TAXONOMY FOR THE FUTURE: ORGANIZING FUTURES INFORMATION INTO A NEW HIERARCHICAL STRUCTURE

by

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INTRODUCTION

> The future now as always depends on understanding the natural and human world, identifying important questions/problems, answering/solving them, discovering and inventing, creating beautiful and useful things, and making good decisions. Which of these doesn't depend on access to information?
>
> —Ramana Rao[1]

Searching the Web currently costs business $107 billion dollars per year.[2] Methods available to typical information users are clumsy and time consuming. Improvements in the structure of information delivery would increase productivity by saving time and money. One structured approach is taxonomy, traditionally used in biology for organizing plant and animal species. It is now being adopted for customized information delivery systems and Web site information architecture.

Taxonomy organizes the ideas of specific subjects into hierarchies. This is a different approach from library classification, which attempts to organize all knowledge into one generalized system. In my role as a librarian and taxonomist, I have heard complaints about the treatment of futures studies in library classification. Futures researchers are not alone in their criticism. Library classification attempts to standardize all knowledge, so certain subjects are not fully developed or are poorly organized.

However, by following the example of Linnaeus, who developed the plant and animal taxonomies, customized hierarchical structures can be designed to organize information and improve understanding. The taxonomy model can be used for any subject, including the specialized knowledge of futurists.

In this article, I will analyze futures studies as it is classified in libraries and develop a "Taxonomy for the Future" (TFTF). My goal is to design a structure that will improve the organization of futures studies materials and support the research methods of futurists. Taxonomies can be customized to provide enhanced information to a specific population by using perspective, personal and persuasive techniques. Taxonomy is also a component of some of the most ad-

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vanced information systems, including the Semantic Web.

LINNAEUS AND LAMARCK

In 1736, the Swedish botanist Carolus Linnaeus invented taxonomy when he published *Sistema Naturae*, a hierarchical presentation of the names of plants and animals. In this organizational structure, the species *Canis familiaris* (domestic dog) is part of the carnivorous order of the mammalian class of the animal kingdom.

The elegant and simple design places each species within the context of its relationship to other species, organizing them by their physical characteristics. The Linnaean classification itself creates knowledge about the nature of life on earth. Any given category, except the first one, is a subset of the preceding classification and each category in the hierarchy has meaning.

Linnaeus assigned vertebrate animals the four phyla of mammals, birds, reptiles, and fish. The rest of the animal kingdom only got two phyla. Insects included crustaceans. *Vermes* or worms accounted for everything else. This was resolved by the French biologist Jean-Baptiste Lamarck, who coined both the terms "invertebrate" and "biology."

Lamarck is often ridiculed for his belief in acquired characteristics, a pre-Darwinian theory of evolution. However, he also disproved the theory of linear evolution.[3] In this theory, God created all animals in a clear line from least evolved to most evolved. This line is replicated within each group of animals.

As an invertebrate specialist, Lamarck began working with the new Linnaean taxonomy. He was particularly interested in mollusks and recognized that they were quite different from all other worms. He developed more phyla for invertebrates, using the linear theory to build a logical order from least complex to most complex.

Lamarck continued working on taxonomy in invertebrates, trying to fit each animal into its appropriate linear placement. As work progressed, he began to recognize that some animals were more evolved in certain ways and less evolved in other ways, which caused him to question the linear theory. Lamarck eventually revised his thinking and in 1815 developed the branching system of biological classification that we use today. Animals do not evolve in one line from primitive to advanced, but rather evolve in different directions. For Lamarck the very process of designing an organizational structure led to a major scientific discovery on the relationships of species. Thinking about the organization of information helped him to make sense of the information.

LIBRARY CLASSIFICATION

Library classification is hierarchical. However, its goal is to put books on shelves, not to make sense of information. The two major systems in the United States are the Library of Congress Classification (LC), primarily used in academic libraries, and the Dewey Decimal Classification (Dewey), for public libraries. The international Universal Decimal Classification (UDC) is based on the Dewey decimal theory and tends to be used outside of the United States. The Library of Congress now maintains both its own classification and Dewey, supplying cataloging and call numbers for both systems.

Melvil Dewey published the first edition of his decimal classification in 1876 at a time when the publishing industry was booming and libraries couldn't keep up with all the new books. Contemporary procedures involved much reorganizing and rewriting at a time when the typewriter was only just being invented. At the beginning of the 20th century, LC amplified on Dewey's ideas and developed their own system.

