

Bridging the Digital Divide through Online Conferencing: Lessons from the CybErg Conference Series

Andrew Thatcher ^a, and Jon James ^b

^a School of Human & Community Development, University of the Witwatersrand, South Africa.

^b Department of Human Kinetics & Ergonomics, Rhodes University, South Africa.

Abstract. This paper looks at the role that an online academic conference might play in bridging the digital divide. It is argued in this paper that the digital divide is more than comparing haves with have-nots. Instead, when looking at mechanisms to bridge the divide it is more sensible to consider the social context of the users. The paper reports on the relative success of the CybErg conference series initiative and suggestions for the next online conference in 2005.

Keywords. Digital divide, Online conference, Information access.

1. Introduction

The presence of a digital divide (the divide between those who have technology and those who do not) has been used to argue that industrially developing countries (IDCs) are being systematically excluded from the emerging information society. This paper explores how an online conference series may be used to bridge that digital divide.

1.1. The 'digital divide'

The term 'digital divide' has been used to describe the disparity between different groups of people in terms of information and communication technologies. The term originated in the United States to describe the divisions between people in terms of those with and those without access to computers and the Internet (Warschauer, 2003a). The digital divide is now more typically used to describe the status of information technology between different groups of people, often the status of the information technology between different countries (or groups of countries) or regions. Many of the underlying disparities are quite easily observable, even within technologically advanced countries. For example, a report commissioned by the Benton Foundation (a foundation that promotes communication for solving social problems in the digital age) reports significant disparities in computer access according to race, ethnicity and family income in the United States (Harris, 2002). The usual variables implicated in defining the digital divide are race, ethnicity, language, family structure, educational attainment, training, income, type of industry, telecommunications infrastructure, physical disabilities and urbanisation (e.g. OECD, 2001). For example, access to information technology in large parts of Africa, South America and South East Asia is highly unreliable, with poor telecommunications infrastructure, unreliable power sources, poor technical support, and long routes for information transfer. Woyaa (1999) reported that user-to-site routes in Africa average 1000 miles compared to 100 miles in developed countries. Poor infrastructure leads to a lack of

access or a poor quality of access to information technology. Also, countries with dominant industries in the transportation, forestry, construction and agriculture sectors demonstrated poor Internet penetration (OECD, 2001). Walter and Tomlinson (2000) estimated that over 80% of all websites are in English, with only 10% of the world's population speaking English as a first language (a estimate that is now quite old by WWW standards). In addition, Bailey and Cothey (2001) warn that rapid changes in software versions also encourage a technological divide. Many online conferences rely heavily on the most recent versions of interactive software (for example, the latest WWW browser, Adobe Acrobat Reader version, or RealMedia player).

Comparing regions around the world in terms of number of people with access to the Internet, it is obvious that North America (with 180 million people), Western Europe (with 190 million people), and Asia/Pacific (also with 190 million people) have the highest penetration rates. In contrast, Africa (with 6 million people), South America (with 33 million people) and the Middle East (with 5 million people) have extremely low Internet penetration rates. Unfortunately though, all these figures are only approximations from NUA (2002) and are nearly two years old (and in all likelihood out-of-date). When we examine the figures for the percentage of the population with Internet access these are even more revealing. For Africa the proportions range from 0.01% (for Liberia) to 11.24% (for the Seychelles). These figures are echoed in countries such as Albania (0.34%), Turkey (3.71%), Iran (0.63%), Saudi Arabia (2.10%), Brazil (7.77%), Mexico (3.38%) and Jamaica (3.73%). Compare these dismal figures to the Internet penetration rates for South Korea (53.80%), Australia (54.38%), USA (59.10%), Canada (52.79%), Sweden (67.81%) and Denmark (62.73%). Again, all these figures are taken from NUA (2002) and some of the figures are estimates from as far back as 1999. Nevertheless, even from these simple illustrations, one might assume that North Americans, Europeans, and people from the Asia/Pacific

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 00 JUN 2004	2. REPORT TYPE N/A	3. DATES COVERED -			
4. TITLE AND SUBTITLE Bridging the Digital Divide through Online Conferencing: Lessons from the CybErg Conference Series		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) School of Human & Community Development, University of the Witwatersrand, South Africa; Department of Human Kinetics & Ergonomics, Rhodes University, South Africa		8. PERFORMING ORGANIZATION REPORT NUMBER			
		10. SPONSOR/MONITOR'S ACRONYM(S)			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
		12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited			
13. SUPPLEMENTARY NOTES See also ADM001766, Work with Computing Systems 2004 (Proceedings of the 7th International Conference).					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 6	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

region might dominate any conference held in the digital realm. The Internet penetration rates are illustrated in Table 1.

