

CAUGHT IN THE WEB: USE OF THE INTERNET IN AGRICULTURAL R,D&E

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Summary. Use of Internet resources in agricultural R,D&E is increasingly common, and is already routine for many people. Two of these resources are particularly relevant: e-mail (including mailing lists) and World Wide Web. Their use can improve the way we work: through speedier document exchange and easier editing; more extensive information retrieval; greater connectivity with other professionals; and increased sharing of knowledge. Some useful mailing lists and Web sites are documented. The social effects, and benefits for productivity, are potentially great but are still ambiguous. This paper is available on the Internet at: <http://www.peg.apc.org/~pgcox/aac961.html>.

INTRODUCTION

The Internet began in 1969 as ARPAnet, named after its sponsor, the Pentagon's Advanced Research Projects Agency (1). Its aim was to allow scientists and engineers working on military projects in America to share expensive computers. Until 1983, the Internet consisted of fewer than 500 host computers, most in American military labs and academic computer science departments. By 1987, it had grown to include 28,000 host computers at hundreds of different universities and research labs. Latest estimates (4) put the total number of net users at between 16m and 40m people worldwide, increasing annually by between 26% and 100%. As of June 1995, Internet connections are available on all continents, with the most obvious deficiencies being much of sub-Saharan Africa, the Middle East and parts of western and south-eastern Asia (10).

Initially, Internet provided for file transfer between computers and remote running of programs using somewhat arcane tools such as ftp and telnet. E-mail and mailing lists (listservs) were the first of the *interactive* applications. Gopher (3), developed in 1991, and better modem technology (providing for faster data transfer over standard telephone lines) greatly improved access to information. But it was with the World Wide Web (*the Web*) that the Internet really caught the public imagination. Conceived by Tim Berners-Lee at CERN Physics Laboratory in 1989, the Web links digitised documents, images, videos and sounds to each other using *live* footnotes (hypertext links). The open-structure of the Web allows information to be linked and followed from computer to computer in innumerable ways. It was the development of multi-media Web browsers, such as Netscape Navigator, which made *surfing the Net* relatively easy.

Numerous Internet service providers give affordable access from a PC via standard telephone lines (8). In 1992, the Commonwealth approved a four-year funding program to establish demonstration telecentres in rural and remote communities. Over 30 telecentres are now either operational or under development in rural Australia. The objectives of the program are to foster the development of community managed telecentres to explore and demonstrate the role of new telecommunications and information technologies in the economic and community development of rural and remote Australia. However, there are few success stories so far (11). The new technology is increasingly promoted in the rural press as a tool that farmers can use for accessing information relevant to them, e.g. Landcareweb (14).

THINGS TO DO AND SEE

Internet resource tools fall into two categories: e-mail based and interactive. E-mail makes multi-authoring of documents and software easier and quicker because of the faster turnaround and ease of editing. It encourages continual interaction between professionals engaged on the same project and goes some way to overcome the tyranny of distance characterising agricultural R,D&E in Australia. Mailing lists are e-mail based discussion groups which bring together people with a common interest e.g. ICRISAT is using a list to facilitate discussion among groundnut researchers (2). In our research, we have benefited from

access to these virtual communities as a source of stimulating ideas, and (although to a much lesser extent) as a way of testing our own ideas. Table 1 shows some mailing lists we have found useful in our work.

Table 1. Some useful mailing lists.

Name of list	Name of server	Discussion topic
arlist-l	listproc@scu.edu.au	Action research
wholesys-l	listserv@netcom.com	Whole systems
sanet-mg	almanac@ces.ncsu.edu	Sustainable agriculture
edupage	listproc@educom.edu	Uses of information technology
joe	almanac@joe.org	Electronic Journal of Extension

In contrast to e-mail, the Web is interactive requiring the user to run a special browser application (usually Netscape Navigator) to request information directly or via *search engines*. The program displays the results of the request immediately on-screen rather than sending them later via e-mail. Table 2 shows some Web locations we have found useful. You can construct your own Web Home Page using a simple text editor or authoring software (web editors) available on the Web. Interestingly, although the search process on the Web is described as truly interactive (because it is synchronous), e-mail based tools encourage greater interaction between people (at least partly because the tool is asynchronous).

Table 2. Some useful World Wide Web sites.

