Crowdsourcing the IT Help Desk: A Cloud Approach to Mass Intelligence

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Growing up, many of us may have heard our parents say, “No matter how smart you think you are, there’s always someone out there smarter than you.” In some sense, this sage advice is at the root of the concept we know as the “wisdom of crowds”—there are always people out there with vastly more knowledge and precise detail than you have.

First coined in 2004 by James Surowiecki, the term *wisdom of crowds*, or *mass intelligence* as it is sometimes called, is the aggregation of information in groups. The aggregate information can result in decisions that are better informed or more effective than decisions made by any single member of the group. Another term, *crowdsourcing*, has also crept into today’s lexicon, and it is sometimes mistakenly used to mean mass intelligence. While similar in concept, crowdsourcing is an action that produces a tangible product, whereas mass intelligence is a concept that often represents the “cloud” that crowdsourcing taps into.

Surowiecki suggests several key factors necessary for mass intelligence to be achieved:

- **Diversity of opinion.** Each person should have private information, even if it’s just an eccentric interpretation of the known facts.
- **Independence.** People’s opinions aren’t determined by the opinions of those around them.
- **Decentralization.** People are able to specialize and draw on local knowledge.
- **Aggregation.** Some mechanism exists for turning private judgments into a collective decision.

Just as there can be wise crowds, there can also be unwise crowds. Crowds that are too homogeneous, centralized, divided, imitative, or emotional often lead to poor decision making and outcomes. NASA learned through the Columbia shuttle disaster what happens when decision making is confined to a homogeneous and emotionally attached group of decision makers who were cut off from the wisdom of rank-and-file engineers.

If we consult the proverbial bible of mass intelligence, Wikipedia, we find the following definition of crowdsourcing:

Crowdsourcing is a neologism for the act of taking a task traditionally performed by an employee or contractor, and outsourcing it to an undefined, generally large group of people, in the form of an open call. For example, the public may be invited to develop a new technology, carry out a design task (also known as community-based design and distributed participatory design), refine or carry out the steps of an algorithm (see Human-based computation), or help capture, systematize or analyze large amounts of data (see also citizen science).

Successful crowdsourcing arises when one or more of the following factors converge:

- People’s inherent drive to share and help each other, with or without reward
- People's ability to reduce costs while expanding scale (almost infinitely)
- People's ability to innovate quickly and more fruitfully, and/or the ability to make better decisions

Crowdsourcing takes full advantage of the promise of the Internet to connect each person to a worldwide network of people and information.

Web 2.0 technologies have unleashed the real potential of crowdsourcing. These technologies enable us to easily and quickly tap into and harvest the collective intelligence of much of the world’s population, irrespective of time or location. As such, they collectively represent the potential to be a significantly disruptive event on the horizon of modern society.

The private sector has already begun to realize that crowdsourcing provides a creative commons that is a boon to business. Sharing what normally would have been internal-only information has provided some companies a competitive edge that has allowed them to harness the intelligence of the masses in a variety of ways. For instance, Netflix held a contest to improve its movie-rating service. A responding team from AT&T Labs won the contest by devising a system to provide more accurate movie recommendations by finding common patterns that might lead certain customers to like certain movies. Similar to the customer recommendations provided on Netflix, Cambrian House actually takes advantage of the masses to vote on new product ideas, and the company Threadless asks its customers to vote on which shirt design should be sold. So great is the potential of crowd wisdom that “You,” the proverbial masses, garnered *Time Magazine’s* Person of the Year award in 2006.

While the private sector has quickly caught on to the power of crowdsourcing, higher education has not yet recognized those benefits as fully. To date, there are only a few examples of crowdsourcing in higher education. This research bulletin refines the concepts of crowdsourcing and mass intelligence and gives several notable examples of their vast potential when they are used together. As higher education faces the challenge of supporting increasingly broad-spectrum information technology services for a progressively sophisticated user population, while facing tighter institutional and IT budgets, the bulletin also offers a suggestion of a potential win-win for higher education: crowdsourcing the IT help desk.