Table 1. Internet penetration rates

Country	Date of Survey	Millions with WWW access	% Population with access
Liberia	December 1999	0.01	0.01
Nigeria	December 1999	0.10	0.08
Egypt	December 2001	0.60	0.85
Mexico	December 2001	3.5	3.38
China	July 2002	45.80	3.58
South Africa	December 2001	3.07	7.03
Brazil	September 2002	13.98	7.77
Australia	February 2002	10.63	54.38
United Kingdom	September 2002	34.30	57.24
USA	April 2002	165.75	59.10
Sweden	September 2002	6.02	62.73
WORLD	May 2002	580.78	9.576.89

However, numerous authors (see Goldman, 2002; Warschauer, 2003a) have cautioned against simply referring to this divide as a gap in the availability of technology. Based on the assumption that the divide is equivalent to an absence of technology, one might expect the divide to be bridged simply by flooding impoverished communities with technology. Authors such as Warschauer (2003a) argue that instead of looking at the presence or absence of technology, one should look at what people actually do with that technology within a social context. It is an obvious enough statement that people have varying degrees of access to technology. However, it is also evident that people vary widely in their reasons for wanting different levels of access. There are people in underdeveloped parts of the world who would desperately like more access to technology, while there are also those people with unlimited access who show no interest in using that technology. Also, introducing the technology to people who have no obvious use for that technology may not help bridge the digital divide.

This leads us to the obvious question of why should an online conference help us to bridge the digital divide? Surely, an online conference should only exacerbate the divide?

Firstly, it is obvious that in a broad region, the availability of technology can often be concentrated in pockets. It has been shown that the adoption of technology occurs more frequently with those people who live in urbanised areas or who work in industries that rely on technology (OECD, 2001). More specifically for this paper, the users of information technology are more likely to be highly educated users with access to relevant technologies, such as people found at academic institutions (Hoffman &

Novak, 1998). From this assumption one might expect a greater representivity of people from different countries at an online academic conference, particularly as an online conference greatly reduces the travel costs when compared to a face-to-face conference.

Secondly, the simplicity of merely comparing the availability of technology between regions can be misleading. As Warschauer (2003b) has argued, the availability of technology does not necessarily determine how we use it or why we use it. In the information age, the ability to access, adapt and even create knowledge through technology has become vitally important to encourage the social inclusion of all people (Warschauer, 2003b). Warschauer (2003b) argues that exposure and incentives to use technology should be used together in order to support social inclusion through technology. One of the ways to achieve this goal, one might argue, is through an online academic conference that stimulates the use of technology, assists in the dissemination of knowledge, allows people to adapt their communication patterns, and even to inspire the creation of new knowledge through the experience. All this of course, is contingent on understanding how different people (or different groups of people) utilise technology. In poor, rural communities it may be that people share technological resources; in which case one must accommodate this use when looking at registration for an online conference. In order to bridge the digital divide, these are important considerations.

1.2. Online conferences

The capability of the WWW to provide online conferencing is so appealing that many face-to-face conferences (including WWCS'2004) have incorporated a 'virtual conference' component to allow participation from people who are unable to attend the conference in person. To be a truly online conference the primary medium of presentation and interaction should be in an online environment (e.g. the WWW). There are a large number of online conferences both of an academic and a business nature to be found on the WWW. There are also a substantial number of companies that design software to support online conferences (for example, WebEx Communication's "Meeting Center", Microsoft's "Netmeeting" or "Live Meeting", or Raindance Communications' "Web Conferencing"). The online conference formats themselves are also quite varied, from simple discussion forums (operating as nothing more than bulletin boards), to graphic-intensive virtual conferences that simulate everything from the registration foyer to the presentation hall. Some conferences remain technologically unsophisticated with simple text-based discussion forums, others that are more graphic-intensive, and incorporate multimedia presentations (e.g. webcasts, video, audio). Online conferences also vary according to the level of synchronicity required for the discussions or interactions. Synchronous online conferences require participants to be online at the same time, whereas asynchronous online conferences permit material to be saved for later viewing and allow discussions to take place over a specified time period. Of course, many online conferences exploit both synchronous and asynchronous interaction, since each form has its own set of advantages and disadvantages. Obviously the level of

