

The Knowledge Matrix: A Proposed Taxonomy for Enterprise Knowledge

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The Importance of Taxonomy

During the Middle Ages, all substances of the earth were said to be made from combinations of four elements – earth, air, fire, and water. The modern field of chemistry could not have developed as fast and as far as it has without the more complex (and meaningful) classification that we have today – the periodic table of the elements. This table was created by the Russian chemist Mendeleev in 1869, and identifies key similarities and differences among the various elements.

Likewise, in the field of biology, the ancient Greek philosopher/scientist Aristotle classified organisms by whether or not they had red blood. It was not until the 1750s that the Swedish naturalist Linnaeus developed the taxonomy we use today, which starts with kingdom (like *Animal*) and ends in genus and species (like *Homo sapiens*).

In both chemistry and biology, taxonomies that today we think of as “wrong,” survived for centuries – mostly because they were *not* wrong. Animals *can* be classified by whether or not they have red blood – it is just not as *useful* a distinction as whether or not, say, they are warm-blooded.

Taxonomy is defined as “the branch of science, or of a particular subject, that deals with classification.”(1) A taxonomy, once codified, gives us a *common terminology* for describing aspects of the world. It forms a basis for *discussion*, which in turn forms a basis for *solving problems*. We label things in order to understand them; we understand them – intellectual satisfaction aside – in order to predict, control, and/or improve them.

In the business world, it is a common dictum that “if you cannot document it, you cannot manage it.” This is especially true of *intangible assets* (of which knowledge is one), since without documentation it is almost as if they did not exist at all.

Documentation of knowledge, then, is crucial to managing knowledge. However, most discussions of “knowledge management” fail to define exactly what it is that is to be “managed.” Without such definition – the foundation of any systematic effort to manage these assets – the structure is weak, and soon collapses. We are left, for example, with systems that index *documents* – as if all documents contain strategically valuable knowledge (when relatively few actually do).

Knowledge “lives” in many places throughout (and outside) the enterprise. It is notoriously resistant to traditional management tools of order, such as organization charts, vertical hierarchies, and geographic boundaries. As a result, as in the old fable of the three blind men and the elephant, each knowledge professional sees only a piece of the puzzle. The whole picture is not clear, and too often there is little coordination among the parts.

If one accepts the often-cited premise that well over 50 percent of the average corporation’s productive assets are intangible, it becomes obvious that it is extremely important to manage those assets – and a robust taxonomy is needed as a first step.

Current Knowledge Taxonomies

The Skandia/Canadian Imperial Bank of Commerce Model

To date, the main taxonomy proposed for intellectual capital has been the model developed at the Swedish insurance company Skandia, and as modified at the Canadian Imperial Bank of Commerce (CIBC). The Skandia model classifies all organization knowledge into two major categories with several sub-categories:(2)

- ▶ *Human capital*. “All individual capabilities, the knowledge, skill, and experience of the company’s employees and managers.” (Edvinsson and Malone, 1997)
- ▶ *Structural capital*. “The organizational capability, including the physical systems used to transmit and store intellectual material.” (Edvinsson and Malone, 1997) Structural capital itself comprises three parts:
 - *Organizational capital*. “Investment in systems, tools, and operating philosophy that speeds the flow of knowledge through the organization, as well as out to the supply and distribution channels” (Edvinsson and Malone, 1997)
 - *Innovation capital*. “Renewal capability and the results of innovation”, including:
 - Intellectual properties, such as trademarks
 - Other intangible assets, such as the theory by which the business is run
 - *Process capital*. “Work processes, techniques..., and employee programs that augment and enhance the efficiency of manufacturing or the delivery of services.” (Edvinsson and Malone, 1997)

The CIBC modification promotes *Customer capital* (formerly under structural capital and defined as the “valuation of customer relationships”) to a third major category equivalent to structural and human capital.

There is something inherently unsatisfying about these schemas. Perhaps they are aesthetically unpleasing in that they seem so lopsided. Also, the categories seem inexact and somehow to overlap with each other. (Are not customers human?)

However, the primary test of a taxonomy is *whether it works* – whether it helps us to understand, and thereby manage, the knowledge asset base more effectively. And most importantly it is here that the Skandia model goes astray. It requires the development of dozens of metrics (total assets, total assets per employee, and so forth – some of which are actual knowledge metrics, others of which measure other intangibles, and still others of which are financial and other operating metrics).

Eventually the Skandia model reduces to a single index that purports to measure all of the intellectual capital of the organization. This for us simplifies to the point of being much too simplistic.