### Highlights of Crowdsourcing and Mass Intelligence

*Disruptive technology* is a term describing a technological innovation, product, or service that uses a “disruptive” strategy, rather than an “evolutionary” or “sustaining” strategy, to overturn the existing dominant technologies or status quo products in a market. There might be some debate as to whether or not crowdsourcing and mass intelligence fall in the “disruptive technology” category. Like Facebook, YouTube, and other recent emergents, the concepts of crowdsourcing and mass intelligence actually represent social phenomena or behaviors that leverage recent technological advancements rather
than the underlying technologies. There appears to be less debate that crowdsourcing combined with the wisdom of crowds has the potential to be truly disruptive. You do not have to look far to find notable examples of how disruptive the two can be.

**Problem Solving**

Perhaps one of the best known examples of problem solving through crowdsourcing is InnoCentive, a self-described “open innovation” company that takes an eBay-like approach to research and development problems in a broad range of domains, such as engineering, computer science, math, chemistry, life sciences, physical sciences, and business. InnoCentive frames the desired R&D as “challenge problems” and opens them up for anyone in the world to solve them. InnoCentive calls the individuals who attempt the problems “solvers” and those who pose the problems “seekers.” The company currently boasts solvers located in more than 175 countries, with more than a third of them having doctorates. The seekers can, and usually do, grant cash awards to solvers for the best solutions that meet the challenge criteria, with the winning solution provider typically earning $5,000 to $30,000, while InnoCentive earns a respectable 40% as a finder’s fee.

Procter & Gamble, the well-respected consumer-goods company, wanted to create a dishwashing detergent smart enough to reveal when the right amount of soap has been added to a sink full of dirty plates. But the challenge stumped their formidable in-house R&D team. Instead of sourcing the research to a well established scientific firm, they turned to InnoCentive, which in turn handed the problem over to its global network of volunteer solvers. In short order, an Italian chemist working from her home laboratory had pioneered a new kind of dye that turns dishwater blue when the right amount of soap is added. She won $30,000 in prize money, and Procter & Gamble had a solution at what some would argue is a bargain-basement price. To date, InnoCentive has helped solve more than 250 challenges on behalf of its seekers.

The crowdsourced approach to problem solving is catching on. Besides InnoCentive, would-be innovators can sign up online to compete for prizes for feats as diverse as landing on the moon or building the first 100 MPG car (http://www.xprize.org), inventing artificial meat (http://www.peta.org/feat_in_vitro_contest.asp), and figuring out how proteins fold (http://www.fold.it).

**Data Mining**

The story of Goldcorp, Inc., is one in which a desperate mining company CEO dropped long-held industry beliefs and not only saved his company from demise but also created the cornerstone for its incredible resurrection. In 1999, Goldcorp CEO Rob McEwen was discouraged by the company’s inability to successfully mine the significant information it possessed about the geological characteristics of its properties. The minerals mining industry had a strong history of protecting its internal data. The last thing any mining company would do is share information assets regarding its geological properties. However, in a desperate move inspired by the power of mass intelligence demonstrated in the early days of the open-source software movement, McEwen openly published Goldcorp data on the web and offered rewards for those who could help his company locate the gold within their mines.
To say McEwen and Goldcorp “struck gold” would be an understatement. From across the world, students, physicists, and geologists demonstrated the power of crowdsourcing the task of data interpretation with incredible results. In all, 1,200 people from 50 different countries offered insight to Goldcorp, enabling the company to find substantial gold within its mines. An effort that cost Goldcorp $575,000 in prize money returned over eight million ounces of gold. Today, Goldcorp is valued at over $9 billion; before the crowdsourcing effort, it was valued at $100 million.

Content Creation

The open-source software movement is a perfect example of the power of mass intelligence and the ability for a community of informed individuals to fill a void previously believed to be the exclusive domain of commercial software companies. The Linux operating system, Apache web server, MySQL database architecture, and Perl or PHP programming environments are commonly referred to as a LAMP, a web server infrastructure made up of group of related open-source software products. (The LAMP acronym is drawn from Linux, Apache, MySQL, and Perl/PHP.) Together these different byproducts of crowdsourced software development are the cornerstone of many Internet environments.