Location	Topics
www.csu.edu.au/links/agriculture.html	Australian WWW servers: agriculture
kaos.erin.gov.au/erin.html	Australian environment
www.agfor.unimelb.edu.au/LCweb/LCweb.html	Landcareweb
www.mid.net/KOVACS/CD/S0060S.html	List of agriculture mailing lists
www.monash.edu.au/library/guides/agriculture.html	Not Just Cows
www.bib.wau.nl/camase/	Agricultural systems and the environment
www.mother.com/agaccess/	agAccess

www.agriculture.com

@griculture Online, Successful Farming

www.csiro.au/

CSIRO

www.dpi.qld.gov.au/longpdk

The Long Paddock

caster.ssw.upenn.edu/~restes/praxis.html

PRAXIS

gopher://penpages.psu.edu/

PENpages

www.ag.uiuc.edu/~interpak/welcome.html

INTERPAKS

IMPLICATIONS FOR THE DESIGN OF R,D&E

The processes of innovation in agriculture and natural resource management are moving towards wider participation in responsibility for effecting change. Information technologies, such as the Internet, can contribute to these social processes. E-mail can change group dynamics through relative empowerment of different points of view that previously would not have been heard. But there is another side to the information revolution: inappropriate use of e-mail (when it is unnecessarily intrusive); rapid choking off of information channels; and addiction to net-surfing. Significant issues need to be addressed in managing Internet resources effectively and establishing best practice use (6, 7), in research and extension as in other areas.

Sproull and Kiesler (15), arguing from a number of case studies, point out that computer-based information technology makes it possible to bypass traditional information gatekeepers, thereby leading to changes in who has influence. They maintain that it has greater potential to support upward and lateral influence, not just downward management control. In the short term, people often tend to over-invest in information, and access to these technologies can be counter-productive. In the longer term, the links between employees resulting from increased participation associated with electronic communication may build a useful capacity only required intermittently at times of opportunity or crisis. Electronic task groups can have larger, more complex, and more fluid structures than their face-to-face counterparts. These help capture the contributions of team members who would otherwise have been hesitant to assert their point of view. Sproull and Kiesler are optimistic that these technologies will empower some users, and this will be beneficial.

Several authors recently have argued for caution in face of our apparent beguilement by electronic communication tools. Talbott (16) points out that *computers are tools of the past* (16, p. 37): that they face backwards towards previous understandings, rather than forwards towards novel opportunities. Ellul (9) asks whether the computer has *any real use and not merely a fictional, phantasmagoric, supererogatory use* (9, p. 274). According to Ellul, the notion that the computer creates freedom is a myth. Rather, it tends to force premature closure in communication practice. Talbott argues that *Hypertext, in the absence of determined discipline, can discourage any sustained attention to another's train of thought, substituting a collage of impressions for concentration, and a flaccid openness for the muscular reception of new and difficult meaning* (16, p. 198). Thus, Talbott and Ellul are calling attention to what they see as a technological bluff that is a poor substitute for genuine communication within real (not virtual) communities.

Nonaka and Takeuchi (13) propose the metaphor of a *hypertext* company comprising three separate knowledge-creating structures: a traditional hierarchy (to run day-to-day business; to spread explicit knowledge through the firm); teams that form and re-form to generate new ideas (the source of creativity); and the knowledge base, where tacit and explicit knowledge come together and are readily accessible.

Clearly, the way in which we are starting to use Internet resources maps directly onto these structures: with e-mail supporting the first of these, mailing lists the second, and World Wide Web the third. However, we still have little basis to guide the choice of the information technologies we use, and how we use them.

The rapid expansion in the use of Internet resources in agricultural R,D&E is a significant development. Use of computer-based communication technology to collect and distribute particular kinds of data can provide a new basis of legitimacy for data that was previously informal. This has implications for the traditional scientific method: identify a problem; form a hypothesis; then test and report the hypothesis with peer review. New technology can variously assist or impede these processes. Problems will be identified in new ways through the intervention of virtual communities. The notion of peer review is being changed as ideas or reports are propagated more quickly through the medium of electronic journals and mailing lists. Information technology will be integral to the success of re-engineering agricultural R,D&E processes.

CONCLUDING REMARKS

The use of Internet resources to support agricultural R,D&E is not cost-free. We do need to make responsible decisions about the appropriate way to use each of them. The big gains in the use of information technology may be still to come: particularly through innovations in communication practice that actively support participation in knowledge management by a much wider cast of practitioners - despite the cultural gaps, and despite differences in access to technology. The unthinking application of Internet resources, as a substitute for face-to-face communication, is a cause for concern because it directs attention away from situations/approaches where more immediate gains can be made. To be of help, it must open up possibilities for action, not just reinforce the *status quo*. The potential of the digital revolution is real (12), and is justified by the same arguments (greater customisation, more options, increased connectivity, and dedication to customer focus) used to support the case for re-engineering agricultural R,D&E (5). The hype that surrounds this technology is not justified; it is probably not even necessary in order to make the case we want. The Internet is starting to provide *some* of the tools we need to bring about *some* of the changes in professional practice that we want to put in place. But the power of balance (17) has still to be recognised, much less achieved.

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