

Trusting the Internet: New Approaches to Credibility Tools

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It has been said that the Stone Age did not end because humans ran out of stones. Instead, Stone Age technology was superseded by new tools and capabilities. At some point in history, it simply became more advantageous to adopt new methods and tools rather than trying to solve problems inherent in older methods. Society may soon be at this inflection point in terms of how people, and particularly youth, identify credible information, abandoning traditional methods of determining credibility that are based on authority and hierarchy for digital tools and new network approaches. Far from being a negative development, new methods and tools for determining credibility may reflect a more distributed and open approach than in the past. Such an approach has important implications for how youth are educated, how policy is determined, and how future information systems are built.

This chapter first highlights some reasons why youth, the institutions that serve them, and society as a whole are moving online, as well as some of the consequences of this move—namely, the paradox of “information self-sufficiency.” A reformulated vision of credibility is offered in this context, which highlights features of digital information and networks. Then, a shift among credibility tools and techniques from traditional authority models to more of a “reliability approach” is discussed. Based on this, a framework for understanding the implications of information self-sufficiency for learning in a networked digital world is presented. This framework is used to highlight the often invisible effects that technology has upon credibility. Finally, implications of this are explored and current and anticipated developments on the Internet are considered. The chapter concludes by discussing implications of the information self-sufficiency paradox in the context of the education of youth in the current digital media environment.

The Shift Toward Increased Information Self-Sufficiency

There is little doubt that in the United States and other developed countries, citizens are increasingly relying on the Internet to gather information. Seventy-three percent of U.S. adults are Internet users, and 42 percent of Americans (about 84 million) now have broadband connections at home, up from 29 percent in January 2005.¹ The numbers are even more striking for youth. Lenhart, Madden, and Hitlin recently reported that 87 percent of youth in the United States ages 12 to 17 are Internet users, 51 percent of whom say that they use the Internet on a daily basis.² Other estimates indicate that half of children in grades 1–5 are online, as are 80 percent of high school students.³

Increasing Internet reliance is also evidenced by the dramatic increase of self-service options available to Internet users. Today, individuals are expected to book their own airline tickets, determine their own retirement plans, and even decide between life-and-death medical treatments using Internet tools and information available on the Web, without the assistance of traditional information intermediaries.⁴ However, the quality of these services varies. Examples of bad self-service options abound and nearly everyone has a horror story of getting tangled in a phone tree or diving deep into a company Web site desperately looking for a phone number to call or person to e-mail. Yet, there are also plenty of examples where online self-support systems and customer service have been designed and implemented well. Examples include Lands' End live chat support service⁵ and package tracking through UPS, FedEx, and other overnight carriers, to name a few.

The trend toward online self-support services and "disintermediation" more generally⁶ is also apparent in nonprofit and governmental sectors. For example, the National Science Foundation has supported extensive research into "digital government" that seeks to provide support of digital integration over a wide variety of government tasks such as electronic voting, public comments, security, and more.⁷ In the K-12 arena, Rice discusses several national policy initiatives involving the use of digital media to expand educational opportunities for U.S. students.⁸

Youth in particular are increasingly dependant upon online systems and support. From homework help services such as Tutor.com to completely virtual high schools,⁹ school-based learning is increasingly complimented by online services. As early as 2001, for example, Lenhart, Simon, and Graziano noted "71% of online teens say that they used the Internet as the major source for their most recent major school project or report."¹⁰ This increasing use and reliance on the Internet means that for a growing percentage of students the quality of online services and self-support options can directly affect their learning.¹¹

Presumably, the chief advantage to customers of online information self-sufficiency is greater control and satisfaction. However, this may not be the reality. ServiceXRG found that of the 60 percent of customers who used Web self-service, only 23 percent reported that they found what they were looking for online,¹² suggesting that only a small minority who choose to use online self-service features are able to find content that satisfies their needs. Thus, and ironically, many customers turned online actually require *additional* customer support. Unfortunately, such outcomes are not atypical.¹³

This shift to digital over physical media, however, is only partly a response to citizen demand for increased self-service. Another important factor is economic pressure felt by organizations to minimize cost by eliminating expenses such as printing and customer service personnel. According to the Web consulting firm Adaptive Path, in the last few years companies have "pushed labor-intensive tasks out to the customer, and they did so in a way that provided the customers with direct access to and control over information that they care about."¹⁴ The advantage to organizations is substantial cost savings. For example, ServiceXRG, a market research firm, found that whereas first contact closure cost of phone transactions is \$49.10, it is \$36.70 when done via e-mail, and only \$11.60 via Web self-service.¹⁵

The awkwardness with which some organizations have shifted the responsibility of support from employees to users is understandable given that the transition to digital methods of information creation, storage, analysis, and distribution has happened in an astoundingly short period of time. In less than fourteen years, the U.S. federal government, for example, has gone from mandating executive agency Web sites (initially little more than simple online

brochures), to requiring electronic voting,¹⁶ Web-based submittals of grant applications,¹⁷ and electronic banking transactions. There simply has been too little time and too much change in the Internet environment to formalize and codify “good online service.” To put it bluntly, what users need in order to take charge of their own online decision making is at best an art and, more often than not, a series of trial-and-error solutions.

Moreover, what may be called “information self-sufficiency” or “disintermediation” is far from an Internet-only phenomenon. Anyone who has checked into a flight at the airport knows that the number of touch screens is steeply on the rise, while ticket agents are in steep decline. Libraries now have self-checkout kiosks as do grocery and other retail stores. Information self-sufficiency is obvious in a world where so many aspects of life are either online (e.g., online banking, music downloads, shopping, medical information, government documents access) or are facilitated by online transactions (e.g., electronic fund transfers, traffic management systems, automated payroll systems). In the end, information self-sufficiency has dramatic impact: it affects how products are marketed, how organizations manage information, how courts assess liability, and even how the current and future workforce is trained.