By the nature of the endeavor, Dewey and LC are designed to organize all of published knowledge. They are necessarily lacking in the details of specific subjects. Library classification also organizes information from only one perspective, so patrons must adjust their thinking to agree with the classification.

The main purpose of these systems is to build call numbers that place books on shelves. They are not intended to provide a library patron with access to knowledge. For that, the patron interacts with subject headings. Librarians rarely offer classification as an entry point into the collection. They consider it to be a professional tool only. The Dewey classification printed its 22nd edition in 2003. However, the most current versions of Dewey and LC are available online for a subscription and are generally not provided to the public. Of course, we still have books that need shelving, but many information sources are changing to digital formats that do not require call numbers, limiting the usefulness of traditional library classification.

Futures Studies in the Library

To analyze the treatment of futures studies in library classification, I elected to use Dewey rather than LC. The primary difference between the two systems is that Dewey uses only numbers for classification, where LC uses a combination of letters and numbers.[4] This gives Dewey ten major classifications, while LC could have up to 26. Dewey has an index and it employs a method of standard subdivisions to create uniform classifications throughout the system. Its schedules are more compact and easier to use for this

type of exercise. All of Edition 22 fits into four volumes.

My first step was to create a sample bibliography of books.[5] One source of titles was the online bookstore of the World Future Society (WFS).[6] Another was the "One Hundred Most Influential Futurist Books" by George Thomas Kurian in the *Encyclopedia of the Future*[7] (TFTF: Futures Studies—Reference).[8] A third source was my own collection of books. Other titles found their way onto the list as the process continued. Some titles that were part of the organizational process were edited out for space reasons.

This list is not designed to be comprehensive, nor does a title's inclusion imply any sort of literary or even futurist value. This is merely a sample list of 343 books that might be used in futures research. It's even somewhat quirky, since the WFS bookstore sells a lot of business books. In order to be on the list, with rare exceptions, a title had to be cataloged by the Library of Congress and include a Dewey classification.

My method in the study was to find each title on the Library of Congress Web site,[9] and determine the Dewey classification. I then organized the titles by the Dewey numbers assigned at the time of publication. A new edition of the Dewey system is published every few years, and I used Editions 17 through 21.[10]

The Future as Defined by Dewey and LC

An English translation of Bertrand de Jouvenel's *L'Art de la Conjecture* (TFTF: Futures Studies—Techniques—Forecasting) was published in 1967 and classified by a Dewey cataloger in the following manner:

> 100 Philosophy, paranormal phenomena, psychology
> > 130 Paranormal phenomena
> > > 133 Parapsychology and occultism
> > > > 133.3 Divinatory arts
> > > > > 133.32 Predictions

De Jouvenel would probably have been horrified by the characterization of his work as divination. He stated in the book, "It is utterly implausible that a mathematical formula should make the future known to us, and those who think it can would once have believed in witchcraft."[11]

LC does not reclassify books, so *The Art of Conjecture* remains in "Paranormal phenomena." However, the study of the future is now deemed more respectable by Dewey. In the 20th Edition, the term "Forecasting and forecasts," was made a standard subdivision, a category that can be added to any classification in the entire Dewey system. As a demonstration, here is the structure for *Visions: How*

Science will Revolutionize the 21st Century by Michio Kaku (TFTF: Technological—Forecasts):

> 500 Natural sciences and mathematics
> > 500 Standard subdivisions[12]
> > > 501 Philosophy and theory
> > > > 501.1 Systems
> > > > > 501.12 Forecasting and forecasts

This set of four categories, represented by the number 0112, can be added to any subject.

Using "Forecasting" as a standard subdivision is one reason for Dewey's poor classification of futures studies materials. The study of the future is defined throughout the system as a tool for use within another subject. While this is actually a fairly accurate description, it means a lot of hiking around the library for futurists. In my sample, classifications for "Forecasting" range from 003 to 658.

