First meeting of the Sub-Committee on Information and Communication Technologies

Committee on Development Information

R E P O R T

Economic Commission for Africa

Addis Ababa, Ethiopia

28 June-1 July 1999

Sub-Committee on Information and Communication Technologies

Agenda item 6.1

Election of officers

1. The Sub-Committee elected the following officers:

2. Chairperson: Niger

   Vice-Chairperson: Mozambique

   Rapporteur: Sudan

Participation

3. The meetings of the Sub-Committee were attended by approximately 80 participants. Delegates came from the following member States: Botswana, Cameroon, Ethiopia, the Gambia, Ghana, Kenya, Lesotho, Mali, Malawi, Rwanda, Morocco, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Senegal, South Africa, Sudan, Togo, United Republic of Tanzania, Tunisia, Zambia and Zimbabwe. States not members of the ECA represented were Italy and the United States of America. Observers participated from the following sub-regional and regional organisations: the Organisation of African Unity (OAU), African Centre for Metereological Applications for Development, African Regional Organisation for Standardisation (ADMAD), the Council for the Development of Economic and Social Research in Africa (CODESRIA), the Intergovernmental Authority for Development (IGAD), and the Southern Africa Development Conference (SADC). United Nations system organizations present were the International Criminal Court for Rwanda, United Nations Educational, Scientific and Cultural Organisation, (UNESCO), the United Nations Environment Programme (UNEP), the United Nations High Commission for Refugees (UNHCR), UNITAR (the United Nations Institute for Training and Research) and the World Bank. Other observers represented the British Council,The Council for Scientific and Industrial Research (South Africa), Ford and Rockefeller Foundations, the Carnegie Corporation of New York, the Global Information Infrastructure Commission, the International Development Research Centre and the International Institute for Information Technology.

Adoption of agenda and organisation of work

Agenda item 6.2

4. Participants adopted the agenda and programme of work presented in E/ECA/DISD/CODI.1/Add1. Regarding the organisation of work, the first day of the sub-committee would discuss important themes on ICT. On its second day, debate would centre on the DISD work programme in information and communication technologies. On its final day, participants would make country and institutional presentations and adopt the report of the Sub-Committee.

5. The secretariat presented document E/ECA/DISD/CODI.1/8 entitled “Status of Connectivity in Africa”. The secretariat indicated that Africa had seen a substantial growth in broadcasting, telecommunications and Internet infrastructure over the last serveral years. Although African countries had made considerable investment in computer hardware and software, they tend to be underutilised. Among the challenges that African information infrastructure faces are the following: extension of telecommunications infrastructure, strategies for choice of suitable technologies among myriad of options, expansion of public access especially to rural areas, improving applications of new technologies and content development.

6. Participants commented and made suggestions in five key areas:

Basic physical infrastructure

7. Rural infrastructure was key in disseminating innovative applications to communities in Africa. However, with its dispersed population the reality indicates that the majority in rural areas are likely to remain out of touch with the new information society unless major efforts are made in this

direction. The consequences are high if rural schools are left out of the new information age. The various low cost satellite technologies such as VSATs and local wireless technologies could be exploited to bridge this gap.

8. Expansion of urban infrastructure is as crucial as that of rural areas especially to satisfy long waits for telephones and to increase the bandwidth. This can not be achieved without building an African telecommunications backbone. Interconnectivity between African countries through a regional backbone would improve bandwidth and help the region to reverse the current costly networks that link neighbouring countries through Europe and North America.

9. The quality of supportive infrastructure such as electricity and roads remains very low in the region. Most African countries are experiencing electric surges and blackouts. It is important to sensitise telecommunications and broadcasters as well as energy and transport sector managers.

10. The reliability of telecommunication infrastructure remains a major threat to the use of the Internet. A combination of various technologies including CD-ROM could alleviate this problem. The point was made that information and communication technologies were far more than Intranet and that the whole panoply of available technologies should be fully utilized for production of, access to and dissemination of information.

Content/information infrastructure

11. Although progress in improving the basic infrastructure is crucial the limited attention to content would have serious consequences on African information infrastructure. Significant attention should be paid to content development and dissemination, training of intermediaries and education and building awareness in new techniques of content packaging and dissemination. Information technologies that reach rural areas, including both mass and hybrid technologies, need content based on local needs. The role of intermediaries in reaching rural people was stressed.

12. Libraries and information services could play a critical role in improving African content. Training of librarians in new content development tools, sensitisation of policy makers on content issues and identification of areas of critical importance including agriculture, environment, health and education and gathering, processing and disseminating information in these areas was stressed. The full involvement of universities in utilization of information infrastructure was vital.