In addition to the LAMP software tools used to support much web content, other open-source software development efforts are used by people across the globe. The Mozilla suite of desktop Internet applications is used by many to surf the web, manage e-mail, and so forth. Sun Microsystems has changed from a focus on hardware to a focus on software that relies on the open-source movement. Even Apple, historically proprietary with respect to its intellectual assets, has accepted the open-source movement (see http://www.apple.com/opensource). The open-source software movement may well be the most significant example of crowdsourcing a function, and it is hard to imagine that it is not here to stay.

A good example of crowdsourced creation of instructional content is Wikiversity (http://en.wikiversity.org). Wikiversity is a project that encourages contributions of learning resources for use in educating people at all levels, from preschool through university. The goals of Wikiversity are to develop open educational resources and learning communities through the use of a collaborative authoring environment, as well as to explore the use of wiki technology in teaching and learning. Content can be created or edited by anyone, and quality control of the content depends solely on the presumed self-correcting nature of crowdsourcing.

Knowledge Management

The power of community intelligence has been leveraged in additional ways. One example is the product rankings or trust ratings on the websites for retailers such as Amazon, L. L. Bean, Target, and Sears. These rating systems allow companies to leverage community feedback to manage customer expectations about their products. Acting as a knowledge broker, these companies are basically aligning a potential consumer with the perspectives and opinions of current consumers. While more traditional means of evaluating product quality have existed for many years in the form of Consumer Reports or CNET product
reviews, this new peer-to-peer evaluation model was difficult to broker until Web 2.0 services created a means to tap into the wisdom of crowds.

Social networks have also allowed individuals to benefit from crowdsourcing in a variety of other ways, including finding answers to just about any conceivable question on Yahoo! Answers. This portal allows an individual to post a question on virtually any topic. Any registered member of the community can offer an answer, and then the quality of the answers can be ranked by the person who asked the question to certify which answer was “the best.” Yahoo! Answers seems to work best for short, relatively easy-to-answer questions. Its value seems to be in delivering many answers rather than authoritative answers. As incentive for answering questions, respondents earn two points for submitting an answer and ten points when an answer is selected as “best.” The more points you earn, the more recognized you become as an “expert.” Like many web-based information sources, Yahoo! Answers provides its services in order to attract advertising revenue. This model has proven more effective than the pay-for-play model used by the now-defunct Google Answers.

The most popular example of the crowd wisdom movement and probably the most commonly cited general reference is Wikipedia (http://www.wikipedia.org), a community-developed and -maintained online encyclopedia with more than 11 million articles in over 262 languages. Wikipedia is as controversial as it is popular. Some noted scholars classify the body of knowledge as a flawed and irresponsible research tool, and in academe, the use of Wikipedia is often discouraged and sometimes even prohibited.

At least one journal article postulates that the error rate between Wikipedia and Encyclopedia Britannica is not as large as most might think. In a blind comparison of side-by-side articles from each reference, Jim Giles noted that Encyclopedia Britannica averaged 2.92 mistakes per article compared to 3.86 for Wikipedia in the comparison sample. Even within the Wikipedia community there are efforts under way to improve the reliability of posted articles. The English-language Wikipedia has introduced an assessment scale against which the quality of articles is judged. Roughly 2,000 articles in English have passed a rigorous set of criteria to reach the highest rank, “featured article” status; such articles are intended to provide thorough, well written coverage of the topic, supported by many references to peer-reviewed publications. In an effort to gain even further credibility, there have been calls within the community to “lock down” featured articles once they pass the rigorous peer review. In addition, there are efforts to bring trust ratings to individual Wikipedia contributors with the intention that eventually the only edits that will be made immediately visible will be those made by individuals who have established themselves as “trusted editors.” While some still question the quality and reliability of Wikipedia, the resource has clearly played a significant role in expanding access to information and leveraging the intellectual power of the community.

Benefits and Potential Pitfalls of Crowdsourcing

Despite the examples noted above, the potential issues that surround crowdsourcing and mass intelligence might make higher education nervous. For starters, many are unsure how ownership should be handled when information is crowdsourced. Who and how many should receive credit? We are not aware of litigation focusing on the
intellectual property aspects of mass intelligence, but it certainly will come. Furthermore, at institutions where intellectual property is the focus of research faculty and staff jobs, it is crucial to ensure that ownership of information is properly handled and documented.

