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AMCIS 2006 Panel Report: The Web as a Digital Reflection of Reality

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Communications of the **A**ssociation for **I**nformation **S**ystems

AMCIS 2006 PANEL REPORT: THE WEB AS A DIGITAL REFLECTION OF REALITY

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ABSTRACT

The web is increasingly relied upon as a reflection of reality, which raises a number of key issues not yet fully recognized or articulated, warranting further study. This new digital reality and the unprecedented capabilities it embodies in terms of searchability, aggregatability, temporal persistence, and so on, give rise to great challenges in the areas of Digital Identity Management, Social Impacts, Currency and Accuracy of Digital Data, Distorting Factors, Legal Issues and Implications, among others, that are only just becoming recognized and articulated. This paper reports on a panel exploring these issues and speculating creatively on how they might be addressed in IS academic research by adopting a fundamental information processing approach to design, incorporating analogs from evolutionary biology, for example.

When we study human language, we are approaching what some might call the "human essence," the distinctive qualities of mind that are, so far as we know, unique to man.

- Noam Chomsky, Language and Mind

FOREWORD

Various logistical missteps led to a low turnout in the panel audience, but this turned out to be fortuitous. Those who did find their way comprised an enthusiastic and thoughtful pool of minds, and the panelists quickly left the stage to gather with them for a stimulating discussion on the floor. All involved found the brainstorming that ensued to be enlightening and worthy of sharing with a wider audience. This panel report represents the effort to do so and incorporates the contributions of many members of the audience as coauthors with the original panel.

I. INTRODUCTION

The genesis of the panel was in a colleague's observation that the web is becoming more and more to be taken as a reflection of reality; when in fact, it has some fundamental limitations that can lead to misrepresentations, distortions, and so on, with unintended or unforeseen consequences. A spirited discussion soon developed as it was noted that web-based information varies widely in quality, currency, authenticity, and other factors affecting its veracity; and, yet we increasingly rely on it for real decisions with tangible effects. Questions arose as to what extent the inherent nature of the web opens up new potential for problems arising from these limitations. How well does the web capture reality? Do we overestimate its effectiveness in doing so? If so, what happens? The breadth and depth of the issues seemed to warrant wider discussion with more colleagues.

The old adage about a tree falling in a forest with no one to hear comes to mind in our context as, "If it doesn't show up on Google, does it really exist?" Over time, we may expect to build confidence that the answer is no, but do we leap to that conclusion too early? (How do you feel when you "Google" something up and there's nothing there?)

Today, we live in two spheres of existence, a physical sphere and a digital sphere. Sometimes we operate in the part that is purely physical but with no digital manifestation, our face-to-face interactions with others, for example. Other aspects of our lives are played out in a purely digital realm via email, instant messaging, chat rooms, or the online marketplace, increasingly populated by merchants with no brick-and-mortar counterparts. Of course the two worlds overlap and intermingle, increasingly raising questions about the uncharted territories in between. What about conflicts between the two alternate realities? How do differences manifest themselves in the intersection? Is the web really any different from traditional media in this respect?

The answers will have very real and tangible implications. Consider CyWorld, the Korean answer to Facebook, currently being introduced in the United States. Described as a "personal media network" with 3-D virtual spaces, the primary source of revenue generated from the swelling teenage customer base derives from purchases of "acorns" (dotori), purely virtual objects such as homepage skins, background music, pixilated furniture, virtual appliances, etc., that members use to decorate their "rooms" or as gifts for other members. Despite, or perhaps due to, the low price, typically less than \$1 apiece, "acorn" sales will generate \$100M in Korea this year. (Schonfeld 2006).

Indeed, based on auctions on e-Bay and other virtual markets, one can now track the currency exchange rate (~10 USD as of last November) between US dollars and units of virtual "gold," the legal tender in EverQuest, the massively popular, Massively Multiuser Online Role Playing Game (MMORPG) (Seigel 2005). Normally, gold must be earned within the game, and the rules forbid out-of-game exchanges, but a virtual black market serves the interest of players who will pay real money to save real time by buying "gold" or even contracting with "gold farming" services where professional players assume clients' identities and bill for hours spent "leveling up" their clients' accounts (accruing achievements to reach higher status levels).

At the 3-D virtual community, Second Life (www.secondlife.com), where members rent land by the square meter to build their own businesses selling whatever virtual goods and services they create, the homepage is constantly updated with the number of US dollars spent in the last 24

hours. As of fall 2007, the figure was hovering around \$365K. The site provides currency exchanges for the virtual "Linden Dollars" and states: "Rates fluctuate based on supply and demand, but over the last few years they have remained fairly stable at approximately 250 Linden Dollars (L\$) to the US Dollar" (www.secondlife.com 2006).

