Searching for a Cloud on the Computing Horizon - 2008

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What's New in Online Search for Chemists 2007, Harry E. Pence, SUNY Oneonta, Oneonta, NY

Writing a column about the world of search engines once a year is almost as bad as trying to sum up everything that has happened on a popular soap opera for the past year. In fact, it is becoming more and more difficult to tell the difference between a soap opera and the latest developments in search. For some time I have confidently been predicting that the arena of web search was about to become a battle zone as Google, Yahoo!, and Microsoft fought it out to decide which would control the advertising revenues expected to flow to the most popular search engine. It seemed like a well-matched battle, suggesting a hard fight. Google was by far the most popular search engine, but Yahoo! had bought the technology and experience associated with several other major search engines, and Microsoft had the knowledge and money to make it a three horse race to the finish. Instead, recent web surveys report that Google continues to run away from the field and now controls over 70% of the search traffic; Yahoo! has roughly held its own with about 20% to 25%; and Microsoft is down to less than 5%. The competition I expected just didn't happen!

By no means does this mean that the search industry has been calm. Early this year Microsoft made an offer to buy Yahoo!, which Yahoo! rejected. Then the real drama began. The ongoing soap opera has included poison pills, a proxy fight, and an attempt by a major Wall Street figure to force Yahoo! to sell itself. For those of us who follow search engines, it was like *All My Children* on steroids! The specifics of this hostile takeover attempt are probably not of particular concern to the readers of this column (except those who hold shares of Yahoo! or Microsoft), but the more interesting question is, "Why would this purchase be so important to Microsoft?" The obvious reason is that the combination of Yahoo! and MSN internet properties would have a dominant market share in this country, over twice that of Google's sites. There is, however, an even deeper reason, which relates to the future of the Web. The major companies all now seem to be in agreement that personal computing will soon be moving to the cloud, and the dispute between Yahoo! and MSN really concerns who will control the cloud.

Cloud computing means that users will access software and personal data that is stored on the web rather than on their personal hard drive. This is viewed as a natural next step in the development of Web 2.0, which will allow users work from anywhere that they have connectivity to the World Wide Web. Everything a user needs will be on the Web rather than on a particular computer. Web providers have begun moving in this direction. For example, Google already offers free or low-cost online alternatives to common business applications, such as word processor, spreadsheet, presentation software, and e-mail, and MSN Live is moving in the same direction.

Is the future of computing to be found in the cloud? Cloud computing seems to offer a number of advantages for both large corporations as well as for software companies. If most of the computing power

resides on the web, major corporations would have to spend less money on IT service and support. In addition, companies will save money by buying simple and inexpensive computers that only need fast web access. The main advantage for software companies is that users can be forced to upgrade to new software versions by making the old software unavailable. For example, when Microsoft rolls out a new operating system, like Vista, Microsoft will control the extent to which users may continue to use the old software. Will major corporations be willing to depend on an outside vendor for something as critical as computer support? More importantly, will individual users be willing to trade some degree of control in exchange for the ability to access their files anywhere and any time?

Meanwhile, a battle is developing, but in a different arena than expected. Google has come out with a new browser, called Chrome, which is designed to be cloud ready. Google seems to be following the strategy of attacking the opponent at its strongest point by completely redesigning the browser. (Disclaimer, both these search engines are in beta versions, and it is too early to fairly evaluate them. My comments are based on the release literature and reviews.) Thus far, Chrome is only for Windows, but Mac and Linux versions are said to be on the way. Google's main goal is to shift the focus of browsers from interlinked documents to a new model designed from the bottom up to support the new Web-based application software that Google is creating, that is, the cloud. The key is Chrome's new JavaScript rendering engine, which is designed to optimize JavaScript execution. For those who want more technical information, I recommend the Google Chrome comic book. Do not be put off by the fact that the technical information is provided in a comic book. It provides an unusually clear description of what Google is trying to accomplish and why.

