1911).
4. National Innovation Initiative, *Innovate America*, Council on Competitiveness, December 2004, pp. 15, 44.