Some will argue that there is nothing new here, that traditional media as reality representations have always been, necessarily, similarly limited and with corresponding consequences. But the depth and breadth to which the web has become integrated into the social fabric is unprecedented, by any standard, and we continue to see what we think is evidence that some of the resulting phenomena are new, unique to the web, perhaps the result of crossing some natural thresholds of information searchability, connectability, and manipulability that make a real and substantive difference and create truly new issues to tackle.

Has the web fundamentally altered our cost-benefit expectations of obtaining information? Are we less willing to invest the cost in search effort to find the information we really need, or do we fall into "satisficing behavior" earlier now, engaging in a first-page-results bias that's like searching for the lost car keys under the streetlight since that's the only place we can see? If so, how does this affect the quality of decisions based on the information?

II. KEY ISSUES AND DRIVING FACTORS

The panel identified five key issue areas to be addressed, recognizing that they are certainly neither exhaustive nor mutually exclusive but rather merely starting points for discussion:

Digital Identity Management. Components of online identity can be difficult to manage or even impossible to control, subject to inaccuracies, complicated by indefinite persistence and unintentional/unsanctioned sources. Perceptions formed from web-based sources are particularly susceptible to bias from mistaken identities or impaired searchability, as is the case with common name searches that result in information overload and excessive cognitive effort without disambiguation.

Social Impacts. The emergence of disruptive communications phenomena in social networking sites, e.g., blogs, Wikis, virtual communities, is effecting changes in long-standing social paradigms and/or the creation of new ones, such as the now common use of different alternative identities for use in different online communities.

Accuracy and Currency of Digital Data. Self-published, web reality undergoes constant organic evolution and mutation, defies efforts to establish accuracy, authenticity, and currency, evading the gate-keeping function traditionally served by print publishers

Distorting Factors. The web can either produce or represent a disproportionate reflection of reality elements due to technical limitations, economic factors, or political influences (e.g., Google search for Tianenman Square as sanitized by the Chinese government depicts festive ceremonies and foods, no mention of the infamous massacre).

Legal Issues and Implications. Virtual artifacts are persistent (Deja News, Wayback, and similar archiving sites), and legal implications for handling and possession are not well-understood, e.g., digital ownership rights, confidentiality, and longevity issues. For example, CNET News reported how "the family of a U.S. Marine killed in Iraq was denied access to the soldier's Yahoo e-mail account due to the company's policies" (Hu 2004). Such incidents highlight the uncharted legal territory opened up in the digital world.

As a counterpoint, it was posited that perhaps these phenomena are not new, but merely transpositions of existing, familiar behaviors into the digital realm. In response, it was argued that the degree of change introduced by the digital revolution has been so extreme as to create new and often unforeseen phenomena that have gone largely unrecognized. Consider the following driving factors:

- **Sources of information:** The number of sources of information about individuals has exploded to levels unimaginable prior to the digital revolution. These include personal homes pages, social and professional networking sites, organizational home pages, news articles, blogs and so on.
- **Ease of aggregation:** Information distributed across multiple disparate sources can now be feasibly correlated and aggregated, producing new information and conclusions that were previously impossible. The panel saw an example in a real estate blog, *FlippersInTrouble.com*, that recently displayed a number of homes for sale in one particular metropolitan area, drawing together detailed financial information about loan balances, refinancing levels, sales history and so on as to identify (to two of four digits of street address) owners selling under financial duress. In another example (Krebs, 2006), a slated speaker at the 2006 HOPE hackers conference in New York City, was taken into custody by the FBI just before he was scheduled to describe how easily he had aggregated, in just 4.5 hours, more than 500 pages worth of identity information for a volunteer "guinea pig" attending the conference: "All I had given him was my e-mail and name. He knew everywhere I'd lived, every car I had driven, and even someone else in Alabama who was using my Social Security number since 1983. He found all my friends, pictures of friends, knew about my brother's criminal history."
- **Information Richness:** The richness (text, images, video, and audio) and depth of information now available online far exceeds the kinds of secondary information available throughout most of history via traditional publishing venues or public records.
- **Indefinite Persistence:** Once information enters the web domain it may be considered indefinitely persistent. Personal information such as the last several home addresses of an individual are available, and several web archive repositories exist. As a result, ePersona information, inaccurate, outdated, embarrassing, unsanctioned or otherwise undesirable, may be difficult or impossible to retract, correct or manage.
- **Lack of Integrity:** Quality and authenticity of information on a website cannot be determined easily. Some studies that assessed the quality of websites found that reliability, accessibility, and completeness of information on the Internet are extremely variable (Eysenbach, 1999).
- **Indeterminate Timeliness:** In sharp contrast to the traditional information paradigm in which publishers served as information gatekeepers with a degree of self-imposed responsibility and adherence to industry standards, the self-publishing phenomenon enabled by the web is inherently unruly, making information timeliness difficult to estimate. It is usually not easy to tell when a webpage was created or updated, making it difficult to date material on the web.
- **Ease of Unsanctioned Alteration:** Historical records or archives in digital form can be altered. This kind of manipulation of information is more difficult to achieve when the same information is in print form. For instance, newspaper articles available in digital archives and collaborative workspaces can be edited and changed. Recently, a controversy arose when a Wikipedia contributor anonymously posted a hoax in the Wikipedia entry for John Seigenthaler Sr., a well known writer and journalist. This incident received publicity and led to critical examination into the credibility of Wikipedia and resulted in policy changes.
- **Biases from trust perceptions:** Factors such as format of web pages and volume of information may produce biases related to trust and credibility that could in turn impact impressions formed. For instance, a study (Eysenbach, 2002) that looked at how web users searched for health information found that users took into account factors such as source, design, scientific or official touch, language, and ease of use to assess credibility