technological sophistication used at an online conference has implications for who will be able to participate. Online conferencing techniques, such as 'real-time' audio or video, require participants to have the appropriate software, hardware and telecommunications infrastructure (such as adequate bandwidth). Text-based, asynchronous discussions require far less sophistication from participants.

1.3. *CybErg conferences*

CybErg conferences are online ergonomics conferences that are held every three years (Thatcher, 2002). Held in 1996, 1999 and 2002, these conferences have attempted to emulate the primary programme of face-to-face conferences through peer-reviewed academic paper presentations and online debate and discussions on these papers. The stated aims for each of the CybErg conferences have remained the same (Straker et al, 1996; Straker et al, 1999, Thatcher et al, 2002). Firstly, to increase the quality of academic papers and the quality of academic discussion by allowing more time to read papers and more time for the discussion of these papers (hence the conference is active for one month). Secondly, it helps to reduce the costs of travelling (such as airfares, accommodation, and subsistence) by negating the need to travel. This would be particularly beneficial to academics from developing countries, where there is a poor rate of currency exchange. Finally, accessing a wider range of participants (through the reduction of travel expenses) and reduce the bias towards predominantly west European and North American delegates found at most international face-to-face conferences. It is in this final aim where the CybErg conference series needs to directly tackle the issue of bridging the digital divide.

At CybErg online conferences the presentation has primarily been in text and static image format and the discussions have been in an asynchronous text-based format. This 'low-tech' presentation and discussion format has aimed at facilitating a greater number of participants from less technologically sophisticated parts of the World. At CybErg conferences in 1999 and 2002 unsuccessful attempts were also made to engage in synchronous text-based discussion, and in 2002 an unsuccessful attempt was made at synchronous audio discussion. A combination of apathy, poor communication and low-bandwidth (for the synchronous audio discussion) probably led to the failure of these initiatives.

The first CybErg conference in 1996 was a phenomenal achievement. The conference itself was organised within the space of a single year from its original conception. Registration was free and 1078 delegates from 34 countries signed up for one of the first online academic conferences. The second conference in 1999 was more sedate. A conference registration fee of US\$75 was introduced and there were only 149 registered delegates from 27 countries. Despite the dramatic drop in the number of delegates the quantity (per delegate) and perceived quality of discussions actually increased. The reduction in the number of delegates was attributed to the introduction of a registration fee and the fact that the novelty effect of an online conference had worn off (many of the 1078 registered delegates at the first CybErg conference only visited the conference website once and made no contribution to discussions). However, it is also possible that the production and distribution of the conference

proceedings on CD-Rom may also have contributed to the drop in registrations, especially from less technologically sophisticated countries. At the time of the second conference in 1999 CD-Rom drives were not standard hardware in many countries. At the third conference in 2002 there were only 115 registered delegates from 25 countries, despite the fact that the registration fee of US\$75 was the same as in 1999. The third conference had as its primary aim the increased internationalisation of the CybErg conference. In the promotion of the conference, an emphasis was placed on encouraging papers and delegates from IDCs. There were two factors that we hoped would act as motivators for people from industrially developing countries. Firstly, we offered a reduced registration fee (US\$40) for these delegates. Secondly, we hoped to encourage papers from these delegates by providing a further publication opportunity in an academic journal (Ergonomics SA) for the best papers concerned with issues in industrially developing countries. In our post-conference evaluation we felt that the emphasised promotion of these factors may also have discouraged people from industrially advanced countries (IACs).