13. ECA should continue supporting content development in Africa. Information on “who is doing what” is crucial to learn from the experiences of other and build on existing knowledge. In addition to sustaining its effort in supporting the African content ECA should consider building information on “who is doing what” in African information infrastructure. The Secretariat informed that Sub-Committee that much information on this topic was available from the AI-AIMS database (http://www.bellanet.org/partners/picta) of the Partnership for Information and Communication Technologies in Africa Web site.

Policy and Regulatory framework

14. Participants saw the lack of an enabling environment, resulting especially from telecommunication monopolies as a major bottleneck to information infrastructure development in Africa. Monopoly frequently resulted in the high cost of and limited access to telephones and other information infrastructure in the region. There was a need for continuous sensitisation of policy makers and regulators to reduce monopoly and move towards both privatisation and liberalisation. Competition could attract foreign investment needed to expand infrastructure.

Partnership and co-ordination

15. A significant number of initiatives have already been working on improving African telecommunications infrastructure. Effective partnership among all those working in this area within the continent and at national level would help the efficient utilisation of resources for building African information infrastructure.

16. The United States Bureau of the Census offered to host or mirror Web sites free of charge for African statistical offices. The Sub-Committee noted that the OAU was establishing a Centre for Information Exchange in collaboration with the ECA.

Capacity building

17. The future of African information infrastructure relies heavily on the capacity of Africa to build innovative applications that address local problems. This could be possible through training ICT professionals in African universities and building a capacity to design and assemble information and communication technology equipment. It was suggested that Africa should not only use, but must also produce at least some of its own technology.

Agenda item 6.3

National Information and Communication Infrastructure (NICI) plans and policies

18. The ECA secretariat presented the document "Developing National Information and Communications Infrastructure (NICI) policies, plans and strategies: the 'why' and 'how'" **(**E/ECA/DISD/CODI.1/7) on this agenda item.

19. In addition to presenting the paper, the secretariat demonstrated a web site that ECA is developing which compiles fact sheets on the status of NICI policies, plans and strategies in African countries. The presentation focused on the transformation from National Information Policy to NICI policies and strategies, documenting NICI status and progress in Africa, and examples of countries that have incorporated NICI plans in their national development plans.

20. Participants expressed concern on duplication of efforts and stressed the strong need for synergies between the various activities in the area of developing NICI policies, plans and strategies, and other ICT activities in Africa. In response to this concern, it was agreed that the Partnership for Information and Communication Technologies in Africa (PICTA), which was established in 1997 under the framework of the African Information Society Initiative (AISI), was a valuable vehicle for partnership and collaboration in ICT activities in Africa. Further collaborative activities were envisaged in the upcoming African Development Forum 1999 (ADF '99) which is going to take place in Addis Ababa from 24 to 28 October 1999 on the theme *Globalisation and the Information Age.*

21. Participants felt that obtaining political support and sensitising political leaders was an extremely important activity in achieving the desired goals for developing an effective NICI policy and plan. The importance of such national policies in ensuring that African people could access information resources in a cost-effective manner was stressed. The secretariat detailed plans about workshops it is organizing to sensitise political leaders in the region on the utility of developing such policies.

22. Concern was expressed on the possible misallocation of Africa's scarce resources on underutilised ICT infrastructure. However, participants reached consensus on the strong need for Africa to leapfrog by making a judicious use of the new technologies, such as wireless and satellite technologies, instead of passing through all stages of technological development. This way, Africa could effectively utilise the opportunities that the new technologies offered to its development endeavours.

23. Participants acknowledged ECA's progress in documenting NICI policies and plans in Africa and suggested that ECA go further in addressing NICI issues in African countries by conducting a complete survey and a comprehensive inventory of NICI status in all African countries. The contribution of UNESCO to this effort was noted.

24. Participants emphasised the linkage between ICT applications (education, health, e-commerce, cultural heritage, tourism, etc.) and economic development, which leads to the need for incorporating ICT issues in national development plans. ICT applications are considered as the driving force for developing NICI policies and plans, and participants strongly felt that NICI policies and plans have to be an integral part of national development plans. It was suggested that ICT could not only support development but could indeed become the engine of growth in Africa.

25. The need for Africa to develop an ICT production industry was expressed as a window of opportunity which might spark overall development in Africa. Consensus was reached on the need for activities

in both the maintenance and production aspect of the ICT industry (both hardware and software) focusing on local needs and applications, with emphasis on the role of the private sector. It was felt that the web site on NICI status should also try to include data on ICT production status of African countries.