of websites. Such credibility assessments could impact opinions formed about people as well.

In illustration, the panel delved further into three of the five issues listed above, Digital Identity Management, Social Impacts, and Distorting Factors.

III. DIGITAL IDENTITY MANAGEMENT

Digital identities are becoming increasingly important but at the same, increasingly outside our locus of control. The well-publicized case of John Seigenthaler's Wikipedia entry is a prime example. (Helm, 2005). The former *USA Today* editor described it as "Internet character assassination" when his biography was amended anonymously (as a prank) to implicate him in the John F. Kennedy and Robert Kennedy assassinations. We note how the web has narrowed the margin for error and magnified the suffering and damage possible in such libel cases with digital information sources such as Wikipedia.com that serve a self-reported 2.5 billion page hits per month.

Consider an example closer to home. At a time when enrollments are closely watched in our field, we in the Information Systems academy are keenly aware that students rely more and more on RateMyTeacher.com and similar sites to select among alternative sections of a course. As a result, the qualities valued by the contributing students, whether we would agree with them or not, may have very real repercussions, even for tenured faculty immune to the fallout from formal teaching evaluations, but now subject to course cancellations or reassignments due to headcount deficiencies or imbalances between competing sections. With no direct control over this aspect of our digital identities, will we maintain teaching standards if they are in conflict with what the teacher-raters value?

We are only beginning to realize that some aspects of our digital identities over which we do exert control initially become public domain when released to the wild of the web and can have unforeseen and very real consequences that may be difficult to reign in. For example, *The New York Times* recently ran a story (Finder 2006) entitled "When a Riské Online Persona Undermines a Chance for a Job" about an employer who looked up the Facebook entry for an applicant. The young applicant had written entries that made him seem cool to other Facebookers, but eliminated him from consideration for the job instantly. A Microsoft manager is quoted as saying, "It's becoming very much a common tool. For the first time ever, you suddenly have very public information about almost any candidate."

To compound the problem, systems such as the Wayback Machine maintain searchable archives of the web so that, in effect, web information, once released, persists over time even after the original page is taken down, making it unretractable. A *BusinessWeek Online* article entitled, "You Are What You Post" (Conlin 2006) describes how a Seattle man is haunted by a 2001 web posting about a drug-related experience. The posting was linked to by a famed blogger which drove so much traffic to the post that, five years later, it still ranks No. 7 out of a total 92,600 Google hits that come up when you type in the man's name. He fears for the bloggers and vloggers (video bloggers) who fail to realize that there is no such thing as an eraser on the Internet. "I see people do that sort of thing now, and I think: 'Oh man, that could come back and bite you.'"

IV. HUMAN SOCIAL COGNITION & INFORMATION SYSTEMS: NEED FOR IMPROVED UNDERSTANDING

We understand that there are some deeper processes involved in human design of language (Chomsky, 1986) and tools, such as information systems (Winograd and Flores, 1986). These processes reflect organic rhythms developed over millennia of human development and interaction. When we come to the era of the Internet, we should expect no less than a continuation of natural human design processes and needs. The longer we get to know and use

the web the more we should see social, human reality appear, and morph, the more focus we should give to studies of this reality to better design and understand information systems.