Information Self-Sufficiency and the Heightened Importance of Credibility

Although information self-sufficiency could (and should) be examined in a number of ways—including economic, political, and even in terms of social and class roles—this chapter concentrates on the effects of information self-sufficiency on credibility, or the believability (i.e., the trustworthiness and expertise) of some source of information. Indeed, credibility, particularly in the context of youth and the Internet, is fundamental to the long-term success of information self-sufficiency and, by implication, the success of digital media themselves. An emphasis on credibility is crucial in the success of society’s digital migration because information is increasingly disconnected from its physical origin and, as a consequence, the credibility of information has taken on new complexities, with new implications.

Consider the simple act of buying a book over the Internet. When people buy a book online, they are not basing their buying decision on a single, physical item. They are instead basing the buying decision on information *about* a book (e.g., its price, author, shipping terms, reviews). Even if they had previously checked the book out of a library, or paged through it at the local bookstore (where they could have bought the book based on the information it contained *and* the physical attributes of the book such as whether it is in good shape, etc.), in the online environment they are simply putting in an order for a book based on some proxy, such as a digital image of a physical item.

This seemingly mundane and obvious fact actually has sweeping implications for credibility on the Internet. In particular, for any online transaction that involves delivery of some physical item, a central means of determining credibility—physical examination and testing—is gone, or is at least greatly diminished (since one can usually return the book after a physical inspection at the end of the process). No more is it possible to review a signature to make sure it is original. No more is examination of the quality of paper used in a publication practical. No more can one audit a physical inventory prior to purchase.

Another example that serves to illustrate the point is a digital fingerprinting system for use by law enforcement personnel in New York State. When suspects are arrested, instead of inking fingers and making cards with copies of fingerprints, in many jurisdictions prisoners now place their fingers on glass and have them digitized. The system was intended to speed

up processing of fingerprints, and to make them more accessible for searches (P. Lorenzo, personal communication). However, removing the physical collection of fingerprints had an unintended consequence. At one arrest a processing officer took a suspect's name and date of birth, and simply copied a fingerprint already stored under that name and date of birth into the new case file (which was against policy). It turns out the date of birth and name given by the suspect were false, and the prints copied belonged to a prisoner already incarcerated. More striking, when the mistake was revealed, and the suspect's prints were actually scanned, it was discovered that he was wanted for another crime—murder. This mistake was possible, and undetectable, in a digital networked environment because every transaction is an information-only event: that is, transactions exist only as digital information with no physical record or artifact. As such, some transactions work better in the digital environment than others.

For example, while buying books online has become popular, buying homes online is still a rarity. This is due both to the size of the transaction, and also to how much of an object's information is intrinsic and how much is extrinsic to its physical form.¹⁸ The more mass produced and standardized an item is, the more information can be "separated out" from that item. In the case of the book, nearly all of the information within the book—including the author, the price, the title, and even the visual images of the pages themselves—can be recreated accurately in digital form. Thus, the information is extrinsic to the physical item. With a house, however, the condition of the roof, the true color of the paint, the "feel" of the neighborhood, and the creakiness of the floors are all intrinsic qualities that need physical inspection to assess accurately. This also explains why buying a new car online is not only possible, but is a growing industry. Although it is a large transaction, new cars are fairly standard, so a test drive of a car in New York is assumed to be identical to test driving the same make and model in California. Therefore, buying that new car in California does not require a second test drive. The same cannot be said of a house. Houses are unique, and so the information relevant to a buying decision is intrinsic to the house.

Since information is the only evidence available to people when making an online transaction (e.g., buying something, talking to someone, learning about something), the credibility of that information is essential. Moreover, methods of building trust, and methods to test assertions have changed. For example, if one goes to buy a book online, that person can no longer test the book to see if it is complete and in good condition prior to delivery. They must now trust the online vendor of that book. This is the great paradox in information self-sufficiency on the Internet: *end users are becoming more responsible for making information determinations, but because they have fewer physical cues to work with, they are becoming more dependent on the information provided to them by others.*

This paradox is complicated further by the fact that people are simply unable to, or fail to, recognize many of the more technical influences on the information with which they are provided in the first place. In fact, there is a great deal of information manipulation that occurs that is *never* perceptible to the user. Built into the tools themselves are filters, assumptions, biases, and outright distortions that can never be factored into a user's credibility decision.¹⁹ Indeed, there has been much discussion and research of how the media used to access information can affect perceptions of the credibility of that information.²⁰ There have also been a number of studies into how the online environment itself affects credibility.²¹ Together, this work highlights how credibility can be both determined and manipulated by technical elements, such as load time of Web pages or site design.²² Research also points out that while technology influences credibility decisions, it is often invisible to the end user.²³

Perhaps because these things are so invisible to most people, this point is completely missed in many examinations of how users make credibility decisions online.

Youth in particular are increasingly dependent on software and hardware tools while accessing information and services on their own within the digital environment. Put simply, there is no way to be on the Internet without some intermediating piece of technology. Be it a Web browser, a cell phone, or some other tool, information flowing to and from the Internet, as well as information crucial for determining credibility, all flow through seemingly invisible agents of code and silicon. The Lankes/Eisenberg Architecture²⁴ can be used to highlight the kind of information manipulation that occurs solely in the province of the tools of the digital environment. This architecture divides the Internet and, by extension, digital networks into four distinct layers: infrastructure, application, information service, and user. Each of these layers can manipulate information in a way that is completely transparent to the recipient. Consequently, there are implications of each layer in terms of youth learning.