There are obvious information quality control factors that we must understand and manage, where possible. While we prefer to assume that people behave out of good intentions, the IT community need only cite the latest and greatest viruses, malware, and bots to illustrate that some people use technology to do harm. Now a new type of threat is possible: the malicious publishing of false information. Even Wikipedia has seen instances in which individuals purposely contribute false information, forcing the Wikipedia administrators to lock certain entries.\(^{10}\)

Are there consequences if contributors submit wrong information using publicly accessible wikis, blogs, and other Web 2.0–enabled services? Processes and tools to safeguard published information would help ensure that contributors submit accurate and useful knowledge. But how do you encourage people to submit information? How do you get the crowd to participate? Some kind of reward system could entice people who perceive themselves as too busy to help others. Reward systems, monetary or otherwise, could also help prevent exploitation of contributors so that there is some reciprocity for their work and an inherent desire for them to participate in good faith.

While trying to get people to submit information is one challenge, another is ensuring that creativity, uniqueness, and even differing ideas get expressed. A phenomenon that stands in the way of the expression of diverse ideas is groupthink.\(^{11}\) Groupthink is not limited to online communications; it is also common in face-to-face meetings where the culture is to avoid conflict, to not upset anyone, and to rapidly achieve consensus. The true benefit of mass intelligence comes from straightforward data and opinions from many individuals, not on the agreement of a crowd.

Crowdsourcing the IT Help Desk

A promising use of crowdsourcing is in the area of providing IT help desk services and support. Just as the private sector uses its own customer bases to provide improved support through forums and open knowledge bases, higher education can take advantage of the mass intelligence of help desk support providers and campus users to create a shared base of knowledge for IT help desks across colleges and universities. A variety of functional models for this can be described, but fundamental to any successful model is the quality of the information in the knowledge base. Quality could be ensured through a ranking system of contributions or contributors, or, like Wikipedia, content can be approved by smaller crowds before making it public. Many knowledge base vendors are already implementing wiki-type tools to allow a wider audience to contribute to support efforts and to assist in keeping support information accurate and up-to-date. Personal incentives for contributing information to the knowledge base range from a contributor’s inherent desire to share knowledge and gain recognition for expertise to winning prizes for top-ranking contributions. Advantages of a crowdsourced knowledge base include better support for those who prefer to look for information on their own, support outside local help desk business hours, a broader base of knowledge than might
be found among individual campus support professionals, and better use of resources across institutions to reduce redundant efforts.

While the central IT help desk was once the source of all knowledge regarding the IT resources and services used on campus, the breadth and depth of technology now on our campuses, combined with a breathtaking pace of change, makes keeping current and informed a daunting task for even the best technologists. If support providers cannot keep pace with the expectations of our students, faculty, and staff members, which is likely to be the case even in optimal economic climates, then something must change. It is difficult to imagine the campus community will willingly accept lower-quality or less-responsive support for information technologies regardless of whether their expectations are reasonable.

The resources required to create and maintain a help desk knowledge base are significant. The impressive Indiana University (IU) information technology knowledge base (http://kb.iu.edu/) boasts over 14,500 individual records and delivers over 25 million solutions annually from multiple interfaces. IU reports spending about 500 hours per week maintaining the infrastructure and content of this resource. If an institution doesn’t have the resources to develop and maintain such a service, however, what are the options? Since a crowdsourced knowledge base would leverage commonalities across institutions, local support professionals would be able to focus on campus-specific needs rather than reinvent the wheel. For example, how many different ways are there to do a mail-merge in Microsoft Office 2007? A greater emphasis on electronic information resources might address current and future help desk staffing needs or allow local support professionals to spend more time providing higher-quality personalized or institutionally unique assistance. Rather than spend time researching answers to common problems, support professionals could use their time specializing in advanced or complex problems. Users seeking information would be able to access the combined intelligence of many institutions at any time of the day or night. Most institutions can’t even think about staffing a help desk 24 × 7, but in our increasingly globalized environment, people legitimately need assistance in traditionally off hours. Why couldn’t we leverage the value of various time zones to harness the power of mass intelligence beyond the normal work day? Additionally, campus users might also contribute answers to posted support questions, competing for recognition or prizes, thus creating a more engaged user community.