Google argues that today's browser needs to be more stable, faster, and more secure. Perhaps most important, the browsers currently in use are single-threaded. This means that if any application hangs up, the browser is locked up until that problem is solved. Chrome runs multiple independent processes, so that even if one process becomes blocked, the rest of the applications can still continue. This capability is essential if cloud computing is to become popular. Chris Messina comments in his blog, FactoryCity, that Chrome ". . . is practically a declaration of independence from the yesteryear traditions of browser design of the past 10 years, going all the way back to Netscapes's heyday . . ." The bottom line is that Chrome is a bold gamble that may radically change the experience of web browsing, even though there are some serious questions to ask before such a change can occur.

Google is by no means the only company coming out with an updated browser. Mozilla has released a second alpha version of Firefox 3.1. Firefox has been nibbling away at the Internet Explorer market share for some time, recently coming close to 20% of the search market. Mozilla's new version also responds to the shift from web pages to applications by including TraceMonkey, which is said to accelerate Javascript performance by an order of magnitude. And just to make it an all-in donnybrook, Microsoft has released a beta version of Internet Explorer 8. IE8 seems to be an evolutionary product, a solid improvement over the previous version, with improved privacy controls and easier web surfing, but it is not clear that IE8 is designed to accept the challenge of cloud computing. Has Microsoft been caught short, or is this just a case where the press releases have not kept up with the technical specifications? The most desirable new feature of IE8 seems to be InPrivate, a private browsing mode which will not record one's browsing history or allow sites to set cookies. For more information, see Michael Miller's comparison of these three browsers. (). Predictions about a web battle were not totally inaccurate; but the battle apparently will not occur where it was expected to be.

Skeptics may well question whether or not the cloud will be widely accepted. Of course, very little is sure in life, but it is clear that Google, Mozilla, and Microsoft are all moving in that direction. It would take a brave or a foolhardy person to bet against these odds. The question of whether or not colleges and universities will choose to move to the cloud may be more in doubt, but this will probably depend more on economics that educational considerations. Some campuses are already moving their e-mail services onto web providers to save money. Some college administrators may elect to use cloud computing, since it will produce even greater savings in technical support and computer laboratories. On the other hand, colleges probably use a greater variety of specialized software than a typical business, and it remains to be seen whether the cloud will support such diversity. It seems likely that at least some, and perhaps many, college applications will be moving to the cloud in the near future. This leads to the critical question, "Will cloud computing have an impact on the college classroom and the educational process?"

Some campuses have already either instituted programs to insure that all students have laptop computers, and more recently some colleges are providing iTouches or iPhones. These programs have certainly been a public relations success, although there is some question about whether they have had as great of an impact on classroom teaching as was hoped. Some faculty have developed innovative ways to employ computer access in the classroom; others have been more likely to complain about students using the laptops to access their e-mail and play games. What if students can access the World Wide Web by the purchase a device like an i-Touch or a simple laptop that only costs a few hundred dollars? This would greatly increase the possibilities for both classroom innovation and for wandering student attention.

One simplistic way to think about this changing environment is to consider education as consisting of two components, content and connections. Traditionally, classroom instruction has been more concerned with content. This made sense, since students could not readily access reference books and journals during the class. Work on connections was relegated to homework and laboratories. The cloud conveniently puts many, if not all, of these reference sources in the students' hands during class. If cloud computing becomes viable, students will have easy access to the library and the WWW, and a professor can ask them to refer to an appropriate article or reference work during a lecture. Discussions of information bias and information evaluation can occur in class in real time with real examples. It will be possible to have students run simulations individually or in small groups at their desks during class.

To prepare for this eventuality, it will be necessary to spend more time disseminating the results of successful projects that use computers in the classroom and also exploring new ways to leverage this convenient and powerful educational opportunity to improve the learning experience. There will also be potential problems. The above discussion assumes that the campus is wired for ubiquitous web access. Campuses that are not wired may be at a serious disadvantage. Perhaps most critical is the need to plan classroom activities that use this new capability to engage the students. Many of our students are already moving towards an always connected lifestyle where their attention is constantly being distracted by the wealth of material at their fingertips. Unless professors plan their classes to focus the students' attention constructively, the current problems with computer distractions will soon seem trivial.