There is one place within Dewey where "Forecasting and forecasts" is placed at a higher category level and is not contained by a different subject:

> 000 Generalities
> > 000 (Place marker)[13]
> > > 003 Systems
> > > > 003.2 Forecasting and forecasts

In my sample of 343 titles, the only two books classified in 003.2 are J. Scott Armstrong's *Principles of Forecasting: A Handbook for Researchers and Practitioners* (TFTF: Futures Studies—Techniques—Forecasting) and *What Futurists Believe* by Joseph F. Coates and Jennifer Jarratt (TFTF: Futures Studies—Profiles).

The system of standard subdivisions also results in books being classed by such useful characteristics as the number of authors. Using this method in the fiction classification, books are first divided into two sections: titles by one author and titles by more than one author. Then they are secondarily organized by genre. Many public libraries simply ignore Dewey and organize these books by genre and author in a general "Fiction" area.

One might presume that the problems with library classification are unique to Dewey and that the LC system is superior. However, LC just has a different set of problems. For example, at various points in the hierarchy, LC employs alphabetical order. In my article on Snoopy's taxonomy,[14] which examines the library classification of animals, dogs, beagles, and cartoons, I observed this arrangement of animals in the LC science structure, "Cats, wild...Dogs...European wildcats."[15] Dewey may distribute titles by the number of authors,

but LC is tossing the dogs into the wildcats.

JERRY'S FAST TRACK TO MOSAIC

In 1994, Jerry Yang and David Filo wanted to keep track of their favorite Web sites, so they developed Jerry's Fast Track to Mosaic.[16] Within a year the Stanford engineering students had changed the name to Yet Another Hierarchical Officious Oracle or Yahoo! They revolutionized the way an average person seeks information and invented a primary method for presenting information on the World Wide Web. They did this by building a hierarchical directory to the Internet and offering it to Web surfers who visited their site.

Unlike traditional library classification, which is available to only the most intrepid library patron, Yahoo! users were encouraged to visit the site and to interact with the classification hierarchy. In a printed version of Yahoo!, published the year after their site first became available, Jerry and Dave appealed to laziness, "Yahoo!'s tree directory structure already has been carefully designed to yield very fast results with almost no planning on your part."[17] The surfers liked it. They liked browsing the subjects. They liked drilling-down to exactly the point of interest.

According to engineers Jerry and Dave, the hierarchical approach is mathematically superior to the search method:

> Suppose you are looking at a hierarchical set of choices such as Yahoo!'s.... The first layer might contain fifteen choices, and when you pick one of those choices, the next layer might offer twenty choices, and then the third layer might give you a list of fifty choices.... Looking at the numbers, when you pick something at the third level you have selected from 15,000 possibilities.[18]

For the user, this method offers more control over the information discovery process. The hierarchy presents a list of related subjects and the users select the ones that most closely meet their interests. The results are a set of hits with significant information. Compare that with the typical search engine process, where the user enters a set of terms and is presented with 15,000 choices in an order of relevance defined by the search engine and not by the user. (This may be where some of that $107 billion per year in search costs is going.) Many search engines now offer a browsing hierarchy. In addition, complex Web sites typically contain some sort of hierarchical display.

Like library classification, the Yahoo! hierarchy organizes all of human knowledge, or at least the part of human knowledge that has a Web site. The hierarchy was not designed to be a cataloging tool

or an organizing method for any particular subject. It's a fast way to get to cool Web sites. Here are the hierarchies for futures studies:[19]

Arts	Social Science
Humanities	Futures Studies
Philosophy	Institutes
Transhumanism	Journals
Extropianism	Transhumanism @
	Extropianism @

The Yahoo! structure demonstrates another organizational technique. Transhumanism is contained by both "Futures Studies" and "Philosophy." In the structure, its primary relationship is with "Philosophy" in "Arts," as indicated by the "@" sign when it is placed as a section of "Futures Studies." In practical physics and traditional library classification, a book can sit on only one shelf, so subject headings account for a title's multiple topics. However, in cyberspace anything can be anywhere at any time. Instead of using a set of cross-references, with cumbersome "see" and "see also" notation, Yahoo! just puts categories in more than one place at one time.

When they organized Web sites into a hierarchy, Jerry and Dave introduced the idea of taxonomy to a new population of Internet users. Their visitors, presumably familiar with library subject headings, were invited to interact with the hierarchy. They discovered that a classification system is a highly efficient method for finding information. It saves time and money by presenting only relevant data. As Yahoo! grew, Jerry and Dave hired a team of librarians to maintain the structure.