Overall Structure of the Knowledge Matrix Taxonomy

The Knowledge Matrix model proposes two distinct and concurrent dimensions along which a “piece” of enterprise knowledge can be classified: its *nature as an asset* and its *content*.

- ▶ *Asset*. How does each item of knowledge exist as an asset? For example, is it a book, a magazine, or a database? We will examine four asset classes that

together form the *knowledge balance sheet* – in other words, that comprise 100% of the knowledge asset base of the enterprise. We will also describe the “gatekeepers” associated with each asset. That is, each of these assets tends to be associated with one (or more) organizational function(s), which typically purchases or develops the asset, and maintains it.

- ▶ *Content.* If we turn our asset classes sideways, we see that associated with each item of knowledge is its content – what it is “about.” For example, some knowledge elements are related to market opportunities, others to competitive threats that face the enterprise. We will examine five broad classes of knowledge content, which together we call the *knowledge compass*, after its configuration – four directional pointers emanating from a center hub.

The knowledge balance sheet and the knowledge compass form the perpendicular X and Y axes, respectively, of the Knowledge Matrix.

The Knowledge Balance Sheet

The knowledge balance sheet is a structure by which we describe the knowledge asset base of the enterprise. What *form* does knowledge take? Here, we see four major *asset classes* into which we can group various *categories* of knowledge assets. These four asset classes are: protected assets; purchased assets; produced assets; and people (see Figure 1).

Protected Assets

Protected assets are what we typically think of as “intellectual property.” They include the following asset categories:

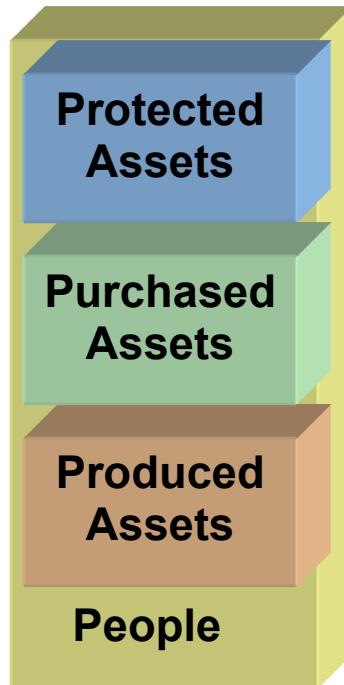


Figure 1: The Knowledge Balance Sheet

- ▶ *Trademarks.* Trademarks can include the words used to identify a brand (like Kleenex®), as well as the graphic logos used to identify these brands. They also include phrases linked with a brand, like FedEx's "Absolutely, positively overnight."TM Trademarks include registered trademarks (the ones with the little ® following them), and unregistered marks (typically followed by TM for a product or SM for a service). In the U.S., trademarks are registered with the Patent and Trademark Office. They are also protected by a variety of international treaties, as well as by the World International Property Organization (WIPO).

- ▶ *Patents.* Patents include proprietary formulas, inventions, and (recently) business models and processes. They too are registered with the U.S. Patent and Trademark Office.
- ▶ *Trade secrets.* Trade secrets are similar in content to patents, but are typically not formally registered, as patents are. In the U.S. various state laws, as well as the Economic Espionage Act of 1996, protect these.
- ▶ *Copyrights.* Copyrights are, literally, the rights to copy (and charge for) a piece of intellectual property, e.g., a book, movie, audio recording, and such. These are registered in the U.S. with the Copyright Office, which is part of the Library of Congress.
- ▶ *Brands.* Branding is a complex art/science, and the subject of dozens of books and hundreds of articles. In a nutshell, a brand is a trademark consistently associated with a certain type and level of user experience. (For example: If I eat under the “golden arches” of McDonald’s, I expect to reliably get a certain type and quality of food and service at a certain price.)

Purchased Assets

Purchased assets typically include assets produced by a third party, and purchased (or licensed) for internal use. They include

- ▶ *Periodicals:* magazines, newsletters, and so forth (both hard copy and electronic)
- ▶ *Commercial databases:* Factiva, Lexis-Nexis, for-pay Web sites like WallStreetJournal.com and such
- ▶ *Directories*
- ▶ *Books*
- ▶ *Syndicated reports:* produced by research houses such as Information Resources, IMS, Gartner, and such, and available to anyone who pays the subscription fee

- ▶ *Custom reports*: produced on-demand for a particular sponsor or set of sponsors, and not available to anyone else
- ▶ *Electronic media*: CD-ROMs and DVDs that increasingly supplement or replace printed forms of the categories listed above

Produced Assets

Produced assets are knowledge assets (e.g., lists, documents, databases) produced as part of another business process, as either a direct product or a by-product, and that have strategic value for the enterprise as a whole.

