Storing and Accessing Declarative Knowledge

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Abstract

This paper briefly reviews the history of the quest to preserve declarative knowledge—from oral transmission in ancient times to the World Wide Web today. It follows with a discussion of Wikipedia's valuable contribution to education in general, and language education in particular, then argues that efforts to provide the Internet community with a high-quality reservoir of knowledge deserve institutional financial support.

The primary function of language is the communication of feelings, thoughts, and knowledge. Many animals communicate on a basic level. Human language, however, takes communication to a much higher level—speeds it up, smoothes it out, and gives it a precision that animal communication does not have. That's why most linguists say that only humans have true language.

The objective existence of *feelings, opinions, and facts* depends on our ability to communicate them. We often declare them. Lovers say, "I love you"; politicians make speeches; and students try to answer their teacher's questions. Yet they exist—in our brains—even when we are not audibly demonstrating that fact. The brain is our primary storage area for all kinds of thought.

Although individual brains have a tendency to forget and eventually die, *speaking and listening* has allowed simple facts and opinions to continue on from one generation to the next, evolving as they move across each generation. The system works well enough for opinions—thoughts and feelings which tend to change anyway, whenever individuals change their mind—and a few facts, if they are easily

remembered or observed. For thousands of years humans passed on knowledge by word of mouth in speech and song. Eventually, however, as the amount and complexity of knowledge increased and its transparency decreased, the necessity for a more effective system lead to the development of *reading and writing*.

At first only a few specialists could read and write. But over the course of centuries these abilities became more and more common. A technology developed to preserve written texts on scrolls and in books. Copies were made by hand at great cost until the printing press came along so that *books and newspapers* could be mass produced and sold at affordable prices—fast food-for-thought. Reading and writing became such important skills for productive members of society that schools were invented to teach the Three R's—Reading, 'Riting and 'Rithmetic. Governments have taken over the bulk of this crucial social function with both *economic and administrative support.*

The knowledge contained in books increased rapidly. Quick and easy access to specific facts in a vast ocean of printed material became a fundamental challenge. As a first step large collections of books were placed into libraries. As libraries grew in size and number of volumes, systems were developed to organize them for easier access—the Dewey Decimal System and card catalogs.

The next big step was to distill the accumulated knowledge into single-volume reference books—dictionaries and encyclopedias, for example—and gather them together into a special section of the library, the reference section. Encyclopedias grew in size from one volume to a dozen or more—a desktop library, though usually stored on a shelf. Sold to education-conscious parents, many middle-class homes owned their own set of encyclopedias. They had to be updated every decade or two. The most up-to-date information was recorded in newspapers. While the trivia was discarded, the more useful and important information worked its way into books, then into *encyclopedias.*

Meanwhile technological improvements made the tools of writing more effective, cheaper, and easily available. Quills evolved into fountain pens and then disposable ball-point pens. Desktop printing came of age with the typewriter—manual then electric. Electric typewriters rather quickly morphed into wordprocessors then computers.

The coming of *computer technology* has brought with it a number of great

advantages. Writers can easily modify their text at any point in the writing process, inserting additions and making corrections. This can be done by hand on printed copies then inputted, or inputted directly. In either case, unaffected parts need not be retyped. Modern computers will even check spelling and grammar, then at the command of a single click correct each mistake.

Distribution of and access to these digital texts over phone lines or electromagnetic waves is swift and efficient. They can be sent across the Internet as e-mail attachments or posted on the *World Wide Web*, available to the public at large 24 hours a day, 7 days a week. Readers can use specific words or phrases to have search engines locate whole documents or to have their own computer locate sections within a document.

The World Wide Web, in particular, has in the words of Crawford (1995) "give[n] everyone their own printing press" creating a "global culture" of individual publishers. It has indeed, as he predicted, decentralized the synthesis and presentation of knowledge, but not just knowledge. The potential for a neural net connecting the knowledge of millions of individuals and carrying on the "great conversation of the scholars" has been obscured by a flood of advertising, self-promotion, and trivia. A search for webpages about kabuki is as likely to turn up information about a sushi restaurant, an avant-garde rock band, or someone's blog as information about traditional Japanese theater. Market forces, crass commercialism, and over-inflated egos have diluted the educational potential of the Web. It has become a library without a librarian or a cataloging system, a random collection of digital texts. Luckily Jimmy Wales and his co-workers at Wikimedia envisioned a comprehensive web-based encyclopedia with free public access—*Wikipedia*.

Wikipedia

In a very short time Wikipedia has been able to amass and centralize a great deal of information on its servers, from scholarly knowledge to trivia. This work in progress is an imaginative and controversial undertaking. It encourages the vast online public that consumes information to actively create a record of human knowledge that is available to all. In the competition for high rankings on the most popular search engines, Wikipedia articles seem to be quite successful, appearing at the top of many searches. It appears to have become an almost indispensable tool for many high school and college students—quick and easy access to facts. So

quick and easy that some educators fear that students will become unforgivably lazy researchers.

Both Knowledge and Trivia

In order to expand its data base as quickly as possible only minimal controls have been imposed on the range and quality of its content. This would be inviting utter disaster for any serious paper publication. Web publishing, however, offers virtually unlimited space and allows editing at any time, even after posting. The vast amount of space available on servers alleviates the need to make distinctions between important scholarly information and merely interesting trivia. Both can be posted, both have important functions in development of the data base and in education.