Again, despite the further reduction in registrations, the quantity (per delegate) and perceived quality of the papers and discussions was seen to increase, even from the 1999 conference. Despite the gradual increase in the mean number of comments made per delegate it was also evident that relatively few participants dominated the discussions. At CybErg 2002, only 7 participants made 65% of the comments. Clearly, if the conference series is to be successful, discussions should be broadly representative of the registered delegates and of the relevant academic community. Unfortunately, it is extremely difficult to obtain similar data on participation levels from face-to-face conferences. Therefore it is not possible to determine whether this online conference series is comparable to similar face-to-face conferences.

The evaluations of previous CybErg conferences (Pollock & Straker, 2000; Pollock, Straker & Forgione, 2002; Thatcher & James, 2003) have shown that the conference series has largely been successful in achieving its stated aims of increased quality, reduction in conference expenses and the internationalising of ergonomics knowledge. However, further attrition in the number of registrations has the potential to endanger the third aim (internationalising knowledge) of the conference series. This paper compares the three conferences in order to determine whether the conference series has been successful in increasing the international representation of delegates and therefore bridging the digital divide.

2. Comparisons 1996-2002 Conferences

In earlier CybErg conferences (1996 and 1999) delegates from North America (42% in 1996 and 15.7% in 1999), Asia/Pacific (28.6% in 1996 and 48.9% in 1999) and Europe (23.9% in 1996 and 23.6% in 1999) dominated the attendance and participation at these online conferences. Delegates from South America (2.7% in 1996 and 10.2% in 1999) and Africa (2.8% in 1996 and 1.6% in 1999) were in the minority. This is despite the fact that one of the papers from Africa was the third most read paper at the 1996 conference and a delegate

from Africa collected the prize for the best contributor at the 1999 conference. In contrast, the most recent CybErg conference (in 2002) showed a more even distribution of delegates. A total of 15.6% of the delegates were from North America, 13% were from Europe, 27% were from Africa, 35.7% were from Asia/Pacific and 8.7% were from South America. These proportions are best illustrated in Table 2 and Figure 1.

Table 2. Proportion of delegates across the conferences

	North America	South America	Europe	Asia / Pacific	Africa
	%	%	%	%	%
1996	42	2.7	23.9	28.6	2.8
1999	15.7	10.2	23.6	48.9	1.6
2002	15.6	8.7	13	35.7	27

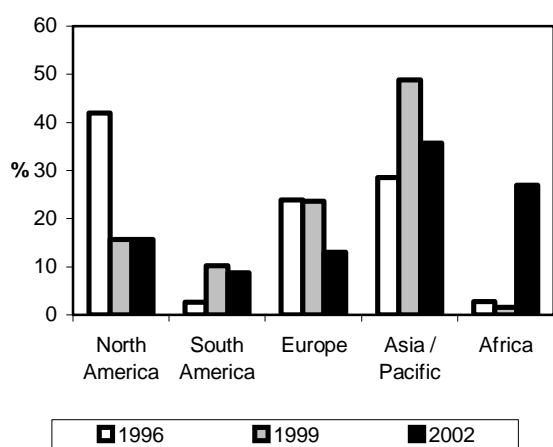


Figure 1. Graphical representation of proportion of delegates from different regions across the conferences

Of course these figures only represent the proportion of delegates and do not give the exact number of delegates. The difficulty with comparing the number of delegates from different regions across the three conferences is that the conferences had different total registration numbers. The first conference in 1996 had a total of 1078 delegates. A total of 453 of these delegates were from North America, 308 were from Asia/Pacific (although mostly from Australia), 258 were from Europe, 30 were from Africa, and 29 from South America. In 1999 there were 149 delegates in total; 24 from North America 73 from Asia/Pacific (at this conference mostly from Australia and South East Asia), 35 were from Europe, 15 were from South America and 2 from Africa. Finally at the third conference with 115 delegates in total; 18 were from North America, 41 from Asia/Pacific (mostly from China and South East Asia), 15 from Europe, 31 from Africa and 10 from South America. All the regions have shown a steady decline in the number of participants in line with the reduction in the total numbers of delegates registered at each respective conference, with the exception of the Africa region that has actually shown a high level of growth (even from the heights of 1996) in the number of registered delegates. This shouldn't be surprising given that the conference was

organised from South Africa. The number of delegates across the three conferences is shown in Table 3 and Figure 2.