TAXONOMY FOR THE FUTURE

The word taxonomy comes from the Greek word *taxis* which the Ancients defined as "arrange" and modern Greeks use for "tidy." It is similar to such arrangement words as taxidermy. The other tax word comes to us from the Latin *taxare*, to assess, and is related to taxicabs. They both come from the Indo-European root of *tag*, to handle.[20]

In my "Taxonomy for the Future," resources are arranged in a manner specifically designed for futurists. It includes the same list of books that required 587 categories in Dewey. The "Taxonomy for the Future" in Figure 1 (see page 47) has 143 categories.

The categories in the "Taxonomy for the Future" are not comprehensive. They cover only the books in the sample. There are major areas of futures research not included in this taxonomy. I would be happy to look at suggestions for additions or rearrangements.

In addition, like most catalogers, I have not read the vast majority of these books. However, catalogers almost always have the book in hand. Since this is a sample exercise, I had only the titles and the call numbers. Online and print bibliographies helped to determine the subjects of the books and to place each title into the single best category.[21] [22] Some books are surely categorized incorrectly and I offer my apologies. I would be delighted to receive suggestions for better placement of any title.

One goal of taxonomy is to describe a subject area using a hierarchical construction in the professional vocabulary of the subject's practitioners. While I did have access to futurist glossaries,[23] it may be that I am using non-standard terminology. Vocabulary suggestions would also be welcome.

Introducing STEEP

The first challenge in developing the "Taxonomy for the Future" was to analyze the titles and select an organizational theme to help users visualize the subject. A theme is a common device in information architecture and is often called a metaphor. For example, the shopping cart on a Web site is a metaphor that represents the shopping experience. In my taxonomies, I have used geography to organize geothermal information; statewide educational mandates for a teacher's professional library; and other similar organizing structures. Linnaeus himself used the theme of biologic similarity. He was reacting to a previous attempt to organize the natural world by location.[24]

The theme that I chose for the "Taxonomy for the Future" is STEEP,[25] a forecasting technique that looks at events in terms of their social, technological, economic, environmental, and political impacts. In this taxonomy, the STEEP structure organizes resources that a futurist might use in a research project.

The first section of the taxonomy is "Futures Studies," which covers the profession and techniques of futurism. The next primary category is titled "STEEP" and includes works that encompass more than one STEEP concept. Finally the five components of STEEP round out the taxonomy. Therefore, the basic organizational structure includes seven major categories: Futures Studies, STEEP, Social, Technological, Economic, Environmental, and Political. All the subjects in the taxonomy fit into these categories.

There are several non-traditional aspects to the structure. The major categories are not in alphabetical order. They are in STEEP order, a more logical presentation for futurists. In addition, even though the last five categories are sub-categories of STEEP, they are presented at an equal level, so there is one less drill-down for these primary categories. Finally, the five STEEP categories are adjectives

not nouns, since I have observed that, within the STEEP method, futurists express these concepts as adjectives.

The system is designed to be simple and easy to use. It can organize any type of futurist resource, including articles and Web sites. However, for this exercise I used only book and serial titles, in order to compare standard library classification with taxonomy. The "Taxonomy for the Future" is presented in Figure 1 as if it were to be used to organize a collection of hardcopy titles that can be in only one place at one time.

Perspective Taxonomy

By using STEEP as an organizational metaphor, I built the taxonomy from the perspective of a futurist. This structure replicates one of the ways that futurists look at information. The concept can be demonstrated by a project that I did for a geothermal company. They owned leases on federal land and were looking for hot water with the idea of constructing power plants. They were very interested in the geology of their lease holdings. So I organized their material by geography: state, county, geothermal area, type of science. If they had been doing more theoretical geology research, I would have organized the material differently and placed the type of science as the primary organizational category, with geography second. Both structures serve geologists, but the geologists have very different goals that are best served by two different structures.

Every group of experts has its own point of view. Designing an information structure from their perspective enables these experts to interact with a system that reflects their understanding of knowledge. They use the system more efficiently because it reinforces their style of thinking.

Personal Taxonomy

It is possible in an online environment to reorganize a taxonomy for individuals so their own topics of interest are the primary categories. In this way, each scientist in a research department could have a personalized information structure.