Infrastructure is composed of hardware (e.g., routers, protocols) used to move information from one place to another on the Internet, and the organizations, such as Internet Service Providers (ISPs), that provide and maintain these mechanisms. This layer is often the most invisible to end users, yet can have a profound impact on the information available to users to enable them to make credibility assessments. For instance, many people do not realize that infrastructure providers can easily block traffic to and from certain destinations, and can make such blocked traffic invisible. When a school blocks access to certain Web sites, they may post a message to a student's browser stating that the site is blocked, or they can more simply provide a "site not found" indication to a user's browser, the same error it would send if the user misspelled a URL. One component of people's credibility assessments in the online environment is the comprehensiveness of the information they obtain.²⁵ As such, filtering programs used in schools may negatively influence students' perceptions of the comprehensiveness, and perhaps even the impartiality, of Internet-based information. In addition, ISPs can block access to any application, disabling software such as instant messaging or social networking at the network layer. The user, not aware of such a block, would only know that their IM (instant messaging) program did not connect to a server and may assume that the error lies in the remote server, thus erroneously affecting their credibility assessment of the remote server, rather than the infrastructure provider.

Applications on the Internet consist of software that allows information to be exchanged between different actors on the network. Applications include Web browsers and instant messaging clients, as well as high-level protocols such as HTTP that transfer Web pages. This broad category covers everything from e-mail applications that automatically mark incoming messages as "junk mail" to the Simple Mail Transfer Protocol (SMTP) that enables e-mail over the Internet, including spam. Spam filters are excellent examples of technology affecting credibility in a nearly invisible way. Many schools have implemented spam filters based on opaque and often proprietary algorithms at the organization level, discarding numerous e-mail messages before any human eyes ever see them. While this type of protection from inappropriate or harmful content can be good, it can also have the unintended consequence of inadequately preparing youth for the digital world they may encounter outside the school environment. Indeed, as both Harris²⁶ and Weingarten²⁷ argue, blocking young people's exposure to information that may not be credible is probably not the best strategy for teaching students to identify and defend themselves against such information, which they will almost certainly encounter at some point in their lives.

Information services are organizations that use applications and infrastructure to meet users' informational needs on the Internet, such as Google and MySpace. From a credibility standpoint, there are ample studies that look at how information services such as Google skew results in their search engines.²⁸ In fact, most search engines, including Google, determine the "quality" and "relevance" of sites using a "link-popularity" metric. This metric selects which Web sites to display and the order in which to display them on the search results page based on how many other sites link to a site. Consequently, more popular pages are selected and are displayed higher in the search results. Because few people go beyond the first few pages of the search output, however, "even if a page is of high quality, the page may be completely ignored by Web users simply because its current popularity is very low."²⁹ This kind of a system sets up a sort of "popularity equals credibility" heuristic³⁰ that could be dangerous or at least disadvantageous to students' learning. As another example of the bias inherent at the level of information services, and the resulting credibility implications, top results tend toward shopping and technology services in Google.³¹ Without knowing this, youth may assume that top results are the "best" regardless of context.

Finally, the *user layer* is composed of individuals and groups, such as teachers and students, who primarily seek and consume information on the Internet to meet their own information needs. Of course, users bring their own biases to both information consumption and production that may affect their credibility perceptions as well as learning. Perhaps the best example is the online encyclopedia Wikipedia. While the collaborative editing afforded by Wikipedia may in fact produce credible information, users must be cognizant that contributors and their contributions may be biased, uninformed, or outdated and should evaluate the information accordingly. A young person using Wikipedia for class assignments who is unaware of the process and accompanying pitfalls of collective editing is thus vulnerable to relying on misinformation.

Decisions at each of these layers can affect credibility judgments by all Internet users, but perhaps particularly by youth, given their heavy reliance on digital media, coupled with meaningful developmental and experiential differences between youth and adults.³² In the end, having tools as intermediaries deepens the information self-sufficiency paradox by making youth more independent in their information seeking, while simultaneously making them more dependent not only on the information they receive but on the tools they use to access this information.

Shifting Credibility from Authority to Reliability

One outcome of this paradox is a shift from an authority-based approach to credibility to a "reliability approach." This shift represents a sea change from the way in which credibility has traditionally been conceived. Whereas credibility has historically been tied to concepts of authority and hierarchy, in the reliability approach, users determine credibility by synthesizing multiple sources of credibility judgments.³³ Both the need for synthesis and the richer set of resources to be synthesized are products of the pressure for participation enabled and imposed by networked digital media.

Traditional approaches to credibility strongly emphasize authority, where a trusted source is used to inform an individual's credibility determinations. In essence, trusted sources are used to "vouch" for the credibility of a given piece of information. People may have many such authority sources, and may themselves serve as an authority in various settings. The

process of becoming or choosing an authority is a process of developing trust and seeking coherence and consistency in the authority.

Some claim that authority is dead on the Internet, for example, some have said Wikipedia (http://en.wikipedia.org/wiki/Main_Page) and group editing have become at least as authoritative as traditional methods for producing encyclopedias, if not more so.³⁴ Others feel that blogging will supersede or at least parallel the authority of traditional news outlets.³⁵ There are indeed a number of ways in which traditional means of authority have been supplanted by open, flat structures for information creation and credentialing. However, to call this tantamount to the death of authority is, at best, an imprecise use of terminology. This new paradigm is not without authority, but more sophisticated methodologies may be required for evaluating it.³⁶ Moreover, while they may not have been as celebrated or accessible as they are currently, history is replete with examples of waves of centralization and decentralization of authority. The dramatic increase in information self-sufficiency has merely led to celebrating the large-scale nature of this decentralization today.