Table 3. Number of delegates across the conferences

	North America	South America	Europe	Asia / Pacific	Africa
	N	N	N	N	N
1996	453	29	258	308	30
1999	24	15	35	73	2
2002	18	10	15	41	31

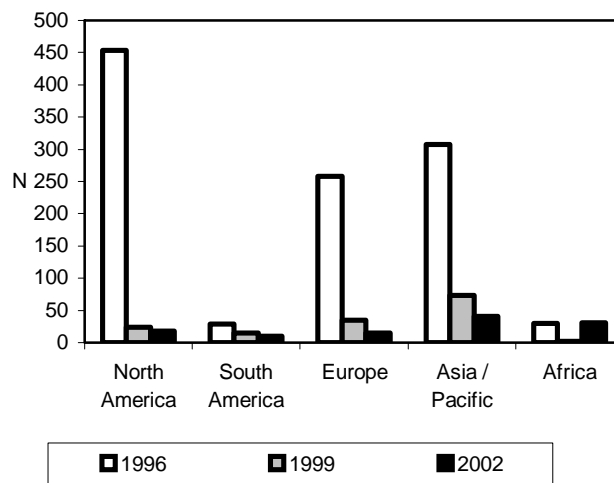


Figure 2. Graphical representation of number of delegates from different regions across the conferences

These figures are also confounded by the global representation of ergonomics and ergonomics society membership. When we compare the number of CybErg'2002 delegates to the number of members from ergonomics societies federated or affiliated to the International Ergonomics Association (IEA), an interested picture emerges (membership numbers were taken from Ergonomics International (2003), the official publication of the IEA). The relative proportions of delegates from Africa and South America (and to a much smaller extent from Asia/Pacific) at the CybErg conference in 2002 were over-represented in comparison to delegates from Europe or North America. The proportions across the five regions compared to registrations at the 2002 conference are represented in Table 4.

Table 4. CybErg delegates as a proportion of their respective ergonomics society membership

	No. of IEA Affiliated Members	No. CybErg 2002	Proportion (%)
North America	4200	18	0.43
South America	230	10	4.35
Europe	5618	15	0.27
Asia / Pacific	4142	41	0.99
Africa	60	31	51.67

The problem with merely looking at the geographical location of the delegates is that it tells us nothing about those delegates, nothing about the circumstances under which they are working, and nothing about the technology that they are using, or how they use that technology. Even within geographical regions there are countries with poor information technology infrastructure. For example, the European region includes countries such as Sweden, Denmark, UK, France and Germany which each have relatively comprehensive information and communication technology infrastructures. However, in the same region you will also find Albania, Latvia, Serbia, Lithuania and Turkey, each with low Internet penetration rates and poor information technology infrastructures. We might break the analysis down to the level of a specific country (e.g. comparing IDCs to IACs) but these types of comparisons will still not answer the question about what access to technology ergonomists (this is an ergonomics conference) in these countries actually have and how they use information technology.

It should be evident from the data presented here, that the CybErg conferences have shown increasing equality in the representation of delegates at the conferences and perhaps even an over representation of delegates from Africa (and possibly South America). This equality of representation has come at the cost of decreased participation in general, and from North America and Europe in particular.

3. Bridging the Digital Divide

One might argue that the mere act of adopting an online medium for a conference has allowed us to make significant headway in bridging the gap. If we build on Warschauer's (2003b) argument it is possible that providing an incentive to be at an online conference would encourage people to engage with information technology and thereby reduce the divide. The incentives for participating in an online conference include being able to discuss and share issues of theory and practice with colleagues from around the World, potential publication opportunities (both at the conference and in academic journals after the conference), and reduced costs associated with transport and registration. However, the data presented in this paper only provide partial support for the contention that the CybErg conferences are bridging the digital divide. At best we have only provided a very narrow bridge. We have not seen hordes of people from technologically disadvantaged communities rushing to the CybErg conferences in the hope of bridging the digital divide. What we have seen is an increased proportion of people from more technologically disadvantaged parts of the world who are willing to utilise virtual conferencing technology. However, at the same time we have seen decreased participation from people who come from more technologically advanced countries. There may be a number of reasons why these people have not continued to engage in this online conference series. It is possible that the novelty of the technology and a conference in an online environment has worn off. The fact that the CybErg conferences have attempted to remain technologically unsophisticated provides support for this possibility. It is also possible that the quality of interaction at an online conference is inferior to face-to-face