Design work in IS has largely focused on individuals and their ability to command and control specific graphical interfaces for computer systems. In the past couple of years, social interaction has become a dominant theme in systems design and web usage trends, exposing a gap in the existing research.

Some of the more mature social interaction applications are task and work-oriented, such as SourceForge or E-bay. More recently, some simply provide space for small group interaction (e.g., Yahoo! Groups, Google Groups, MSN Groups). In the interim, multi-player online games have used the Internet to enable play (e.g., The Sims, World of Warcraft). Finally, we are seeing spaces focused mostly on sharing and more purely social interaction among huge groups (e.g., MySpace, Facebook, YouTube).

We can differentiate these applications by focus and level of prescribed interaction patterns (structure) (Figure 1).

	Structured	Organic
More Task Focus	SorceForge, E-bay	Yahoo!Groups, Google Groups, MSN Groups.
More Social Focus	Sims, World of Warcraft	MySpace, Facebook, YouTube

Figure 1: Web Social Applications by focus and structure

When we look at Figure 1 and consider the state of IS research, we see that, at best, we have begun to study open-source community interactions and e-bay auctions. We have used Yahoo! Groups or other tools in its category in order to causally study student groups involved in virtual team studies, but what study has looked at the phenomenon of organic, task-focused groups on the web? The U.S. Army has entered the multi-player online game space with its immersive combat simulation *America's Army* (www.americasarmy.com), described by Wikipedia as, "the first computer and video game to make recruitment an explicit goal" (Wikipedia 2006). Universities and hiring managers have used MySpace and similar organic, social applications to expand their information networks (Finder, 2006; Zhang, 2006). All of the categories in Figure 1 are being used in business, but we have not yet studied them.

As humans bring their evolved, social reality into the web, we need to expand our studies to include the new opportunities afforded by the innovations that result. We can expect to see the expression of deep structures and persistent long-term patterns of human behavior, and we can expect to see systems designed to overcome the limitations of typical, face-to-face interaction, taking advantage of the specific capabilities of the web. We can expect that the web will mold reality and reflect it. We will have opportunities to influence that molding and to multiply its reflection if our studies expand to include the what, how, and why of these web-enabled social interaction reality spaces.

V. DISTORTION EFFECTS

The panel now shifted its attention to address an intriguing question: Does the Internet distort human perceptions of reality? If indeed the web does distort human perceptions, citing some novel examples for panel discussion might help to highlight existing research and fruitful avenues of additional academic inquiry. It is also important to recognize that distorting perceptions is not necessarily unwelcome, for instance, in those situations where initial perceptions can be harmful to human relationships.

The panel first considered human emotions and the Internet. A substantial body of IS research exists supporting the premise that computer-mediated interactions (e.g., email or instant messaging) strip both bodily language and possible emotional cues from human communication (Daft et al. 1987; Jarvenpaa and Leidner, 1999). Thus, it follows that the Internet potentially distorts human perceptions of the emotional truths of others (i.e., realities).

However, perhaps the Internet could also elicit incorrect emotional responses in humans. As a thought-experiment, the panel considered the “stadium stampede” phenomenon in which normally rational individuals become irrational and chaotic as everyone tries to exit a stadium en masse. Such a phenomenon sometimes results in needless injury or death resulting from the group hysteria (Sugiman and Msumi, 1988).

The psychological explanation for such human behavior involves an innate cognitive mechanism that recognizes panicked faces of others. Such a mechanism presumably stems from our evolutionary history (Dawkins, 2006). For our human ancestors, those who rapidly responded with panic – to the panicked faces of surrounding humans – probably had a better survival chance than those who did not respond immediately. However, in the context of a “stadium stampede” where perhaps a soccer fight has occurred, the rapid visual spread of panic can result in an irrational group response and damaging consequences. An innate survival response that worked well for the savannah of the past does not work so well in the soccer stadium of today. Those who do not panic might have more chance of survival given our modern environment.

The “stadium stampede” phenomenon can also occur digitally, as the Internet exposes human individuals to images and videos of other humans. Unlike television or print media, individuals on the Internet are not only passive recipients of images and videos but also can publish their own images and videos and actively self-direct their search and discovery processes of additional content. On the Internet, the same innate cognitive mechanism that recognizes panicked faces of other human individuals exists (Bray and Konsynski, 2006). The panel highlighted two unanswered research questions surrounding the Internet, human emotions, and distorting effects on perceived reality. First, when and under what circumstances are emotions (e.g., fear) propagated by the Internet? Second, **can Internet technologies help mitigate in-group spread of negative emotions?** Both of these questions might prove fruitful avenues of additional IS research and theory with significant social benefits.