**What It Means to Higher Education**

Benefits gained by the private sector’s leveraging of mass intelligence, as well as benefits seen from early crowdsourcing efforts in higher education, strongly suggest that crowdsourcing and mass intelligence can help colleges and universities encourage innovation and leverage increasingly scarce resources. Areas in which higher education can benefit include teaching, research, service, and administration. Barriers to widespread adoption of crowdsourcing are centered in the academy’s emphasis on and recognition of individual contribution.
The higher education community has already benefited in some ways from the application of mass intelligence over the past decade. The Sakai and Moodle initiatives are examples of the higher education community's attempt to leverage knowledge existing within the academy to provide better, and ideally less expensive, learning management systems than can be acquired from commercial for-profit vendors. While it can be argued whether these efforts have yet fully achieved this goal, the work to date is certainly a testament to the potential of applying mass intelligence within the higher education community.

Similarly, initiatives such as MERLOT (Multimedia Educational Resources for Learning and Online Teaching) and Connexions have been built on the benefits of community engagement and sharing of instructional content to improve teaching and learning. A crowdsourced collection of learning materials allows individuals to contribute educational content that can be reused, copied, customized, and mixed together into finished products such as complete online courses, printed textbooks, and educational CD-ROMs. The open nature of crowdsourcing ensures that specialized expertise can be shared more broadly across institutions, and materials can be continually refined by multiple authors to keep content timely and relevant. MERLOT, in particular, attempts to address the issue of content quality through its network of peer reviews, using a trusted third party to determine the merits of content submission. This structure can assist users in assessing quality and accuracy of material coming from authors with whom they may not be familiar. Compared to traditional publishing, crowdsourcing activities using advanced technologies facilitate more rapid development and distribution of materials to students—a particular advantage for rapidly changing fields of study such as the sciences and medicine.

Several schools, including Rice University,13 The Ohio State University,14 Indiana University, and the University of Illinois15 have started initiatives to encourage collaborative research and bring together researchers from different disciplines to foster innovation and collaboration both within and outside the institution. Higher education has been slower to embrace crowdsourcing of research, even though the practice has already made some inroads in the private sector. Unfortunately, although granting agencies, publications, and institutions often endorse or require release of research data, the practice of withholding data continues, and it can stand in the way of crowdsourced collaborations. Projects such as the one to create the foundation for a comprehensive gene wiki,16 however, are helping pave the way toward accepting crowdsourcing as a means to create and provide open access to research data.

When evaluating crowdsourcing opportunities for higher education, it is necessary to recognize the potential barriers to successful implementation, as well as areas in which crowdsourcing can be both successful and beneficial for institutions. Faculty tenure awards are still primarily based on individual scholarship, contribution, effort, and credit. Additionally, ownership of crowdsourced information creates a potential legal issue, as intellectual property laws have not yet addressed information harnessed through mass intelligence. One area that might prove to be the exception is the creation and sharing of learning objects for instruction. Similarly, the value of collaboration in research efforts is beginning to be recognized. However, as long as the nature of academia continues to
value individual contributions over collaborative efforts, the more successful applications of crowdsourcing are likely to occur in the service and administrative areas. Given increasing budgetary pressures and the drive to utilize resources more effectively and efficiently, the time is right for institutions to consider moving towards crowdsourcing services such as IT help desk service and support.

**Key Questions to Ask**

- Why does higher education often not recognize and leverage the extent of its own mass intelligence?
- What cultural barriers would need to be overcome at our institution in order to support a crowdsourcing philosophy?
- What recognition, rewards, or incentives could we provide to those who contribute resources to a crowdsourced effort?
- How can crowdsourcing be encouraged in an academic environment in which individual contributions and credit figure prominently in career advancement, such as tenure decisions?
- How do we address quality control for content that is shared?
- How do the potential institutional differences in technological application affect the ability to leverage mass intelligence across institutions?

**Where to Learn More**


**Endnotes**

15. Indiana University and the University of Illinois are participating in the HIKE Project, which will allow community-source involvement in a knowledge management solution. See http://kb.iu.edu/data/aybz.html.

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