Beyond this historical view, most people use the term *authority* to refer to a single entity, or small set of entities. That is, authority has traditionally been conceived of as hierarchical and centralized. For example, libraries have come together to invest the power of authority in a given institution. For example, the Library of Congress keeps a file of book authors' names, birth, and death information. When citing an author (or including them in a library record) someone can consult these authority files for proper spelling, aliases, and confirmation of an author's identity. This can be thought of as "authority by consent," where all parties in a situation or context agree on who is the authority—that is, who provides the accurate information.

Nonetheless, it might be more precise to use the terms *authoritarian* and *authoritative* to clarify traditional notions of authority. *Authoritarian* is defined as the enforcement of an authority: in essence, the removal of choice by force of law, policy, structure, or some other means. *Authoritative*, on the other hand, is authority granted on the basis of perceptions of trust and expertise. The former is active and enforced, the latter is earned. Wikipedia is more likely to be the death of an authoritarian view that encyclopedias come from only Britannica, Groliers, or other large publishing houses, than it is to be the death of authority per se.³⁷ Thus, the problem of determining the credibility of Internet-based information is not a crisis of authority, but rather a crisis of choice. There are simply currently more choices about whom to trust. Although this is true for virtually all media venues to some degree, the scale of choice makes the Internet particularly affected by shifts in authority.

Libraries have been wrestling with this issue of shifting modes of authority since at least the early 1990s. Many in the library community—though not all, of course—have reacted to the overwhelming number and variety of information choices available to their clients via the Internet by adopting an authoritarian view that the library is where to get good, accurate, and credible information, while the open Internet is filled with bad and wrong information. One famed tag line of the time was, "Information on the Internet is free, but you get what you pay for." Many want the library to become a preferred provider of information, yet the concept of "preferred" only works in an authoritarian view when there is someone who can make others prefer or select something over something else.

This resistance to the democratization of authority among librarians is ironic because there are few professionals better suited to the authoritative world of the Internet than are librarians. They have a culture of open and free expression and access to ideas. They are generalists who move agilely across different topical domains. They are skilled at searching

out information, and locating potential biases in information. Their enterprise (i.e., the library) has little invested in the production of information, and much invested in the consumption of information products from a wide variety of sources. Furthermore, librarians already have a reputation as authoritative, not authoritarian.

The resistance to the democratization of authority is not limited to librarians. Teachers, college professors, doctors,³⁸ and indeed just about any information intermediary has had to wrestle with the new environment of plurality in authority. For some areas of the economy, the effects have been drastic. For example, the travel industry has been rocked by the growth in online bookings.³⁹ And, although people may not be buying houses online, they are using Internet real estate listing services to even the marketplace.⁴⁰ Perhaps one of the most striking examples of the role of authority can be seen in the insurance industry. As Levitt and Dubner note, the simple act of allowing consumers to directly compare term life insurance rates from different organizations over the Internet, rather than depending on the authority of a life insurance salesperson, led to the cost of term life insurance in the United States to drop by \$1 billion.⁴¹ Interestingly, in this case the concept of an authority in a field (an insurance agent) was actually used to mask truly credible information (in the form of lower prices).

The decentralization of authority has turned out to be particularly attractive for teenagers. This shift against stated authority and hierarchy on the Internet is perfectly matched to teenagers' own internal shift against authority of all types.⁴² Note, for example, that the most common tools used by teens include IM, MySpace, and Google, all of which allow for a sort of level playing field, where the "right" or authoritarian answers are virtually indistinguishable. IM, a peer-to-peer technology that allows for instant access to friends and social peers, may constitute a wide network of potential experts in this environment built by the teen, not imposed by some adult "expert." In other words, the technology allows greater opportunity for young people to themselves become authoritative experts in many areas, potentially even shifting the power balance between children and adults in some cases. Eysenbach makes a parallel argument for how digital media have impacted the relationship between doctors and patients.⁴³

Not surprisingly, many adults feel it is a problem that teens may not look to vetted and traditional sources of "valid" information. Their answer to the problem is often phrased in educational terms: "If only we show them the good stuff, they'll use it." This approach has several guises, normally in terms of literacy: digital literacy, information literacy, information problem solving, and those approaches that rely upon checklists to determine "right" and "wrong" information. However, while these approaches can have a positive effect in certain populations, such as undergraduates and elementary school children, under certain conditions they do not always "fix" the problem.⁴⁴

Of course, the concept of multiple authorities existed prior to the Internet. But, the cost in terms of time, money, and even reputation to seek out a multitude of authorities was very high. With the Internet and other digital media, the range of possible authorities has expanded greatly. Before the Internet, for example, a young person might have to rely on his or her local television news or newspaper to predict the weather. Now he or she can go to the Weather Channel, AccuWeather, or even the National Oceanic & Atmospheric Administration for weather information. The task then becomes determining from a number of sources which among them is most credible.

Moreover, a consequence of the culture of information self-sufficiency is that people, even youth, can more easily become authorities themselves. Not only do users have more

sources to choose from, but now they can also access data and information directly, thereby avoiding traditional authority sources altogether.⁴⁵ For example, now young people can gather weather data directly from a variety of satellites and radar installations (including home-based weather stations), and train themselves, until they feel they have sufficient expertise and trustworthiness to credibly interpret information. As users take it upon themselves to become authorities by directly evaluating, synthesizing, and even producing information themselves, the notion of a singular authority ends, and “reliability” becomes the predominant form of credibility assessment.

