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Business Productivity and Organization of Knowledge: A Look at the Emerging Requirements

Abstract: Access to information—and classification techniques and methodologies that support that access—are already playing important roles in making information accessible to employees in the business environment. But most businesses are only beginning to solve the higher level requirements of enabling action, which is the domain of knowledge. The traditional document-oriented model itself is a stumbling block, because it focuses on the document as a large, inert information artifact, ignoring the ultimate business objectives of getting things done and generating competitive advantage. New models for organizational knowledge resources are needed, and classification approaches will still play a vital role, but such approaches must be highly adaptable, they must be formalized to accommodate technological implementations, and they must embody meta-principles for self-organizing knowledge resources in business environments.

1. Breaking Down the Boundaries of Technologies and Disciplines

The charter of the International Society for Knowledge Organization (ISKO) states its desire to function as "the connecting link between any and all institutions concerned with conceptual questions pertaining to the organization and processing of knowledge."

That description resonated more than a little bit with us at Knowledge Transfer International, "the Knowledge Management Company," and it reminded us once again that the solutions we are seeking and applying for our general business audience come from unexpected quarters.

We keep being surprised at the expanding range of disciplines and technologies concerned with "knowledge": brainstorming software, hypertext, expert systems, electronic publishing, help desks and help systems, groupware, information and library science, object-oriented information modeling, information interchange standards, semantic networks, technical writing, and a variety of methods for classifying the content of bodies of information, including thesauri, back-of-the book indexing, and computer-processable AI ontologies.

However, we should not be surprised, because we know that knowledge itself has become organizational infrastructure in business, superseding line-of-command organization and even trendy "process re-engineering" management strategies as the persistent glue of business organizations. Knowledge is the only constant, even though knowledge itself is fluid.

2. Information Science—Access to Information Resources

The requirements of the business community do differ from those of libraries. The differences are not hard and fast, but they are still significant. Our perception of information and library science is that it is fundamentally about access to information. And the lessons of information science are already highly relevant to every Fortune 1000 company, because all of them are concerned with information as a corporate asset.

That may be most evident in the popularity of document management systems for
networked environments. Such systems make direct use of classification in the form of "document profiles." And every good help system for software applications uses keyword search. So the need for effective methods of mapping access to information could not be greater, and no one is better qualified to create those methods than information scientists.

But "information" is not "knowledge." Most of us in the traditional documentation and training community perceive the role of information science as ending when information seekers find what they are looking for. We think of ourselves as standing where words and images are converted into individual and organizational performance—where information becomes knowledge and is turned into action.

Information retrieval expert Elise Yoder summed up her recent study of World Wide Web search tools with the following observation: "... it is apparent that ‘finding’ and ‘reading’ are just two activities among a spectrum of activities that include identifying promising resources, assessing the value of things that have been found, reading for understanding, and using the information to do work" (Yoder, 1995).

Successful access and reading must be followed by understanding and integration of that knowledge into personal experience. That knowledge enables action. Our experiences applying that knowledge refine it further, synthesizing it into new knowledge, which in turn must be made accessible to others, completing the upward evolutionary spiral of organizational knowledge development, management, and transfer.

3. How Is the Business Environment Different?

The growth and incredible pace of change of technology mean that everything we deal with in our business and personal lives is evolving toward greater complexity and toward greater information content. Nevertheless, the business environment’s needs are different of the typical community and university library environment—if not in purely qualitative terms, then at least in quantitative terms.

- **Businesses continuously create their own new information products.** If you are in business, you are in the business of creating new knowledge and creating information products, for both internal and external consumption.
- **Increasingly, the intellectual holdings live in a virtual, shared space.** Although the holdings of libraries increasingly take the form of electronic resources, companies are aggressively converting all of their information resources into centralized electronic repositories.
- **The need to adapt to change is much higher.** Bad or dated information itself must be rooted out and systematically killed, and classification systems themselves must change rapidly. For example, the category of Web-based document management systems did not exist a year ago, and new category represents a radical change in the distinctions among retrieval systems, document management systems, and other information-based World Wide Web technologies.
- **Size of holdings is not always an advantage to the information seeker.** Instead, it is often a disadvantage. The needs of the information seeker are immediate. Speed of access to solutions, not multiple documents, is vital. The corporate employee is not engaged in textual exegesis.
- **The information needs are critical.** Corporations are engaged in economic battle. Redundant, conflicting, or dated information must be reduced to "unique" kernels of true, relevant information. Lives and safety depend on it, too, in many cases.
4. How Do These Differences Affect the Organization of Knowledge in Business?