conferences and they would therefore prefer to attend the face-to-face conferences that are more readily accessible. Qualitative feedback from the CybErg conferences (e.g. Thatcher & James, 2003) suggests that the quality of papers and discussions at CybErg conferences are at least as good (if not superior) to face-to-face conferences. However, we have to remember that this information was gathered from CybErg conference attendees, many of who would have authored papers at the conference or would have participated in the discussions themselves. Non-attendees may have already voted by not registering for any of the CybErg conferences. It is also possible that the CybErg conferences were poorly marketed to these communities. The third CybErg conference in particular was marketed to ergonomists from industrially developing nations with papers and concerted effort aimed at encouraging delegates from Africa and South America. The international scientific advisory committee was made of members primarily from industrially developing countries, translation services were offered for delegates that were not English-speaking, one of the selection criteria for papers was their importance in addressing issues from disadvantaged communities, and registration discounts were offered for delegates from industrially developing countries. All these initiatives may have made some people shy away from the CybErg'2002 conference.

Despite the reduction in the numbers of delegates we have still learnt a number of valuable lessons. Firstly, we have established that it is important to maintain a level of technological simplicity at the conference. This means ensuring that we have simple HTML versions of all the papers, that the majority of discussion forums are text-based and that no one is excluded because of sophisticated software requirements. The website itself was programmed using open-source software that was compatible even with older versions of web browsers. There was limited use of video and other alternate formats. Where alternate format were used, freeware versions of the viewing product were included on the website and with the CD-Rom proceedings.

We have also learnt that the reduction in conference registration fees for developing nations was important in encouraging conference attendance for delegates from these countries. In fact, the low cost of conference registration (and attendance through the reduction in travel-related expenses) in general is an important incentive for many delegates, particularly those who are reluctant to travel. Through our analysis of the earlier CybErg conferences (see Thatcher and James (2003)) we have also shown that lengthening the time for the discussions (at CybErg conferences, the discussions can theoretically take place in a conference environment for a period of one month) increases the perception that papers and discussions are of a high quality (in some instance higher even, than face-to-face conferences). The ability to have online moderation of discussions both encourages discussion and discourages inappropriate comments. Finally, the conference series has enabled us to establish a world wide network of contacts for people interested in bridging the digital divide and on tackling issues in industrially developing countries.

4. CybErg'2005

We would like to apply the lessons that we have learnt from the previous three conferences to the next CybErg conference, CybErg'2005. CybErg'2005 is scheduled to take place from 1-30 September 2005. Firstly we will not make the mistake of concentrating our promotional efforts exclusively on encouraging people from disadvantaged communities. Bridging the digital divide also means that we need to bring both sides of the bridge closer together. We will not be effective in bridging the digital divide if delegates with a low level (or for that matter a high level) of technology access and usage dominate the conference. This means that we need to maintain a relatively unsophisticated format for the majority of the conference papers and discussions, but that we also need to allow for more sophisticated methods of paper presentation and interaction. We therefore expect to keep the majority of the conference format unchanged (e.g. HTML and PDF papers, and text-based discussions) but also to introduce alternative formats for paper presentations (e.g. short video/audio inserts, webcasting of opening addresses and keynote addresses, and synchronous discussion sessions).

Through two major themes we hope to encourage papers and participation from people from developed and developing parts of the world. The two major themes are 'meeting diversity in 'cyber' ergonomics' (following a similar theme as proposed for the IEA2006 Congress) and 'developing online communities' (through the use of technology in particular). Papers are encouraged in all areas of ergonomics, human factors and human-computer interaction. We would like to encourage papers on participatory ergonomics, participatory design, cross-cultural ergonomics, organisational design and management, physical workload methods, mental workload, psychological well-being, physical well-being, musculoskeletal disorders, repetitive strain injuries, cognitive modelling, input devices, ergonomics and children, ergonomics and gender, low-cost interventions, computer-mediated communication, computer-supported cooperative work, ubiquitous computing, design and emotion, work-schedules, social interaction, social inclusion, social responsibility, ethnographic studies, cross-cultural communities, and cross-cultural interfaces.