Reliability commonly refers to something or someone perceived as dependable and consistent in quality. If you have a reliable car, it is one that runs well over time. Reliability to the scientist is simply the consistency of data, such that the same treatment (e.g., questions, experiments, or applications) yields the same result over time. If an authority approach is exemplified by believing that a given news anchor will give a credible answer, then switching from news station to news station looking for commonalities in the same story exemplifies a reliability approach. Reliability approaches to credibility can be seen in the physical world. The fact that a person’s signature is seen as a marker of credibility in legal settings is the belief that a person signs his or her name in a reliable fashion. Reliability is also seen in the cornerstone of good journalism: to confirm information with a second source.

Authority and reliability approaches are often used in conjunction in both the physical and digital world. In the aftermath of Hurricane Katrina in New Orleans in 2005, many residents turned to chat rooms and community-run Web sites to resolve contradictory and often false information coming from traditional channels and sources (including the federal government and the mass media). Local Web sites, such as NOLA.com, allowed communities to come together and share information. Users were able to hear from multiple sources, including eyewitnesses and residents, and to get a more accurate, complete, and thus credible picture of the situation in the neighborhoods. Users who provided the most consistently accurate information became trusted authorities, and traditional authorities (the government and the mass media) were deemed less credible than the users. This is but one example of how digital media have turned credibility on its head.

Perhaps the most common way to become an authority, however, is through reliability. If someone consistently gives out testable and *accurate* information, they are often seen as an authority.⁴⁶ Experts are not simply people with the most experience, but people who have the longest track record in using their experience successfully. The true power of reliability, however, is not only in its capacity to create authority but in its power to destroy it as well. While the necessary degree of reliable performance for authority status varies across contexts (e.g., a baseball player who bats .350 is considered outstanding even though he hits the ball less than half of the time, but a mathematician would not be considered an expert if she got math answers right only half of the time), it is clear that agents giving out unreliable information over time will lose their authority status and, by extension, their credibility.

Authority and reliability also have “halo effects,” meaning that a person who is seen as an authority in one area may be presumed to be an authority in other domains as well, even without proven performance. This can be seen, for example, in celebrity product endorsements. Likewise, unreliable performance in one area can cast doubt on performance in other areas. Like an accountant who cheats at Monopoly, or a minister who cheats on his wife, loss of credibility in one area can cast suspicion on one’s other domains of authority. These halo effects become even more pronounced in the digital environment when the information

about and from an agent (person, organization process) can be more voluminous, diverse, and mobile than in offline environments.

Ultimately, reliability and authority anchor the endpoints of a continuum of approaches to credibility. With authority, preexisting agreements are in place and assumed: the conversation is over. With reliability, by contrast, the conversation is open and ongoing. Networked digital media enhance this conversation and thus are more likely to encourage users to seek out more information and other people to come to a credibility judgment compared to traditional media. Since digital networks bring to youth an overwhelming amount of information and people to engage with in arriving at a credibility judgment, there is pressure for the tools they use to incorporate some ability to participate, or engage in a conversation with people and sources. Builders of digital network tools and information services have begun to respond by being more open and by creating more opportunity for user participation in content creation and dissemination. In so doing, the tools built for users today to find and use credible information facilitate reliability approaches to credibility assessment, and thus learning via constant "conversation."

Digital Media and Credibility by Reliability

Recent trends in digital media facilitate the shift to a reliability approach of credibility assessment. The Internet is by its very design open, providing only minimal control at the network level. The guiding technical protocol of the Internet, Transmission Control Protocol/Internet Protocol (TCP/IP), simply breaks data into packets and makes sure these packets get to the proper destination with fidelity. What these data packets contain, what they do, and how they do it is completely ignored by most users. From this very simple packet-switching technology, Internet users have built e-mail, the Web, instant messaging, and all of the services that users enjoy today. Indeed, the Internet's interoperability, open access, and decentralized control are especially well suited to innovation on the scale of the individual user.⁴⁷

As a result, even higher-level Internet functions are not defined or controlled by the Internet itself. Indeed, there is no central authority that controls the Internet, beyond its basics such as domain name registration and the structure of TCP/IP. Even so-called governing bodies such as the World Wide Web Consortium (W3C) merely suggest standards that are often embellished, altered, or ignored by software developers.⁴⁸ The Internet is, in a very real sense, an agreement, and an ongoing conversation where organizations and individuals share information.

This open architecture and decentralized control provide enormous capacity for participation, which contributes to accurate credibility assessment through reliability among multiple shared perspectives and experiences. Yet, there is nothing inherent in digital networks that makes infrastructure participatory. There are many historical examples of large-scale networks that were centrally controlled, where infrastructures were provided to users with little input by those users. Commercial online networks ranging from CompuServe, Prodigy, and America OnLine to not-for-profit Freenets and BitNet networks were "black boxes" that only allowed users to manipulate pre-made tools. These are historical examples, however, because, even in the case of AOL, these proprietary networks have either been superseded by the Internet, or have had to radically change their underlying infrastructures to accommodate the Internet.⁴⁹ Thus, although involvement in the infrastructure and at the level of specific software applications is not a certainty, the Internet's evolution appears to favor involvement and participation.