26. Securing ICT access for rural communities was underlined as one of the main considerations in developing NICI policies and plans in Africa, and planning with users for the utilization of information and information technologies.

Agenda item 6.4

Content development in Africa

27. The secretariat presentation ("African Content Development: Creation and Dissemination" E/ECA/DISD/CODI.1/3) was a continuation of its presentation to the Plenary (agenda item 4) on this topic on 28 June. The representative of the Secretariat pointed out that all areas of content development, ranging from traditional ones such as book publishing to Web-based content, were least developed in Africa of all the world's regions. He stressed that web based information systems (WIS) were important because they tied together all the other tools of content development. He discussed the issues in creating, hosting and disseminating web content in Africa and suggested national strategies for improving content in Africa. He concluded by underlining the importance of being on the Internet so as to build web content.

28. The chairperson stressed that the information needs of users had to be taken into account in developing and maintaining information repositories, including Web-based ones. Comments from participants covered a wide range of issues including access, capacity, tools and content type.

29. The limited Internet access that academic and research communities in Africa presently have was raised as an issue of concern with direct relevance to Africa's ability to engage in research and teaching. The need for provision of content in all formats, including the Web, as Internet access remains so limited in the region. The continuing role of libraries and other information intermediaries was stressed, as well as the desirability of traditional information specialists becoming information brokers to the new technologies. Advantages of the Internet were cited, such as the decentralisation and democratisation of information access.

30. Regarding the capacity to develop content in Africa, ECA was requested to provide assistance to African countries in this area. The secretariat informed participants that it shared their concern and briefed them on ECA’s efforts to address the issue. The World Bank’s activities in the area of content development with particular respect to indigenous knowledge were detailed.

31. Concerning the tools used in content development and accessing the Internet, the availability of tools which provide wider access to the Internet such as e-mail delivery of web sites was pointed out. The need to conserve web content on media such as CD-ROM and DVD-ROM was also raised. Several participants raised the issue of considering other means of content provision including radio and television and creating links between the new technologies and others such as radio, television, print media and traditional fora.

32. The need to focus on the inclusion of ICT related content in teacher training curriculum curriculum was stressed. UNESCO detailed efforts towards virtual university and research development. One participant stressed that web content should become a way to help building an African personality with an African image. Also pointed out was the necessity of utilizing the new media to African advantage, along with the need to promote information culture that looked favorably on the free dissemination of information. It was felt that the development of local content would make WIS more relevant to communities. Local content issues included access to government information, use of local languages and dissemination of indigenous knowledge. The secretariat detailed the free availability of tools for Web-based content development, the need for information brokers, the trade-off between information access and use, and the possibility of developing content offline.

Agenda item 6.5

Report on the Implementation of the African Information Society Initiative- Reports of the African Technical Advisory Committee on the Implementation of the African Information Society Initiative (1998) and the Partnership on Information and Communication Technologies for Africa (1998)

33. In introducing agenda item 6.5, the secretariat presented documents E/ECA/DISD/CODI.1/3 and E/ECA/DISD/CODI.14 which gave detailed information on the last meetings ATAC and of PICTA. Information was also provided on the African Information Society Initiative, as ATAC and PICTA are AISI modalities of implementation.

34. In the debate on this item, several participants stressed the importance of political commitment to implement resolutions in order to bring reality to the information society in Africa, while others cited examples of such commitment in their countries. Implementation of AISI through PICTA coordination mechanisms and close partnership between AISI and other African initiatives such as the African Connection were commended. In addition to existing AISI coordination efforts countries were urged to set up mechanisms to coordinate ICT activities at national level. Several delegates stressed the need to liberalise and privatise telecommunication services in order to reduce tariffs and provide communications services to rural areas. Such actions would facilitate the implementation of AISI at national level. The secretariat detailed the steps that it had taken to sensitize African decision makers on this issue.

Agenda item 6.6

Report of the Eighth Meeting of the Standing Committee on Standardization and Harmonization of Information Systems in Africa

35. The secretariat presented document E/ECA/DISD/CODI.1/9 which contained information on the officers, country and institutions papers and other proceedings of the Eighth Meeting of the Standing Committee on Standardization and Harmonization of Information Systems in Africa . It also described the training in which members of the Standing Committee had taken part.

36. Following the recommendation made by the Standing Committee workshop participants on the need for collaboration between ECA and UNESCO in assisting member states to host their databases and information content on the Web, one participant noted that facilities in the universities and research institutes in each member country could be utilized for this purpose.