The business requirement is for knowledge, not just access to information. It would be hard to verify that assertion if you take a look at most businesses, which are still counting output of documents (or conversion of documents to electronic format) as a method of measuring their "success" in organizing corporate knowledge resources. Yes, access is very important, but it's only part of the requirement, not all of it, because action does not take place until information is converted into knowledge and performance.

The technology that is causing the problem—rampant, pervasive computerization and now almost universal networking—will provide some of the important tools that allows us to break the persistent constraints of the paper-based mindset. But we must do more new thinking before implementation and, in particular, we must take full advantage of the experience and solutions evolving in organizations like ISKO.

5. The Information Model Is Changing from "Document" to "Dialog"

We are already seeing a shift from the broadcast model of publishing—sending large, comprehensive information objects ("documents") to those who request them—to allowing information seekers to dial in and ferret out the specific information they need. The networked computing environment makes this change possible, even encourages the transition to information seeking as a process of dialog. The challenge facing the designers of information repositories shifts from providing "all" answers to (1) shaping resources to be more effective in providing knowledge and (2) telling information seekers how to ask the questions in a way that provides them with the answers they need most expeditiously and reliably.

[This second change parallels the general business trend of shifting costs and burdens to suppliers and consumers. The now omnipresent automated bank teller machines provide a good example. ATMs are tireless and work all night, but they put the burden of specifying the transaction on the bank customer instead of on a human teller.]

The business world's current model of knowledge transfer still rests on books and articles. But even in their snazzy electronic forms, books and articles are almost all still print-based at heart. (Most current implementations of "hypertext" do little to change the model.) The granularity of the resource is simply too large, and the burden of extracting knowledge is placed almost exclusively on the knowledge seeker.

Deconstruction and formal modeling of the resource are the first part of a general solution that will allow us to computerize the gathering and processing of knowledge resources, enhance their effectiveness, and leverage their value. It is not simply a matter of breaking books and articles down into smaller chunks—the approach taken by increasingly popular document management systems and by many hypertext publications. Knowledge resources must be "reverse engineered"—in effect inverting the processes we perform in assembling traditional documents—in order to identify the component elements, relationships, and even "behaviors" of those resources, accommodating the interaction between knowledge seeker and a body of knowledge generated by subject-matter experts.

Information must also be modeled for more effective communication. "Irrelevant" detail must be suppressed—or at least suppressible—so that we can read less and grasp important information quickly and easily. But detail must remain accessible, because one person's "irrelevant details" are another's critical kernels of information. Meaning and relationships of meaning must be made explicit.
6. The Importance of Classification

Classification is the second major part of the solution. But classification must be driven down to the more granular level of document components—adding metadata to small document elements and even to the relationships among those elements.

When we reach this level of classification of discrete elements, we reap the benefits of distributed development, precise specification, controlled change, and flexible re-use, because explicit classification schemes help make information processable by computers as well as accessible to humans.

A second benefit of classification is that it can make meaning more explicit and precise, providing greater understanding, not just better access and processability. The linking of formal ontologies to deconstructed information elements may serve as a form of—or a complement to—a system of classification. Together, they may allow computers to extend our intellectual reach by supporting precision, mastering complexity, and providing unfailing memory for millions of facts and relationships.

7. Distribution of Responsibility for Development and Optimization

The traditional assumption of technical communication is that effective documents and training systems are assembled carefully and proactively from research by an individual or small group, and designed for maximum impact on a well-defined target audience.