The panel then considered a rise in the number of individuals choosing to blog about their workplaces on the Internet. One view espoused was that such blogs “publicized” what previously were private, closed-door discussions. In response, several companies (e.g., Google, Microsoft, Friendster, and Delta Airlines) have fired employees responsible for such blogs. Yet according to the Electronic Frontier Foundation, such employees are, “saying the same things [as] around the water cooler... in a forum... read by millions of people” (CNN Money, 2005).

Another example of individuals choosing to blog about their workplace involves a website known as CDCchatter (www.cdcchatter.net). The website is a public blog hosted by a Federal government employee at the U.S. Centers for Disease Control and Prevention. Unlike other employee blogs that identify the contributing individual, CDCchatter allows multiple individuals to blog about the government agency anonymously, without requiring registration. Individuals can also choose to register and then opt to mask their identity when contributing an article or comment. The site has been operating since January 2006.

Recently, anonymous posters at CDCchatter began to ask questions regarding the distribution of annual cash rewards for employee performance. High performing government employees potentially receive annual bonuses from a “group pot” for stellar work performance. On CDCchatter, some individuals raised concerns that the annual cash rewards were distributed unfairly, or that employees were not being given full information about the size of the “group pot” of funds. In less than a week after the anonymous blog discussion started, a U.S. Senator requested a formal investigation into the concerns. Through the Freedom of Information Act (FOIA), prominent metropolitan newspapers also requested that the government agency disclose

employees who received a cash award of \$2,500 or more between January 2000 and July 2006 (CDCchatter 2006).

The panel then highlighted two unanswered research questions surrounding an increase in workplace blogs. First, do public blogs (with identifiable or anonymous posters) hinder or help firms and government agencies by increasing transparency and public pressures? Second, are there any social norms to workplace blogs; if so, how are these norms established? Both of these questions were presented in light of the rising use among teenagers of myspace.com, facebook.com, and similar public websites sharing the personal likes, dislikes, trials, and tribulations of its members. In all probability, thirty years from now the future U.S. President will have had a myspace.com webpage, long-since preserved by one of the Internet archive engines. Will this prove embarrassing or will future leaders find it more acceptable to be publicly transparent with their thoughts and feelings online?

While at one level the behavior is nothing different from workplace gossip, at another level it is presenting this information in a new context (i.e., globally accessible to millions of individuals simultaneously) wholly different from the past. For firms and government agencies, the new context prompts them potentially to fire employees who operate their own workplace blogs.

VI. DISCUSSION: EVOLUTIONARY PROCESSES IN INFORMATION PROCESSING & IMPLICATIONS IN IS

The panel finally considered the challenge of “information overload” resulting from the Internet and the increase in information systems influencing elements of our life at work and home. Linking perspective of evolutionary biology brings a unique view to IS research challenge.

With regard to evolutionary biology, Edward O. Wilson enlivened the academic world with his introduction of sociobiology over a quarter of a century ago (Wilson, 1975). His proposition that human behavior was influenced by evolutionary development was intellectually and physically assaulted. (He had a jug of water tipped over him at least at one conference). But ultimately his thesis won the day (Alcock, 2001). Sociobiology, rebranded as evolutionary psychology (Buss, 1999), has entered mainstream thinking in some academic disciplines, yet it is very much on the periphery, essentially out of sight of IS academic thought.

Of note for both biologists and researchers in the IS field: Life is about information. All biological life forms convey and process information. At the cellular level, genes contain information necessary for the production of proteins, bodily maintenance, reproduction of new cells, and potentially future generations of offspring (Watson and Crick, 1953). At the cultural level in humans, memes represent information that one individual's mind transmits (verbally or by demonstration) to another mind, including “tunes, ideas, catch phrases, clothes fashions, ways of making pots” and similar cultural tidbits (Dawkins, 2006). At the conscious level, humans also use language as a method of communicating complex information, be it thoughts, feelings, warnings, past events, future possibilities, or abstract ideas (Wade-Benzoni et al., 1996). Finally, at the digital level of information systems, information can take a binary form of 0's and 1's that provide instructions to a computer.

This led to a question: What can the universality of information exchange inform IS research with regard to “information overload” experiences in humans? Might it be possible to borrow lessons from evolutionary biology to address challenges of too much information? Life employs multiple mechanisms to allow possible modifications in the information passed from one generation to another. In the face of changing environmental pressures, not being able to change and adapt can hurt both an organism and its entire species (Wilson, 1975).