More information on CybErg'2005 can be found on the conference website at: <http://cyberg.wits.ac.za/> or by emailing thatcher@umthombo.wits.ac.za.

5. Acknowledgements

The authors would like to thank Elsevier Science Publishers and Liberty Mutual for their sponsorship of CybErg 2002 and CybErg 1999, and the International Ergonomics Association for their sponsorship of CybErg 1996 and their endorsement of all three CybErg conferences.

6. References

- Bailey, G., & Cothey, V. (2001). Social impact of rapid development in the web's underlying technological infrastructure. *Cultures of Learning Conference*, Bristol University of Bristol.
- Ergonomics International (2003). Membership numbers. *Ergonomics International*, 78(4), November 2002. Retrieved from <http://www.iea.cc/newsletter/nov2003.cfm>
- Goldman, M. (2002). *Bridging the digital divide*. Net*Working 2002. Retrieved December 12, 2003, from <http://www.flexiblelearning.net.au/nw2002/extras/digitaldivide.pdf>
- Harris, L. (2002). *Bringing a nation online: the importance of federal leadership*. Retrieved March 16, 2004, from http://www.civilrights.org/publications/reports/nation_online/bringing_a_nation.pdf
- Hoffman, D.L., & Novak, T.P. (1998). Bridging the racial divide on the Internet. *Science*, 280, 390- 391.
- NUA. (September, 2002). *How many online?* Retrieved December 12, 2003, from http://www.nua.com/surveys/how_many_online/index.html
- OECD (2001). *Understanding the digital divide*. Retrieved September 12, 2001, from http://www.oecd.org/dsti/sti/prod/Digital_divide.pdf
- Pollock, C., & Straker, L. (2000). Evaluation of a virtual conference: CybErg 1999. *Asia Pacific Computer-Human Interaction Conference*, Singapore.
- Pollock, C., Straker, L., & Forgione, L. (2002). Evaluation of the CybErg 1996 virtual conference. *Proceedings of CybErg'2002*, Retrieved from <http://cyberg.wits.ac.za/cyberg/default.php>
- Straker, L., Pollock, C., & Case, I. (1996). *Enhancing the accessibility the quality of international ergonomics discussions: An introduction to Cyberg 1996*. Retrieved from <http://www.curtin.edu.au/conference/cyberg>
- Straker, L., Pollock, C., & Smith, R. (1999). *Increasing the accessibility, diversity and quality of international ergonomics interaction*. Retrieved from <http://cyberg.curtin.edu.au/members/main.shtml>
- Thatcher, A., & James, J. (2003). Evaluation of virtual conferencing for ergonomics. *Proceedings of the 25th Triennial Congress of the International Ergonomics Association*, Seoul, South Korea.
- Thatcher, A. (2002). CybErg'2002: Ergonomics for human and community development. In H. Luczak, A.E. Çakir & G. Çakir (Eds.), *WWDU 2002 Work With Display Units. World Wide Work* (pp. 253-255). Berlin: Ergonomic Institut für Arbeits und Sozialforschung
- Thatcher, A., Deverell, A., Fisher, J., & Miller, K. (2002). *Welcome address for CybErg'2002: ergonomics for human and community development*. Retrieved from <http://cyberg.wits.ac.za/cyberg/default.php>
- Walter, K., & Tomlinson, P. (2000). *State of the world index. dispatch from the state of the world forum*. Retrieved September 12, 2002, from <http://www.simulconference.com/clients/sowf/dispatches/dispatch2.html>
- Warschauer, M. (2003a). Demystifying the digital divide. *Scientific American*, 289, 42-47.
- Warschauer, M. (2003b). *Technology and social inclusion. rethinking the digital divide*. Boston : MIT Press.
- Woyaa (1999). *Top 50 African websites. in search of quality web content*. Retrieved August 30, 2000, from <http://www.woyaa.com/topweb/top50report.html>