Although some people disparage Wikipedia for its inclusion of trivia, it serves some useful purposes. The high level of interest in this sort of information motivates people to upload greater volumes of data, which require administrative decisions about processing and organization. Those decisions can then be applied to the construction of more serious articles. Just as child's play provides them with adult skills, trivial articles can act as prototypes for more scholarly ones. Trivia also plays an important supporting role in studies of foreign cultures and languages. As an English teacher in Japan, I find that Wikipedia helps bridge the culture gap between my students and me. It does this in two ways: (1) by being multi-lingual and (2) by presenting multi-cultural content.

Since articles *can* be written in virtually any language, they *do* appear in many of them. Articles on the same subject are hyperlinked to one another for easy referral. Whenever there are equivalent articles in Japanese and English, my students and I can toggle back and forth between them picking up proper names, specialized terms, their natural usage within sentences, and their relation to other words. It provides much more comprehensive language input than the standard dictionary, based only on isolated words and their meanings.

Because people throughout the world write articles, the content comes from many different countries. I am impressed by how much is written about my adopted country—Japan. My oral English classes at the university tend to cover general topics centered around the students' personal lives here in Japan: TV programs, movies, music, fashion, memories of their past, and more recent news events. When

one of my students mentioned that he liked Yukorin, for example, the name did not ring a bell with me, and he did not have the confidence or language skills to explain who she was. Our conversation immediately petered out. A week later, after pulling up and printing the English article on Yukorin, I was in a much better position to engage that student in a conversation about an entertainer that, without knowing her name, I had been seeing every Sunday night on Karakuri television, a popular Japanese program. I passed a copy of the short article to the student, giving him a chance to study English that I hope will be both useful and highly motivating.

Quantity Now, Quality Later

Wikipedia is in the process of rapid expansion. Wiki wiki, meaning quick in Hawaiian, aptly describes the *production* of Wikipedia as well as the ease and speed of access to its information. It is similar to the cerebral cortex of an infant, which reaches a maximum number of synaptic connections in the first eight months after birth (Calvin and Ojemann, 1994, pp. 181–182). The connections are initially established quickly and rather haphazardly and subsequently refined. Less active ones are pruned out, leaving only the more useful ones, even as new connections continue to be added. Wikipedia is still in its infancy. Although an amazing amount of material has been posted, there are still innumerable articles crying out to be written and stubs that need to be expanded.

There is no reason to be concerned about a tradeoff between speed and accuracy, since all articles are forever works in progress without deadlines. We can have speed now and accuracy later. Writing style can also be improved after a rough draft has been posted. It has been my experience that people who complain about a Wikipedia credibility gap invariably fail to provide specific examples of misinformation. I have no doubt that mistakes do exist. I myself have occasionally noticed some. Any such mistakes can, however, be corrected at any time. In the words of Kris Kristofferson (1970) "the things that they complain about are things they could be changing."

Mistakes, poor writing, and sloppy scholarship can be expected to work their way out of any specific article as it matures. Even at this early stage in the development of Wikipedia, however, I would say that the quality of its information, organization, and writing style is relatively quite high by World Wide Web standards. For any serious web search Wikipedia is a reasonable and convenient

first stop. Used wisely it can usually provide students and other neophyte scholars with initial background information on their subjects and specific keywords to refine their further research.

Wikipedia is not and will never become a crystal ball. It will not tell you which stocks will go up and which will go down. When you are sick, you will still need to visit a doctor. Lawyers will still be the best source of information for people with legal problems. Yet it is a quick reference that can bring you up to speed on a wide range of issues, so that you can enter into discussions with experts better informed and prepared to ask insightful, intelligent questions.

Into the Future

Wikipedia is in a state of continual flux, being constructed and renovated by an army of volunteer Wikipedians (Wales et al., 2007). As material builds up it would naturally tend to stabilize and then need to be maintained. Supervision by administrators, the bureaucrats who appoint them, and an Arbitration Committee that adjudicates the more minor editorial disputes will likely increase, solidifying mature articles at a point where both quantity and quality is high. The computer hardware to store and distribute this record of human knowledge will also have to be maintained. In theory the space available is unlimited. There are, however, purchasing costs for computer hardware and setting it up, and then continuing maintenance costs for rent, utilities, and staffing. Where will the financial resources come from?

Wikimedia has been soliciting individual private donations in the last few months. Their service to the educational community deserves wide institutional support. Schools rightfully spend large amounts of money to educate the citizens of their countries, residents of their school districts, and even students from abroad. Education has been one of the primary functions of government for at least a hundred years. Since World War II scientific and then social science research has been added to government's educational responsibilities. With the computer revolution, increasing amounts of tax money and donations to private schools have been going into information technology both hardware and software. It will be a shame if the educational establishment does not devote a small portion of these massive funds to provide a high-quality reservoir of knowledge on the Internet.

Wikipedia does not and should not monopolize the scholarly portion of the

Web, but it has certainly become a valuable addition. By providing stable URL addresses for a broad range of background material, to which other webpages can hyperlink, it provides a solid foundation of shared knowledge on which to build the Information Superhighway.

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Points of Contact

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