One key insight that surfaced during the panel was the realization that there is a fundamental connection between IS and evolutionary psychology. Humans, like all animate objects, depend on their information processing skills to survive and reproduce (March, 1999; Hawkins and Blakeslee, 2004). The current information processing skills of humans are a result of several

million years of evolutionary development. Current thinking suggests humans have between twenty to a hundred pre-programmed behaviors (e.g., identification of and halting at a precipice, infant suckling behavior, innate cognitive abilities assisting with learning a language) that are a consequence of an extended evolutionary process. Many of our innate information processing capabilities, however, are ill-suited to the information intensive modern world. The panel introduced the conjecture that **a central role of information systems is to overcome humans' information processing limitations resulting from our evolutionary history.**

The panel took a broad view of IS. One important role of IS is to overcome human limitations akin to earlier use of technologies. What distinguishes IS from other technologies is that information systems can help humans transcend cognitive as well as physical limitations. The knowledge and information embodied in a specific IS is unique, contrary to other predictions of the commoditization of technology (Carr, 2003).

An example of using technology to overcome human limitations involves statistics. Most humans do not possess inherent statistical expertise (e.g., many people play the lottery hoping to win, yet are unconcerned about being struck by lightning, despite the fact that the latter is more likely to occur). In contrast, information systems are good at analyzing statistics and ranking odds. By using information systems, all humans can overcome their cognitive limitations with statistics.

Another example involves using IS to reduce the innate cognitive prejudice invoked whenever we encounter another human differing in appearance from immediate family or ourselves (Dawkins, 2006). This "stranger detection" reaction may have been beneficial for our ancestor's early pre-history, but is ill-suited for the pluralism of today's modern societies and workplaces. Using information systems to enable faceless, computer-mediated communication between humans (e.g., email or instant messaging) could reduce many of the environmental cues that might elicit prejudiced behavioral response. Information systems could help overcome social prejudices by producing a new, distorted reality where physical attributes are secondary.

The panel also stressed a second important role for IS and evolutionary biology: Leveraging biological mechanisms for optimizing information processing for the digital world. Biological life has had more than three billion years to develop different mechanisms to fit different environmental niches and changing conditions. One limitation for digital information systems involves static files, which are often saved to a hard drive of a computer and remain there until the user performs some action on them. In an organizational context, files are scattered across multiple computers of multiple users. Though a search engine may help different users find a desired file, this approach still requires active searching by a user. Instead, an optimum solution would be to imbue some awareness and artificial intelligence to computer files and have them find appropriate users. Akin to ants that collectively are capable of building an elaborate colony, files could begin to "self-organize" themselves into neighborhoods.

Less such a proposition sound too radical, consider the use of categorized web links and automated "bots" supporting Google's search rankings. In such a case, the composition of individual pieces of information (i.e., websites) organizes the system as a whole. For Amazon.com, the patterns of buying behavior organize the recommended links for additional purchases.

The panel considered two simple rules for "files as biological analogs." First, attempt to self-propagate to as many hospitable environments as possible. Second, make friends with files of similar attributes (e.g., content, previous editors, use patterns). The panel then considered Figure 2, consisting of three environmental niches on the Internet. These individual niches can represent the virtual workspace of unique users with unique preferences in the type of knowledge and information they would like to find them. In niche 1, File B has attributes similar to files A and C, forming a neighborhood of files belonging to user 1.

Following the two simple rules, File B attempts to send a copy of itself to niche 2. However, user 2 does not want File B and "kills" (i.e., deletes) this copy in niche 2, which triggers File B and its

neighbors to favor niche 2 less. This action and response represent a changing environment becoming more hostile to files of certain characteristics. File B also attempts to send a copy of itself to niche 3. In this case, user 3 does want File B and appreciates its arrival. By using the file, user 3 triggers File B and its neighbors to favor niche 3 more. Files A and C, which are neighbors of File B in niche 1, will then try and send copies to niche 3. User 3 may find none, one, or both of the files useful, which will produce different environmental pressures for niche 3.