For example, in the "Taxonomy for the Future," the term "Technological Forecasting" is placed within "Futures Studies" (TFTF: Futures Studies—Techniques—Forecasting—Technological Forecasting) because it is a technique used by futurists. However, someone who is looking at the "Technological" category would probably also be interested in the technological forecasting method, so the categories could be displayed as in Yahoo!:

Technological
    Forecasts
        Technological Forecasting @ Futures Studies—Techniques—Forecasting

In the "Taxonomy for the Future," forecasts are arrayed all over the full taxonomy as subsets of other categories. So for someone who is primarily interested in forecasts, the presentation could be customized in this way:

Forecasting	Forecasts
Environmental Scanning	STEEP
Scenario Planning	Global
Technological Forecasting	Regional
Wild Cards	Europe
History	United States
	Social
	Evolution
	Technological
	Biotechnology
	Internet
	Telecommunications
	Economic
	Business
	Environmental
	Sustainability

This is a rearrangement of the taxonomy using the same terms and STEEP relationships. In this case, the primary categories are "Forecasts" and "Forecasting," emphasizing an individual interest. With this feature, many individuals in an enterprise can have private taxonomies. Work is streamlined because researchers interact with an information system featuring their own subject area.

Persuasive Taxonomy

Taxonomy is a semantic art that both defines subject relationships and selects words to label categories. The nuances of category placement and vocabulary impact users overtly or subliminally. In this sense, taxonomy can reflect the users' thought processes or it can persuade users toward a desirable pattern of thinking.

For example, a taxonomy can emphasize key concepts. I did this with the placement of "Creativity" (TFTF: Futures Studies—Creativity). By manipulating alphabetical order, I was able to list "Creativity" as the very first concept within the first major category. The community of futurists places high value on creativity. It is an important skill for anyone involved in forecasting. Placing this

concept in the first position confronts everyone with a reminder to be creative. It is an encouragement for better performance.

Language selection is another aspect of persuasive taxonomy. While reviewing the literature for this article, I perceived a futurist philosophy promoting the concept of commitment to future generations. Even as I was writing, *The Futurist* magazine (TFTF: Futures Studies—Serials) arrived in the mail with an article by Joseph Coates, "Updating the Ten Commandments,"[26] in which the first five commandments exemplify the commitment to a better future. In this philosophy, which does not seem to have a name, those who are privileged to understand the future also have the responsibility to promote positive directions.

Two books in the sample with this philosophy have the word "responsibility" in their titles: Stewart Brand's *The Clock of the Long Now: Time and Responsibility* and *International Rights and Responsibilities for the Future* by Kenneth W. Hunter and Timothy C. Mack. I adopted their word and built a section within "Futures Studies" entitled "Responsibility" (TFTF: Futures Studies—Responsibility).

The flexibility of taxonomy, with its subject-specific language and topical variability, makes it a valuable organizational technique for the digital age. Taxonomies are frequently used in the navigation of complex Web sites. Information architects now concern themselves with category design and labeling. These structures are also at the center of some of the most advanced information management proposals.

THE FUTURE OF TAXONOMY

The Semantic Web

Taxonomy is a key component of the Semantic Web, as envisioned by Tim Berners-Lee, inventor of the World Wide Web, in his 2001 *Scientific American* article.[27] In a telecommunications scenario, similar to Howard Rheingold's *Smart Mobs* (TFTF: Technological—Telecommunications), Berners-Lee describes a scheduling interaction involving cell phones, Web access, databases, taxonomy and ontology. Eventually the appointment is made, after typical time and location negotiations. However, in this scenario, electronic agents are doing the negotiating. Human beings are required only for establishing criteria and for approval.

In the Semantic Web, digital agents map a set of common definitions. One database may use the term "family name," another may use "surname," still another will use "last name."[28] The electronic agents understand that these phrases mean the same thing, enabling them to search multiple databases with different semantics.

The mapping is achieved through the use of ontology. According

to Elin K. Jacob, a professor of Library Science at Indiana University, "Ontology (with an upper-case 'O') is the branch of philosophy that studies the nature of existence and the structure of reality."[29] In the world of electronic data, Berners-Lee uses the lower-case ontology as "a document or file that formally defines the relations among terms. The most typical kind of ontology for the Web has a taxonomy and a set of inference rules."[30] Inference rules define computational operations.