37. The issue of Local Area Networks (LANs) was raised, for their importance in advancing the state of information and communication technology utilization in the region and in facilitating Internet connectivity. It was noted that while the skills' base in Africa for the management of LANs was still fairly limited, there were even fewer who were trained as Internet node implementers and operators. While acknowledging the efforts of the Internet Society and ECA in training African Internet node operators, it was noted that more needs to be done in this area to support Internet connectivity initiatives in Africa. The Secretariat informed the Committee about the ECA survey on the utilization of ICTs, including LANs, in African universities and research institutions. The database with results of the survey would shortly be posted on the World Wide Web.

38. The secretariat demonstrated its Intranet, which had been developed as a DISD project activity funded by the Government of Korea. The Intranet is a closed access facility for the ECA secretariat and United Nations organizations based in Addis Ababa. The presentation on Intranet was to demonstrate to member States how TCP/IP technology could be used effectively for information dissemination within an organisation.

Agenda item 6.7

Review of the Terms of Reference of the Committee on Development Information (CODI)

39. The Secretariat presented document E/ECA/DISD/CODI.1/24 with the same title as the agenda item.

40. The secretariat presented revised terms of reference for the consideration of the first meeting of CODI because the original terms of reference, as established by the ECA Conference of Ministers in 1997, were found inadequate to facilitate CODI's work.

41. Some participants felt that specific information and communication technologies such as broadcasting, as well as information specialties, such as libraries and archives, should be spelled out in the Sub-Committee terms of reference. The consensus, however, was that the references were deliberately non-specific to include all rather than exclude any information technologies and specialties. Several participants proposed elevating the status of Observers to Members. The Secretariat explained that it was bound by United Nations rules in this regard, but that invitations sent to observers would encourage their full participation. Several participants stressed the need to reinforce efforts to secure greater participation on the part of African universities, research institutes and the Association of African Universities.

42. One participant stressed that as a forum of discussion CODI should go beyond references to the use of ICTs to their development aspects. It was noted that the inconsistencies between the texts relating to the different sub-Committees should be corrected. It was suggested that the Sub-Committee on Information and Communication Technologies should also include under its description a section on monitoring and reporting, as appeared in the section on geo-information, requesting member States to submit reports to the Secretariat on its activities in the area of information and communication technologies.

Agenda item 6.8

Review of the DISD programme of work in ICT for the biennia 1998-1999 and 2000-2001

43. In introducing this agenda item for consideration, the secretariat detailed the work programmes being undertaken and to be undertaken by the subprogramme in ICT. The resources attached to these activities were, unless otherwise specified, from the regular budget of the United Nations. Document E/ECA/DISD/CODI.1./10, the second aspect of the presentation, dealt with the former PADIS project: its achievements, weaknesses, evolution and absorption into the new ECA structure within DISD.

44. In the discussions on the above item, members requested more information about the relations between DISD and the following:

- the Standing Committee on the Harmonization and Standardization of Information Systems in Africa
- the former PADIS project
- the ECA subprogramme on Harnessing Information for Development.

45. Members requested also information on the relations between AISI and CODI, CODI and the Standing Committee and membership in CODI. The secretariat clarified that the work and aims of PADIS, an extrabudgetary project, had been incorporated into the regular work programme of the Division. All the agreements which PADIS had entered into with partners needed to be reviewed in light of the new ECA structures.

46. Comprised of experts and funded by extra-budgetary sources, the Standing Committee was convened by the Director of the DISD. Since its work was highly relevant to the Sub-Committee on Information and Communication Technologies of CODI, which dealt with norms and standards in ICT, the Standing Committee would present reports on its work to CODI. As long as funds remained for its operation, it would continue its work. The Development Information Services Division was the organizational unit of the ECA secretariat which implemented the sub-programme on Harnessing Information for Development. The ECA Conference of Ministers had adopted the African Information Society Initiative, but had mandated ECA to work on its implementation with as many partners as possible, in view of its immense scope. The organizational unit at ECA responsible for the coordination of AISI was DISD through its team on promoting information and communication technologies. There was also a strong proposal for the revival of the information management and dissemination services at the ECA Subregional Development Centres (SRDCs). To that effect,

participants encouraged the deployment of ICT focal points to each of the SRDCs in order to monitor, coordinate and evaluate ICT development in the various subregions and in member States.