Indeed, involvement and participation have led many Internet software designers to view the very process of software development as a means toward credibility. For instance, so-called open source software at its most basic is when the developer of a piece of software makes the underlying source code of the software application available to the public. Anyone with sufficient programming skills can then take the source code and analyze it, add to it, or incorporate it into another software package. On the Internet, this simple concept has been expanded to a more complex approach to any system development.⁵⁰ While anyone with sufficient skill can use open source software, if they improve or expand the original code, they must give the additions back to the open source community.

Open source software and the associated movement propose a new concept of credibility in terms of tools: credible tools are ones that are built in the open, where a conversation on the merits and structure of infrastructure can be debated and tested. This stands in stark contrast to more traditional models of credible software development. In a traditional approach to software development, credibility is defined by the organization that produced the software. This organization would have some standing in the community, good practices, and a proven track record of quality products (i.e., authority). Interestingly, this is often proffered in terms of security. A system is “secure” if few have access to its inner workings, and if the few programmers who put it together used a common quality process. The open source approach takes an opposite stance: To be secure, software must first be transparent and then tested by others (i.e., be reliable). The idea is that, if everyone can see the code, and can test it, flaws will be easier to find and because the process of implementation is tested in public, everyone can trust the product. Open source advocates would argue that by being able to dissect and test all aspects of a piece of software, right down to the very source code, they can better determine both the trustworthiness of a tool as well as the expertise of the tool’s creators (i.e., its credibility).

While there is an ongoing debate between the “open” and “closed” software development approaches, there is no question that it has changed the shape of tool building on the Internet. For example, the Internet produced the concept of “open beta” where software products were made available to any Internet user to test while still in production. Over time, these beta test processes run longer, sometimes never leaving beta (i.e., “continuous beta”). Even traditional software developers such as Microsoft and Adobe have moved toward a more open approach “to enlist a large army of bug testers to help iron out any kinks”⁵¹ in their products.

This openness goes a long way toward addressing the information self-sufficiency paradox among youth, but only for those with sufficient technology skills and education. That is, youth with sufficient technical skills now have the ability to choose and shape the tools themselves. Skilled youth who are wary of a given Web browser can use another one, or even write their own, often in concert with others sharing a similar concern. If a school wants to know exactly how its e-mail program is filtering spam, it can now shop multiple filtering packages until it finds the right one, sometimes evaluating the very source code of the filter.

This ability of *skilled* users fluent in the technologies of the Internet has important implications for youth and education. If society wants youth to be truly able to make credibility decisions in digital networks, then youth must understand the technical nature of the network itself—from the use of tools to the creation of tools. Simple use skills, such as browsing the Web, are insufficient to truly understand the role that tools play in the credibility of Internet-based information. Furthermore, if schools and other institutions prevent youth from participating in the underlying infrastructure,⁵² they are limiting youths’ ability to

resolve the information self-sufficiency paradox and, by extension, limiting youths' ability to learn about and act upon credibility.

This limitation, and youths' reaction to limiting access to the underlying infrastructure of digital networks, can be seen in content filtering put in place at many schools and libraries today. When faced with limited access to the Web, many youth have begun to document the limitations of the filters themselves. Privacy organizations and civil liberties groups have joined students in challenging the efficacy of filters, and have called for change.⁵³ Because the infrastructure that these filters are built upon is open, and because the filter is not part of the network itself, it can be modified or replaced by those who possess the skills to do so. Suddenly the invisible nature of the network itself is visible—and indeed debatable.

The "Credibility Conversation"

To be effective both at constructing reliability-based credibility assessments and in working collaboratively to build innovative technical tools, youth must be able to engage in appropriate conversations with appropriate others via the Internet. Accordingly, Nielsen/NetRatings indicates that teens' usage of digital media is shifting. While the top sites for youth ages 12 to 17 used to be those offering a selection of instant messaging buddy icons, in the last three years the most popular sites have shifted to social networking sites or those providing assistance with social networking content, profiles, and page layouts.⁵⁴ While social networking sites such as MySpace, the Facebook, and others are relatively recent, teens' desire for online social interaction is not new. Teens have preferred social uses of the Internet for some time. For example, in 2001 Lenhart, Raine, and Lewis found that extremely popular uses of the Internet among teens included e-mail, instant messaging, and visiting chat rooms.⁵⁵ Teens' desire for social Internet experiences also shows up in institutional education settings, where Simon, Graziano, and Lenhart found that a large percentage of teens "say they use e-mail and instant messaging to contact teachers or classmates about schoolwork."⁵⁶

Beyond simply a person's age or cultural fads, the migration to social applications on the Internet is in part due to the very nature of learning. Conversation theory,⁵⁷ for example, proposes that learning and knowledge are gained through the interaction of agents around ideas as they go back and forth describing an idea. This interaction can then be used to develop new understandings and new knowledge through a process that contemporary learning theorists call *scaffolding*: one idea building upon another. Learning conversations can take place between two individuals (say a teacher and pupil), two organizations (negotiating a set of academic standards), or even two societies (debating over the best way to educate youth).

Framed by conversation theory, the utility of social interactions in online learning environments (be they formal or informal) for youth is obvious. As youth engage in conversations they learn, and the online environment allows for a greater scale and scope of conversants. Furthermore, as they encounter systems for learning in the digital environment, they may seek out tools to aid in interactions and conversation. The tools they seek out do not simply present credibility information, or third-party credibility assessments, but instead allow youth to participate in the conversation, and therefore the process of credibility verification and knowledge creation. Indeed, recent research suggests that members of open-source online communities are able to effectively build collective knowledge through "virtual re-experience," whereby individuals share their work using online tools to co-construct applicable knowledge.⁵⁸ Clearly, among other uses, youth are well poised to take advantage of precisely this type of conversation.