Two of Berners-Lee's compatriots at the World Wide Web Consortium, Eric Miller and Ralph Swick, further describe the Semantic Web "as a place where strongly controlled (or centralized) metadata vocabulary registries can flourish alongside special-purpose, small community or even *'private' vocabularies*."[31] The italics are mine, because what I have been discussing in this article is private vocabularies. I have been looking at taxonomies as a way to describe a body of knowledge using specialized words and specialized relationships.

Making Sense

Taxonomy is one type of the sensemaking software applications that M. Mitchell Waldrop discussed in his March 2003 *Technology Review* article.[32] This category of software became important after the September 11 attacks, when it was apparent that clues were everywhere but federal agencies did not know how to read them.

The vast majority of digital information is unstructured, meaning it does not exist in a database, but instead is found in word processing documents, email, spreadsheets, etc. Taxonomy software can crawl through unstructured data, collecting terms and concepts and placing them into an organized structure. A recent marketing press release for Inxight Software's taxonomy package suggested an automated progression for organizing information: categorize unstructured information, extract nouns and concepts, analyze links or track events, present relationships, and summarize documents.[33]

This process could assist an enterprise to understand what information is available and how it relates to other information. According to Ramana Venkata, founder and CEO of Stratify, another software company, taxonomies are "tools to help you deal with huge amounts of information in a much more intuitive, natural way—to see patterns when you don't know what you're looking for."[34]

Sensemaking software helps users understand the implications of data. In addition to taxonomy, software in this category includes packages for information mapping, visual presentation, thought organization, and relationship analysis. Business applications include pharmaceutical companies, which tend to have state-of-the-art corporate libraries. They need to understand the relationships of

various chemicals or genes. For a drug producer, knowledge management can be a matter of life and death, or a major lawsuit.

In his book *World Without Secrets* (TFTF: Technological—Information Age—Privacy), Richard Hunter, a vice president at Gartner, the technology research company, writes, "The state of the art for taxonomy-building in the near future is a team of smart people..., not a battery of smart machines."[35] He forecasts five to ten years before automatic taxonomy construction is accurate. However, accuracy is only part of it. The full potential of taxonomy is its flexibility. An automated taxonomy can rearrange categories into a personal taxonomy, but only a taxonomist can create a persuasive taxonomy. The ability to understand how an enterprise uses information, and to refine a structure so that it promotes the values of the enterprise, requires the subtle awareness of human consciousness. This type of sophisticated category design is the difference between a list of categories and a knowledge structure that promotes and increases the value of information. As biologist Stephen Jay Gould stated, "A classification is no more than a set of convenient pigeonholes until the causes of ordering can be specified."[36]

CONCLUSION

Making sense of information may be the primary human cognitive activity. In a time of discovery, Linnaeus contributed to our sensemaking capacity with an elegant method for categorizing plants and animals. Lamarck analyzed and changed the Linnaean categories to develop a new understanding of biology. When industrialization allowed the mass production of information, Melvil Dewey used categorization to physically organize books on a shelf. In the modern era, when a new form of digital information needed to be organized, Jerry Yang and David Filo again turned to categories for Yahoo!

In developing the "Taxonomy for the Future," I have designed a set of categories that will help futurists to better organize their information and to be more productive in their professional endeavors. I have also shown that category design is subjective. The most effective presentation of information comes from the perspective of the user population. This perspective can be further refined into personalized structures for individuals. By manipulating categories and using specialized language, persuasive taxonomy can help to promote and achieve enterprise goals.

The sheer volume of information produced by our society requires that we develop new organizational methods. Taxonomy's hierarchical and relational structure helps us to make sense of extremely large amounts of digitized information. As part of the Semantic Web, it combines with ontology to map the vocabularies of multiple databases.

Taxonomy is a tool for understanding and a tool for communication. Its value and its application change with the user. We all gather information. We all want to understand what we gather. Our goals for using information are as varied as each member of the human race.