Specific categories of produced assets include:

- ▶ *Transaction data*. For example, credit card companies maintain huge databases of who charged what items, at what kind of store, at what time and day, and so forth. When aggregated and analyzed, this kind of data can have strategic value. (This is what “data mining,” also known as “business intelligence” software, is all about.)
- ▶ *Operating data*. Other kinds of data can have value as well, most often when aggregated and analyzed. For example, Dun and Bradstreet, which compiles credit histories of individual companies, is able to aggregate these data points into industry-wide databases that in turn have value as marketing and sales tools.
- ▶ *Strategic documents*. Strategic plans, product development memoranda, marketing plans, and sales plans all have great value. These mostly have “defensive” value, meaning their value is realized by maintaining secrecy about what they contain, rather than by selling them in an open marketplace.

- ▶ *Customer/client/prospect lists.* During the course of executing the marketing/sales process, lists of customers and prospects are developed and maintained. These may be kept in an integrated customer relationship management (CRM) system, on individual desktops and personal digital assistants, or even on 3 x 5-inch index cards.
- ▶ *Local databases.* In a more general sense, there may be other kinds of local databases that have value when aggregated.
- ▶ *Proprietary software.* Rather than purchase or license software from a third party (which in our taxonomy would be a “purchased asset”), companies may elect to develop proprietary software themselves. If successful, such software can provide *strategic differentiation* over other firms who compete in the industry. A good example is the proprietary trading algorithms that the largest Wall Street houses develop.
- ▶ *Internal best practices.* These may be kept in a formal database, but have value whether or not this occurs.

People

“People are our most important asset.” Whether companies actually believe this often-repeated business cliché is best reflected in how they actually care for, develop, and maintain such “assets.” But, we quite agree that collectively they are the most important asset of any enterprise, whether engaged in services, manufacturing, government, or not-for-profit work. There is a large body of knowledge and literature regarding the economic value of the “human asset”, which goes beyond the scope of this chapter.

Not only are people the most important part of the knowledge balance sheet, their knowledge is also the hardest part to manage. This is because most of their strategic knowledge remains *tacit*, meaning outside the boundaries of documents and databases.(3) Nevertheless, it benefits our taxonomy to be able to take the most important *indicators* of knowledge and begin to codify them, thereby managing them more rigorously. To simplify (which we must do in the interest of our overall goal of developing a robust taxonomy), the major value categories of people-as-knowledge-asset are as follows:

- ▶ *Education and training.* University degrees; training courses, such as those that earn Continuing Professional Education credits; workshops; executive education; and distance learning together constitute an important part of the knowledge base of the enterprise.

- ▶ *Experience.* Current and past projects or work-team assignments, completed within the current enterprise or in other organizations, can have strategic value.

- ▶ *Contacts.* The “communities of practice” to which an individual belongs or contributes can have great value. These can include:
 - ❑ Professional and trade organizations
 - ❑ Social, civic, charitable, or recreational groups
 - ❑ Organizational boards

- ▶ *Employment contracts.* One of the best ways to assure continued access to an individual’s knowledge is to put that person under an employment contract. Even retired employees can be contracted in such a way that the enterprise continues to maintain access to their expertise and contacts.

Management Challenges Presented by the Knowledge Balance Sheet

The primary challenge in managing these various asset classes is that they typically “belong” to widely dispersed and independent groups in the enterprise. Their respective gatekeepers (whose budget power is used to acquire and maintain them) are typically not connected to each other. As a result, the typical enterprise is left with a series of *knowledge tactics* – but little in the way of true *knowledge strategies*.

The typical gatekeepers for the asset classes we reviewed are:

- ▶ *For protected assets*: the legal department (for existing properties); the R&D department (for properties under development); the marketing function and/or outside advertising agencies (for brands)
- ▶ *For purchased assets*: the library
- ▶ *For produced assets*: the respective “producer” business operating units; the IT function
- ▶ *For people*: the human resources department; individual operating units

To manage knowledge strategically, linkages need to be built among these far-flung gatekeeper groups.

The Knowledge Compass

In discussing knowledge as an asset, we have been essentially “content-neutral.” For example, all databases may be purchased by the organization’s library, regardless of whether their content pertains to business opportunities, competitive threats, patents and technologies, and so forth. However, the functions that *use* these assets are different – Sales, Competitive Intelligence, and R&D, respectively. One of the essential challenges of KM is that *knowledge assets are typically purchased and maintained in different ways than they are used*.