The concepts of openness, and indeed participation, in the development of tools exemplified in the open source movement can also be seen at the level of the Web sites and remote resources that users access on the Internet. Information services are under increasing pressure to open their sites and resources to youth participation. Information services today understand the power of participation. Where once services might count hits to a Web page, or unique visitors, today whole industries are devoted to analyzing a user's path through a Web site to discover what information he or she encountered, where this information led to successful "goal conversion," such as buying a product or, in an educational context, learning a piece of information, and where the information led to confusion or exiting a site. Educational organizations are now beginning to understand that the true power of the Internet for learning is not simply wide-scale and one-way distribution of information, but instead is getting closer to what is happening inside users' (learners', customers') brains. This trend follows larger forces at work in the educational setting that have resulted in the shift from accreditation and evaluative education bodies to outcomes evaluation and performance standards.⁵⁹

Recognition of the increasingly participatory nature of information services can also be seen in the rise of social networking sites, where the information service is little more than an infrastructure for user-contributed conversations and artifacts. Such services are the purest example of a trend finding its way into a large number of Web sites: users contributing to the ongoing conversation about an artifact (such as a book listed on Amazon), fact (such as an entry in Wikipedia), place (such as Flickr communities devoted to a given city), or other entity. In much the same way that traditional tool developers feel an increasing pressure for community input, content providers are also feeling an equal pressure for community input on their content. Part of this pressure comes from users who see participation as a crucial part of assessing the *credibility* of these artifacts, facts, and topics.

The advent of services that allow greater user involvement, such as blogs, social networks, and recommender, rating, or commenting in e-commerce and other sites, has led to increased demand by youth and other users for involvement in Internet services of all types. Key issues here in terms of credibility are, can one trust a person one has encountered online, and does that person know what he or she is talking about? Increasingly youth and others are looking to user-submitted comments, editorial reviews, and open conversations on a given topic, artifact, or idea to determine trust and expertise. And, in many cases where sites do not provide these functions, the youth community can take advantage of the open nature of the Internet to create their own. This has led to the rise of an entire class of network destinations known as "protest sites" devoted to user discontent with a given institution, person, brand, or product. In the physical world, youth might be limited in their protests to complaints to the principal or reliance on third parties such as better business bureaus, but online youth and others can seek out and build communities of discontented users regardless of geographic location.⁶⁰ Moreover, users new to the brand or item can now easily find such sites, allowing them to incorporate the dissenting views, as well as the official information, when making credibility decisions. In this way, youth can compensate for their relative lack of life experience⁶¹ by leveraging that of others. Of course, these user communities gain strength in numbers and are assessed in terms of their reliability, rather than their authority, as discussed earlier.

This style of grassroots organization has quickly spread from the consumer to the political arena. With an open network, opposing voices that challenge the credibility of some "official" information have equal access to the network and, at times, equal weight compared to official

information outlets and forums. This type of information “leveling” afforded by open digital networks can also be seen in schools. Youth, dissatisfied with either the information available to them from their classes, schools, and teachers, or with the venues for complaint, have turned to the digital environment to disseminate information of protest or information otherwise unavailable within the school. For example, there are now several sites rating teachers, professors, and classes. Blogs, MySpace, and other community sites are filled with “counter information” meant to provide greater context to, or to at least raise concerns about, the credibility of a given piece of information.

Of course, the Web also provides ample opportunity for users to post false information. There are many examples of “astroturfing,” whereby marketing firms have set up seemingly grassroots sites that actually promote particular products or approaches.⁶² Certainly youth may put up false information on protest sites as well, either intentionally or unintentionally. The result is that credibility may be harder to determine for any piece of information. False information also increases pressure on information services to provide opportunities for community feedback, in essence inviting protestors and commentators into a controlled space where an organization can respond to counterinformation.

This pressure for a voice on the part of youth can be expected to result in more opportunities for discussion and conversation in both existing and emerging forms of digital media. It is not surprising that the distinctions between information seeking, learning, and communicating are breaking down. Where once users would e-mail (or instant message) in one application, and search the Web in another, they are now doing both simultaneously. This is not a simple matter of convenience, but rather is based on users’ implicit or explicit preference for knowledge acquisition through conversation. Given what is happening on the Web in terms of social uses and applications, it appears that users are looking to talk with others in order to better evaluate what they find and to synthesize this information into actionable knowledge.

It is also likely that the trend of tracking users’ conversations online will continue and will be enhanced. Information retrieval systems may well develop into conversational retrieval tools that link information by how others have used such information in their conversations. Just like libraries used to produce pathfinders and annotated bibliographies, users will soon be able to find a piece of information, such as a Web site, and follow that information to all of the other public information used in a given conversation. Such a holistic context will allow users to make credibility determinations about an item in the full context in which it resides. Digg.com provides an excellent present-day example of such a system.⁶³ When a Digg.com user finds an interesting news story on the Web, he or she can mark it, allowing other Digg users to not only view the site, but to discuss it in an online forum. What this does, in essence, is elevate the interest of one user to a group’s consideration and evaluation.