But given the pace of change, the growing need for effective information, and the demand for timeliness and customization, it is not possible for technical communicators—or anyone else in the typical business organization—to proactively build such resources for each newly identified requirement. So the burden of building and managing knowledge resources has to be shifted to everyone who contributes to or uses those resources.

Deconstruction and classification of knowledge resources will make it possible to shift the burden of building (and contributing to the continuous evolution of) network-based knowledge resources from "librarians" and "technical writers" to other members of the organization—and even to customers. Thus the construction of the knowledge resource can become a distributed, manageable task, much as entry of data into fields in a relational database can be distributed among thousands of people if everyone understands and adheres to a consistent set of rules and guiding principles.

How are these evolving requirements for organizing knowledge in business reflected in today’s practices?

8. Case Study #1: So Who Needs Classification???

In 1994, Morgan Stanley Trust Company (MSTC) found that its eleven globally dispersed functional groups lacked a complete set of operating policies and procedures. Many employees found themselves relying on fragmented and occasionally anecdotal information to do their jobs.

A prior corporate-level decision to create a paperless "electronic office" for propagating information efficiently and quickly had already put TCP/IP stacks in place, so MSTC chose World Wide Web architecture as logical mechanism for an organizational information resource.

Knowledge Transfer International (KTI), publishers of *KM Briefs* and *KM Metazine*, recommended developing an "intranet" that would serve as a "corporate World Wide Web" and provide internal e-mail, a bulletin board, and other functionality.

Policies and procedures at MSTC are inherently hierarchical—they encompass a series
of tasks and sub-tasks at the business unit, functional, and individual levels. Many are built around transaction processing systems, so ensuring that their presentation matches the hierarchy embedded in the work model is critical. Problems arise if a procedure isn't carried out according to the work flow embodied in a transaction system.

So how should MSTC's online information be classified for retrieval? The answer, at this time, is "Don't bother." The material is connected with structural hypertext links that directly reflect the work flow within the organization. In a sense, every document must be where it is because MSTC employees have well-defined job roles and correspondingly well-defined procedures. So who needs classification to make good use of the online documents? Certainly not those who use the system.

9. Case Study #2: Classification is Part of a $5 Million Difference


At the end of 1993, Digital had over 300 discrete internal databases of information about their products and services—helpful to their sales personnel and business partners, but not nearly as helpful as they might have been, because information isolated in business units prevented sales personnel themselves from presenting the full range of solutions offered by Digital. And at times, the product information in separate databases was contradictory, creating confusion among sales personnel and customers.

The solution was to create a central repository that replaced the separate databases. Of course, when you combine information once accessed by where it was found into one large, centralized database, you need to replace the organizational segmentation with enterprise-wide methods of identifying and extracting that information.

In a six-month span, the Information Repository group led by Deborah Bennett created a "common standard language" of Digital's products and services and built a library of keywords and synonyms—a rich classification system that reflected the logical organization of their promotional literature architecture. A team of 12 indexers schooled in information and library sciences had primary responsibility for building the library and assigning keywords to documents. During this period the group also evaluated the development efforts and audited the activities of employees using the new service.

What were the results? Even the development team was surprised by how rapidly Digital personnel took to using the system and by early demand for access to the system from Digital business partners. It may be hard to quantify the business benefits that rapid access and greater control over accuracy may bring, but Digital realized a direct savings of over $5 million dollars in dissolving the 300 separate databases.

10. Case Study #3: Classification in a Web Publishing Application

An electronic edition of the Communications of the ACM of August 1995—a special issue on hypermedia—is now available at http://space.njit.edu:5080/cacm/overview.html. This effort under the direction of Michael Bieber at the New Jersey Institute of technology employs two forms of classification: (1) metadata associated with each Web page and (2) semantic labeling of the hypertext links themselves—that is, you can view a meaningful description of the target of each hypertext link, and thereby decide whether you will actually traverse the link.