The knowledge compass attempts to manage this paradox by concurrently classifying knowledge assets by a second set of characteristics: by what they are *about* (as a proxy for how they are used). These content categories intersect the asset categories described earlier in matrix fashion. We will keep the categories broad, in order to achieve comprehensiveness while maintaining comprehensibility.

Our categories of what knowledge is about include two major dimensions, each of which has two endpoints (see Figure 2). The two major dimensions are knowledge about events, entities, and such that are *internal* to the organization; the other involves *external* events, entities, and so forth.⁽⁴⁾ The internal dimension includes *product* knowledge and *process* knowledge. The external dimension includes knowledge of *friends* and *foes* of the organization. At the center of the compass rose is knowledge about *people*, as people exist in both internal and external dimensions.

Product Knowledge

Product knowledge includes knowledge that typically goes into the products (or services) we make and offer for sale. It can include

- ▶ *Basic science*
- ▶ *Technologies in the public domain*
- ▶ *Proprietary technologies*
- ▶ *Product features and benefits*
- ▶ *Brands*

It is often captured and managed in the form of *intellectual capital*, that is, protected assets as we have defined them above. This includes trademarks, copyrights, patents, and trade secrets.

Process Knowledge

Process knowledge includes the way we do things. It can comprise:

- ▶ *Technology processes*, such as how to manufacture a computer chip
- ▶ *Business processes*, such as how to bring that chip to market
- ▶ *Project results*

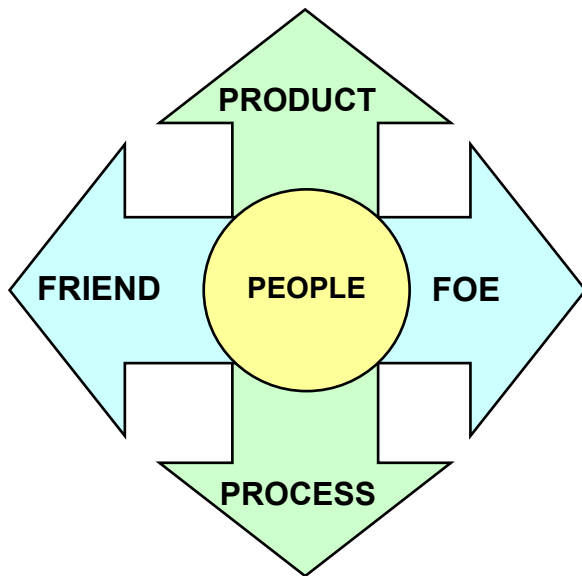


Figure 2: The Knowledge Compass

VERTICAL = the internal dimension

HORIZONTAL = the external dimension

It can also include comparative elements:

- ▶ *Internal best practices*: the best solution set developed within our organization
- ▶ *“Best-in-industry” practices*: the best solution set developed by *any* company in our industry
- ▶ *“Best-in-world” practices*: the best solution set developed by *any* company in *any* industry

Friends Knowledge

Friends knowledge is the first of our two external categories. It includes all entities, forces, and such that are external to the organization and are primarily *positive*. These represent opportunities for the organization and can include:

- ▶ *Customers*: the end users of our products or services
- ▶ *Channels*: retailers, wholesalers, distributors, resellers
- ▶ *Suppliers*
- ▶ *Complementors*: makers of products that render our products more valuable (for example, PC manufacturers if we produce software)
- ▶ *Market trends*

Foes Knowledge

Conversely, *foes* knowledge includes knowledge of entities, forces, and such that are primarily *negative* to the organization. These represent threats to the enterprise and can include:

- ▶ *Direct competitors*: those who sell what we sell to the same markets to which we sell
- ▶ *Potential competitors*: those who have the basic competencies to become direct competitors, but have not as yet done so
- ▶ *Substitutes*: products that, though based on different technologies, offer similar benefits to end-users as our product (for example, trains if we provide local air travel)
- ▶ *Critical issues*: factors that may have interests counter to those of our organization, for example government regulations

People Knowledge

People stand at the crossroads, as they may be “internal to” (that is, employed or otherwise financial engaged by) the enterprise, or they may be “external” (everyone else).