Youth may understand this type of information seeking better than adults. Through e-mail, instant messaging, and texting, youth already create close-knit “research” teams that share findings and implicit credibility assessments.⁶⁴ Credibility in these contexts is not determined by the individual, or even the individual in interaction with a Web resource, but within a community engaged in a larger conversation. For school assignments, students may use sources they determine to be credible from their past experience, their heuristic appeal,⁶⁵ the input of experts such as teachers and librarians, and from others, including their peers. This “credibility conversation” may, however, extend past the actual assignment and well into the evaluation of that assignment. A low grade, or follow-up from teachers, may have an impact on how a student evaluates credible sources in the future, and how he or she conveys

information about the sources to others (via social networks or otherwise) who may want to use those sources in the future.⁶⁶ The grades and feedback that the peer group receives should also influence future credibility decisions. However, unless credibility is made explicit in this large and ongoing conversation, it will be ignored. That is, if teachers, parents, adults, and peers do not make credibility part of the discussion, and if there is no consistent result from either embracing or ignoring credibility, it will become invisible, not cognitively attended to by youth, and therefore not assimilated into knowledge. This situation is made worse by the growing educational environment that emphasizes “high-stakes” testing, which minimizes rich assessments and interactions between student and teacher.⁶⁷

The need to highlight credibility in conversations has implications for educational policy makers as well. If youth are exposed only to vetted and “safe” resources, often pruned of a great deal of context and conversation, how are students to gain the invaluable skills required to determine credibility on their own, outside of guided environments? Harris identifies such “conservative attitudes” as a structural challenge that must be overcome.⁶⁸ What policy makers must understand is that, as Weingarten⁶⁹ and Harris⁷⁰ argue, the unintended consequence of creating “safe” learning environments is an environment that limits learning about credibility.

The fact that technology constrains youth information before youth are able to make credibility decisions has startling implications for education. To begin, a common strategy to prepare youth to make informed credibility decisions is based around educational programs normally under some literacy rubric such as information literacy, digital literacy, or media literacy.⁷¹ These programs typically present young people with various strategies and checklists to determine the quality of information they find via digital media.⁷² While this approach makes sense for much of the information a student might access through digital networks, it does not make sense for all Web-based information. For example, how can one judge the credibility of information at a given URL when the true URL is masked by inline frames that show content from some third-party destination as if it were just a part of a normal page? Although this is a specific feature of the Web today, there are sure to be many analogs in future digital technologies. Moreover, there is no amount of literacy instruction that can prepare the average young person for the effects of a network infrastructure that they cannot control directly.

Conclusion and Recommendations

This chapter described the growth of information self-sufficiency and the related paradox where users are simultaneously more responsible for decisions, while also more dependent on information provided by others and the tools used to manipulate information. It discussed how the Internet and digital networks that allow for community participation in the construction of the underlying network and infrastructure have become the predominant model for existing and future digital media, and how this has led to credibility assessment by reliability rather than by authority. It presented a model in which knowledge is gained through conversation and reflection, and argued that digital networks and tools must address this reality. Finally, it showed how this need for participation and involvement has influenced information services, and how users themselves define and assess credible information.

Primary aims of the chapter have been to highlight trends that will most likely endure, continue, or expand as future digital media develop, and to show how youth are both affecting and being affected by these trends. Large-scale digital networks have extended

youths' ability to build their own social networks to aid in the assessment of credibility. They have also allowed youth to participate in the networks in meaningful ways, in essence elevating their own personal credibility in certain domains. However, this new reality has serious implications for youth, as well as for society as a whole.

To prepare youth to make fully informed credibility decisions, they must become fluent in the tools that facilitate the conversation and become aware of potential biases in the network technology itself. As noted by Harris, schools may be an ideal place to do this, but they are limited in their ability to do so.⁷³ Without technical fluency, however, students become dependent on, and often unaware of, the stakeholders who control the network's infrastructure and the policies they create.⁷⁴ Yet, as others in this volume have pointed out, the extent to which youth are involved shapes the Internet and the services available. The omnipresent nature of the digital environment is necessitating more technical fluency and greater explicit consideration of credibility and technology at an earlier age.

So, what are the implications for youth and credibility in the digital environment? The first is that youth, with enough training, now have equal opportunity to access the infrastructure they increasingly depend on. Unlike previous media technology widely adopted by youth, such as radio, television, and the phone system, youth can not only adopt technology, they can shape it at its most fundamental levels—at the level of infrastructure. Furthermore, with the global nature and low cost of entry to the Internet, innovations that are started by a teenager in one schoolhouse or bedroom can become an internationally adopted standard. These changes highlight the possibility that, with the emphasis of open source on public function testing as a means to credibility rather than credibility determined by the reputation of the code's corporate origin, youth with sufficient technical skills can enter the infrastructure development arena on an equal footing to established organizations. This implies that any attempt to prepare youth for life in the digital world should incorporate some fluency in the basic technologies of the network, and the ethical guidance in how such technologies should be implemented.

Indeed, youth have now come to expect involvement in all aspects of information in the network. Schools, business, governments, and other institutions and organizations must change to accommodate this expectation. If not, youth will migrate their attention to venues that allow for conversation and debate of information, or create their own. This is perhaps the most important implication for youth from the increasing requirement for participation on the network. Youth can and will increasingly expect to shape their information domain, and define credible information on their own terms. Any system that seeks to either impose an authority view of credibility, or that seeks to change behavior, must now be done with the understanding that youth can simply bypass these attempts and create counterstructures. Furthermore, these alternative credibility structures can have a global reach and build communities of like minds across divisions of geography, race, gender, age, and other demarcations.

Thus, there appears to be a pressing need to educate youth to assess credibility in participatory ways, thereby steering the potentially negative implications of digital networks toward positive outcomes. Because youth in particular are more self-sufficient in decision making, and also more dependent on the information that others are providing to them, digital media increase the importance of credibility, as well as their ability to make credibility judgments effectively. Learning through "conversation," typified by collaboration with others, is one avenue toward reliable credibility assessments. In the end, this is perhaps the most realistic

and effective means by which to increase knowledge among youth increasingly reliant on digital media for the information that is central in their lives.

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