This Web publication is not a test bed for interface design, but it is a test of what value
these forms of explicit classification add to an online publication. The publication is still new, and no studies have been performed (at this writing, March, 1996) to analyze the results of this effort, but at Hypertext 96 Bieber provided at least one interesting observation about the authoring process: Most of the hypertext researchers in this collaborative effort had great difficulty generating good semantic labels for the links. This is surprising to me, because hypertext is a domain that is concerned with meaning and communication of meaning. Apparently, grasping the very notion of applying meaningful explicit labels was either very difficult for people without a formal understanding of the classification process or the participants lacked a commitment to doing it completely and well.

11. How Well Is Business Learning These Lessons?

Based on these and other cases, how well are business enterprises learning to organize knowledge? Not very well at all, it seems!

These case studies are still concerned with access to information, not with "knowledge" and its role in business organizations. Of course, raw access is a necessary first step, and some of the merits of improved access can be assessed by the initial savings they generate. But the need for access to knowledge that solves problems, enhances effective performance, and creates a competitive advantage is increasingly critical. Businesses will be forced to change their approaches, because we waste so much time if we cannot understand information and apply knowledge ... and ultimately re-use that critical asset.

Market forces should cause the change to happen. Think about the transformation of software application help systems over the past 10 years. They were once little more than online reference manuals. Now they contain rich hypertext relationships, they know your "context" in a limited way, and some of them even interact with you via "wizards."

It's impossible to draw statistically valid conclusions from three dissimilar case studies, but there may be some useful hints in this diverse sampling. The range of applications itself is instructive: (1) information tightly coupled with job functions, (2) information in a large central repository that requires sophisticated methods of classification and access, and (3) pinpoint location of the instances of an idea within a single publication.

Some conclusions that might be drawn from examining the case studies and the business requirements in general:

- **Downsizing will create opportunities.** There is a real, growing need to make information accessible, and there is money in it for information and library science professionals if the business requirement can be connected with information access and knowledge management.

- **Effectiveness will be evaluated.** If classification systems or practices fail to meet the audience requirements for effective access, the systems themselves will be changed on the fly. General principles for constructing adaptive classification systems will be vital.

- **Opportunities for experts in classification will exist, but they may center on design, not application.** Any time you can tell a business manager she can save $5 million, you are assured of an easy sell. (A positive sell on the quantitative merits of enhanced access may not be easy for some time yet.) But technology will replace application of classification systems by humans in many cases. For example, Digital will gradually replace its 12 indexers with selection of keywords by its own powerful Alta Vista Web search engine. And pattern recognition will supplement or even replace manual assignment of profiling information to bit-mapped images. Therefore, design and testing of classification systems, development of methodologies for applying them, and selection
of supporting technology may be the primary opportunities.

- **Metadata associated with information elements will encompass patterns of creation and use, not just meaning.** For example, new products from the Xsoft division of Xerox Corporation support attaching "business attributes" to information objects—not just attributes that categorize objects by meaning. Information may be seen in isolation, but it may also be viewed in the context of its development, change, and successful applications—that is, in its context as knowledge in business processes.

- **We will experience a transition in emphasis from information access to creation, management, and extraction of knowledge.** The business requirement is not just accommodating how people find information but how do they derive knowledge and performance from it. New information models based on the dialog of information seekers with electronic subject matter experts will require thoughtful new solutions.

- **All organizational stakeholders will participate in the building of corporate knowledge assets.** It's not possible to develop comprehensive top-down methods of managing all the knowledge resources in a company. There's too much of it, it changes too fast, and the need for accuracy and effectiveness will not diminish. The alternative is to enable bottom-up development of those assets in a participatory environment. Formal meta-principles for self-organizing knowledge resources will be vital, because we must use computers to assist the processes of knowledge development.

Information and library science people will also have to make the transition to the knowledge-based business paradigm. If they understand that the requirement is "Solve my problem" or "Give me a competitive edge," they can help lead that transition. The outlook for applying the lessons of information science—especially in the area of classification—should be good, because they transcend technology-driven solutions. But their success may depend in part on formal models that enable a wide range of supporting technical solutions.

**References**