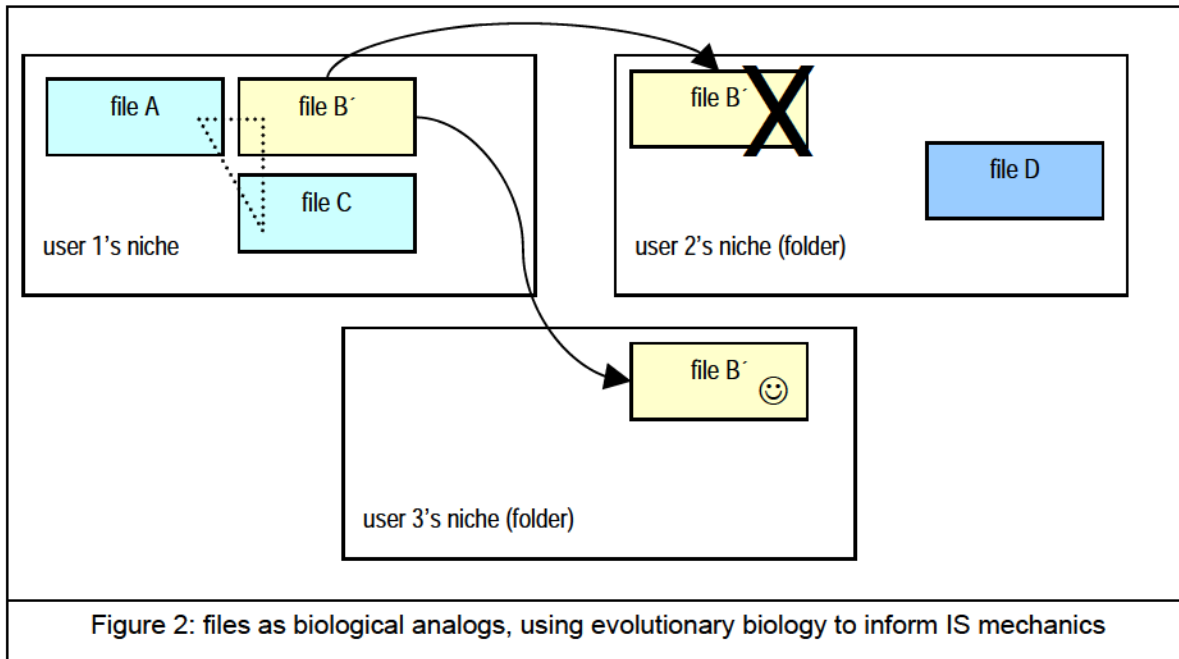


Figure 2: files as biological analogs, using evolutionary biology to inform IS mechanics

The panel unanimously agreed that more research is required regarding IS and evolutionary biology. On the psychology side, the next step is to develop the general proposition that IS can overcome human cognitive limitations. We must systematically examine the current and potential connection between information systems and each of the identified innate human behavior modules resulting from our evolutionary past. Some of the ameliorating information systems have already been developed (e.g., statistical packages), and those not yet created should be fertile domains for IS research and development. Conversely, on the mechanics side, websites like myspace.com are already using user preferences and social networks to deliver customized content. Additional research into intelligent web agents, including intelligent files, may produce additional innovations. The broader prospective outcome is to establish a conceptual foundation for IS that is not rooted in the traditional turf of business (e.g., Davis, 1974).

VII. SUMMARY AND CONCLUSIONS

The panel posits that the web is increasingly relied upon as a reflection of reality and that this raises a number of key issues, not yet fully recognized or articulated, that warrant further study. A preliminary set, neither exhaustive nor mutually exclusive is proposed to include: Digital Identity Management, Social Impacts, Currency and Accuracy of Digital Data, Distorting Factors, Legal Issues, and Implications.

The discontinuous change effected by the web has resulted in a number of unprecedented factors, such as searchability, aggregatability, indefinite persistence, and others, driving the issues above and presenting what we believe to be fundamentally new phenomena that affect the verisimilitude of the web as reality. These phenomena are manifested in a variety of examples – virtual economies intermingling with real ones, virtual world indiscretions leading to loss of real world jobs, hidden readers in email lists and chat rooms may silently read postings, forward

comments anonymously, or take communications out of context – individually no more than intriguing anecdotes, but taken together, representative of greater forces at play, worthy of study in and of themselves.

As IS academics, we are compelled to wonder how we might adjust, adapt, exploit, abate, or otherwise address the issues proactively and, seeking to explore the possibilities for fundamental solutions to such fundamental issues, we indulge ourselves to consider human information processing at the most basic level and examine the connection between IS and evolutionary psychology. We cast the role of IS technology as a vehicle to overcome human limitations akin to earlier use of technologies, but now helping humans transcend cognitive as well as physical limitations. We contemplate existing and conceivable implications and then extend the idea to leveraging biological mechanisms for optimizing information processing for the digital world. For example, rather than honing search technology, we might seek to design information files with the intelligence and behavioral knowledge to dynamically self-organize, along the lines of biological systems, to relieve the burden of searching altogether. Such conceptualizations open a rich and intriguing array of research opportunities as well as challenges.