Such people can include:

- ▶ Internal experts
- ▶ External experts: consultants, academics, channel partners, securities analysts
- ▶ Communities of practice: trade associations, professional groups

Several existing management practices already acknowledge the role of such networks:

- ▶ *Alumni relations.* Large consulting firms, for example, often retain active networks of former employees. These form a vast knowledge base and are also helpful in gaining new assignments.
- ▶ *Analyst relations.* Technology companies, for example, typically have formal programs to cultivate relationships with the analysts who report on their products and services.
- ▶ *Academic relations.* Many Silicon Valley companies and investors, for example, maintain active relationships with research universities, such as Stanford University.

Note the distinction between this *knowledge about people* and the asset category of *people*. In the latter, we are talking about people as a vessel for knowledge, as a form that knowledge often takes. In the former, we are talking about the knowledge of *who those people are* who know what they know. (It is admittedly a bit confusing at first.) Here, it is “who knows about X.” As an asset, it is the “X knowledge” itself that we are describing.

The Knowledge Matrix and What It Does for Us

We have discussed four major knowledge *asset classes*, and five major knowledge *content classes*. Now we can envision a 4 row x 5 column matrix (Figure 3). Every piece of enterprise knowledge maps into one of the 20 cells in this matrix. A database that contains information

about possible competitors goes into the “purchased/foes” cell. A trademark for a new product of ours goes into the “protected/products” cell – and so forth.

Each cell is subdivided into the specific asset and content categories listed previously. It is possible that any single asset will fit into more than one cell. A database, for example, can contain information relevant to both customers and competitors.

		CONTENT CLASS				
		PRODUCT	PROCESS	PEOPLE	FRIENDS	FOES
ASSET CLASS	PROTECTED					
	PURCHASED					
	PRODUCED					
	PEOPLE					

Figure 3. The Knowledge Matrix.

What is the value of this rationalized taxonomy? We believe there are several major kinds of benefits:

- *Enables a knowledge inventory.* The first step in any serious effort to manage knowledge is the development of an inventory of what that knowledge is. Specific asset values can then be evaluated against their costs, and overlapping assets can be eliminated. Non-productive assets may be able to be sold or licensed, creating incremental revenue. Thus, the knowledge inventory is the first step in increasing the return on investment for the knowledge process as a whole. The Knowledge Matrix represents a model that can be used as the basis for such an inventory. It represents the “chart of accounts” into which specific knowledge assets can be classified and documented.

- ▶ *Increases knowledge accountability.* A knowledge inventory enables a level of *accountability* for each knowledge asset. Specific gatekeepers can be assigned whose responsibility includes maintaining and safeguarding each asset.
- ▶ *Promotes knowledge integration.* One of the current roadblocks to managing knowledge effectively is that knowledge is typically *managed by asset class* (for example, lawyers manage the protected assets; librarians manage the purchased assets; and so on). However, knowledge is typically *applied by content class*. The request most often heard by knowledge services providers is “Give me everything we have on topic X.”

And it usually means just that—everything—regardless of whether it is in a database, a consulting report, or a conversation a salesperson had with a customer that morning. Having this kind of matrix in a relational database, updated in real-time, enables a rapid response to that kind of request.

- ▶ *Forms the basis of a knowledge gap analysis.* At least as valuable to knowing what we know is knowing what we do not know. A matrix such as proposed here enables us to identify and correct gaps in our knowledge base.
- ▶ *Heightens knowledge security.* If we are serious about protecting our knowledge assets—and these days, an assault here is a real possibility—we must know where these assets sit in the organization so that these positions can be fortified against unauthorized access and misappropriation.

CONCLUSION

Notwithstanding the apparent importance of developing strategic taxonomies for enterprise knowledge, various alternative schemas have not been forthcoming. The development of a robust model for enterprise knowledge is a crucial step for KM to take if it is to be an effective management discipline. We offer the Knowledge Matrix model discussed in this chapter as a next stage – in the hope that it will be developed and improved in the future.

Endnotes

1. *The New Shorter Oxford English Dictionary* Oxford University Press, New York, 1993.
2. *Intellectual Capital*, Leif Edvinsson and Michael S. Malone. HarperBusiness, New York, 1997.
3. Indeed, I have argued elsewhere (*Ten Myths About Knowledge Management*, address to the 2001 Online Conference, New York, NY) that *all human knowledge is tacit*, and that any explicit or codified “knowledge” is essentially *information*, not true knowledge. The latter distinction I have also explored elsewhere (“The Knowledge Value Chain: How to Fix It When It Breaks,” *Proceedings of the 22nd National Online Meeting*, M.E. Williams ed. Information Today, Inc. Medford, NJ, 2001).
4. We acknowledge that, increasingly, knowledge-based management is about making the distinctions between “internal” and “external” seem rather old-fashioned and less useful than it once may have been.