ACKNOWLEDGEMENT

NOTES

1. Ramana Rao, *Information Flow* (#3, July, 2002), www.ramanarao. com/informationflow/archive/. Ramana Rao is the founder and CTO of Inxight Software.
2. Tina Byrne, "Free Info on Web Might Cost More than You Think," *Cincinnati Business Courier*: http://cincinnati.bizjournals.com. This article discusses a study commissioned by Factiva, an Internet company that provides business information.
3. For a more detailed version of these ideas, see Stephen Jay Gould's article, "A Tree Grows in Paris: Lamarck's Division of Worms and Revision of Nature" in his book *The Lying Stones of Marrakech: Penultimate Reflections in Natural History* (NY: Harmony Books, 2000), 115-143.
4. Dewey and LC call numbers actually consist of two parts. The first is the classification and places a book within a subject. The second is the Cutter number that places a book within the classification. It is named after Charles Ammi Cutter who developed the alphanumeric prototype for the LC system in 1891. For example, the Dewey call number for Barbara Marx Hubbard's *Emergence: The Shift from Ego to Essence* (TFTF: Social—Spirituality) is 299.93 H838. The LC number is BL624.H838. The "H838" is the Cutter number and "H" stands for Hubbard. LC does the official cataloging for both LC and Dewey, so it assigns the same Cutter number for both systems.
5. I am grateful to Timothy C. Mack, editor, and Rima Shaffer, associate editor, of *Futures Research Quarterly* (Bethesda, MD: World Future Society) for suggesting sources of books about the future (TFTF: Future Studies—Serials).
6. World Future Society Bookstore: http://www.wfs.org/bkcatalog. htm.

7. George Thomas Kurian, "One Hundred Most Influential Futurist Books" in George Thomas Kurian and Graham T.T. Molitor, eds.; *Encyclopedia of the Future* (NY: Simon & Schuster Macmillan, 1996), 1079-1082.

8. This notation indicates a title's placement in the "Taxonomy for the Future." Developing a system of call numbers is outside the scope of this study; however that would streamline notation and allow labeling of hardcopy material for any futures library that adopts this method.

9. Library of Congress Online Catalog: http://catalog.loc.gov.

10. Melvil Dewey, *Dewey Decimal Classification and Relative Index*, Edition 17 (Lake Placid Club, NY: Forest Press, 1965).

   Edition 18, (Lake Placid Club, NY: Forest Press, 1971).

   Edition 19, Benjamin A. Custer, ed. (Albany, NY: Forest Press, 1989).

   Edition 20, John P. Comaromi, et al., eds. (Albany, NY: OCLC Online Computer Library Center, 1989).

   Edition 21, Joan S. Mitchell, et al., eds. (Albany, NY: OCLC Online Computer Library Center, 1996).

11. Quoted in "Michael A. Posner's Page of Statistics Quotes," http://home.earthlink.net/~posner/quotes_s.html.

12. Dewey classifications must have a minimum of three digits, hence the duplication of "500."

13. The term "place marker" is not used in Dewey. I am using it here to clarify the hierarchy.

14. Katherine Bertolucci, "Happiness is Taxonomy: Four Structures for Snoopy," *Information Outlook* (Washington, DC: Special Libraries Association, March 2003), Vol. 7, No. 3, 36-44.

15. Library of Congress Subject Cataloging Division, *Classification Class Q, Science* (Washington, DC: Library of Congress, 1989), 438.

16. David A. Kaplan, *The Silicon Boys and Their Valley of Dreams* (NY: William Morrow and Co., 1999), 304.

17. David Filo and Jerry Yang, et al., *Yahoo! Unplugged: Your Discovery Guide to the Web* (Foster City, CA: IDG Books Worldwide, 1995), 59.

18. *Ibid.*, p. 45.

19. Yahoo! Directory: http://dir.yahoo.com.

20. *American Heritage Dictionary of the English Language, Fourth Edition*, 2000, www.bartleby.com.

21. Amazon: www.amazon.com.

   Barnes and Noble: www.barnesandnoble.com.

   Michael Marien, *Environmental Issues and Sustainable Futures: A Critical Guide to Recent Books, Reports, and Periodicals* (Bethesda, MD:

World Future Society, 1996) (TFTF: Environmental—Reference—Bibliographies).

Michael Marien, *World Futures and the United Nations: An Annotated Guide to 250 Recent Books and Reports* (Bethesda, MD: World Future Society, 1995) (TFTF: Futures Studies—Reference—Bibliographies).

World Future Society Bookstore, *op. cit.*

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FIGURE 1
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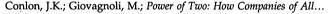Jarratt, J.; et al.; *Managing Your Future as an Association: Thinking...*

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