A unique perspective was offered by Michael Epstein, a colleague from the panel audience engaged in work at MIT and in the private sector, exploring mixed-reality and augmented reality applications of technology. In a paper session at the same conference, he and co-author Silvia Vergani presented a pilot mobile technology walking tour created in Venice, Italy, within the context of creative tourism (Epstein and Vergani, 2006). Designed to enable interactions between tourists and locals and to engage travelers as co-producers of the travel experience, their project embodies the tension, articulated in the panel, in technology being intertwined with reality. The paper they presented, describing the project, stipulates: "From the outset, we recognize the potential incompatibility between the natural, palpable beauty of Venice and cutting edge mobile technology." Epstein's reflections on the panel capture the blend of optimism and skepticism that inspire us to pursue the unanswered questions:

The panel was a refreshing collection of warnings, scoffs, and skeptical fascination with the latest uses of wearables, websites, and mobile technology. The meager audience sat erect to marvel at the oddity and the moral quandaries put forth. I found myself gravitating towards the questions of identity, sparked by the panel's captivating examples of how identity is formed through Google images, public access to personal finances, and other people who share our names. In some ways it felt a bit retro, early 90's when we were debating the digital divide, cyborgs, and SiliconSnake Oil (Stoll, 1995).

*So what are we to do with these gaps between our own real and digital selves? In our group discussion following the panel presentations, we struggled with social issues resulting from this gap, but then my thoughts wandered towards the creative potential of these gaps. My work focuses on narrative development with new media, specifically mobile devices. The gaps between our digital and analog selves can provide the friction for compelling storytelling. Classics such as Don Quixote and Huckleberry Finn make use of stolen identity to highlight issues of false nobility and meaningless feuds. The novels are driven by the unresolved tension of characters consciously and unconsciously trying to be something they are not. In the gaps between what we experience directly and what is mediated through digital devices, we find similar distortions of nobility and conflict. Whether it is s***-talking in a chat room or porting highly personal conversations to public spaces via cell phone, digital-ness is bringing out the Huck and Quixote in all of us. And in the Acapulco lobbies and conference rooms, there was fair share of AMCIS false Dukes and industry knights errant.*

Mining the narrative fuel from these gaps between what we know digitally and what we know directly will take some time. Glancing at a couple of my past and future projects, I have found that theatrical performances can successfully integrate audience cell phones into the performance. Extending the stage to all the small screens in the audience can both divert attention from what is on stage and set up various surprises. Later, for the History Unwired project in Venice, Italy, I began juxtaposing mobile device narratives with intriguing and dynamic aspects of the built

environment. Finally, the resurgence in recent months of well-funded mobile products without business plans, begs the development of a satirical mobile product—something that encapsulates both the bravery of mobile entrepreneurship and the silliness of the resulting products. Overall, I am working towards the development of high tech narratives with a sense of auto-irony and self-reflection, admired as much for their use of the new media as for their independence from the medium.

In summary, the panel struck a chord that resonates broadly, suggesting that indeed there is something to this idea that the web is enabling a new reality not yet fully understood or appreciated, but of significant importance. As evidenced by the panel discussion, this realization taps our collective consciousness and inspires us, as information systems scholars, to rethink fundamental assumptions about systems design to address the challenges raised. In that spirit, we conjecture that evolutionary biology can inform design, highlighting how systems might be intelligently integrated with our natural abilities, to help us deal with today's information environment challenges, such as information overload, for which nature did not have a chance to prepare us. At the same time, the field offers a rich set of biological models upon which to draw as we seek alternatives to dealing with the complex issues that have confounded traditional approaches. Whether the solutions will derive from evolutionary biology or other alternative perspectives, the technology/reality frontier evolves on its own terms and leaves it to us to crystallize the issues and explore the possibilities.

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1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
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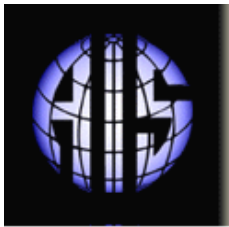
Michael Epstein is a Flash producer and researcher at MIT's Department of Writing and Humanistic Studies. He is the founder of Untravel Media, a company that produces multimedia walking tours for mobile devices. His *History Unwired* project is a walking tour through one of Venice's more hidden neighborhoods, delivered over location-aware, multimedia phones and PDAs. The content is a first-ever mix of mobile video, animation, audio, and installation art for the tourism sector. Michael Epstein lives and works in Cambridge, Massachusetts.

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