Agenda item 6.9

Participant presentations

Mozambique

47. Mozambique informed the meeting about the status of information and communications technologies in the country. The Informatics Centre of the Eduardo Mondlane University (CIUEM) and the Institute of Social Communications are key players in the the implementation of various ICT projects including community telecentres, development of national information policy, the Schoolnet project to promote the use of ICT in secondary schools and community based radio and rural television.

Sudan

48. The delegate from Sudan described the privatisation of the telecommunications sector in his country. Sudan now has several private companies assembling computers, and a local software industry has begun. Internet came to Sudan in 1997. Courses on computer and ICT technologies are offered at university level, but vocational training is not on a par with higher education in this respect. The Government has a Committee to deal with the Y2K problem.

ACMAD

49. The participant from the African Center of Meteorological Applications for Development (ACMAD) in Niger informed participants about Communication for Rural Communities using Radio and Internet (RANET), a project which uses information and communication technologies to strengthen the capabilities of National Meteorological and Hydrological Services (NMHSs) of twelve African countries as a pilot effort to demonstrate the importance of dissemination of meteorological information, alerts and warnings to rural areas in Africa.

Acacia Initiative

50. The International Development Research Centre Acacia Initiative was set up in 1997 to empower sub-Saharan African communities with the ability to apply ICTs to their own social and economic development. Acacia has launched national strategies in Mozambique, Senegal, South Africa and Uganda and has regional activities elsewhere. Acacia has put in place an evaluation system known as Evaluation and Learning System for Acacia (ELSA) to monitor its activities.

UNESCO

51. Through its Regional Informatics Network for Africa (RINAF), UNESCO is supporting a number of countries in preparing a NICI policy reports for the African Development Forum to be held in Addis Ababa on October 1999. UNESCO plays also a key role in the following activities: universal access in the new information environment, info-ethics in the use and exploitation of information, contents and applications development, national information and informatics infrastructure and virtual learning environments including initiatives to create learning networks for African teachers.

Morocco

52. Recognising the important of ICT as an engine for development, the Government has recently established a Ministry in charge of post and new technologies. Morocco has more than 100 IPSs bringing services to over 70,000 Internet users, and cybercafes are mushrooming throughout the country. The Centre National de Documentation (CND) is the national centre in charge of the processing, management and dissemination of materials related to Morocco produced locally as well as externally. CND works closely with several regional and international information systems. Four major databases compiled by CND are now published on the Internet.

International Programs Center (IPC)

53. The United States Bureau of the Census developed The Integrated Microcomputer Processing System (IMPS) and makes it available to over 100 national statistical offices around the world. IMPS

performs the major tasks in survey and census processing while not requiring major computer skills in the data processing operation.

UNITAR

54. The representative of the UNITAR OSS/EIS programme briefed participants about the activities of the Systèmes d'information et de Suivi de l'Environnement sur l'Internet (SISEI) project. The programme presently covers CILSS and ECOWAS member States but will be extended to the rest of Africa. The system contains information contributed by the member countries on environmental topics as well as the profiles of institutions working on environmental matters and other related areas.

Council for Scientific and Industrial Research (South Africa)

55. The Council for Scientific and Industrial Research briefed participants about the South African National Foresight exercise coordinated by the Department of Arts, Culture, Science and Technology. The insights that the exercise had gained on electronic commerce were also highlighted. Telecentres (multi-purpose community centres) are seen as instruments for empowering the poor and disadvantaged to participate in the global economy. The lessons that can be learned from the activities of the Universal Services Agency of South Africa were also discussed.

Togo

56. The Togo presentation focused on Togo's steps towards the formulation of national information policy and a national information network. Issues concerning use and access of the Internet were also raised.

Namibia

57. The activities of the information and communication technologies (ICT) sector in Namibia were presented by the participant from the University of Namibia Library. The presence of five Internet service providers as well as Internet based banking were some of the points noted.

British Council

58. The representative of The British Council in Ethiopia representative described the Internet services of the British Council. He also announced the plans of British Council to open community telecentres in two towns outside the capital city of Addis Ababa. His point about applying restrictions to email only users at the Internet services centre received several comments. He also announced that the Council will provide initial funding to the community telecentres for the first year and will later work on cost recovery basis afterwards.

Mali

59. The representative of Mali briefed participants about the Internet and status of telecommunication status in Mali as well as the telecentre there run by Unesco. It was suggested for Mali to follow Namibia's model in making government information available on the web.

Recommendations

60. The Sub-Committee adopted the following recommendations:

1. CODI urges ECA to deploy ICT focal points to each of the Subregional Development Centres (SRDCs) in order to monitor, coordinate and evaluate ICT development in the various subregions and in member States.

2. ECA should work with its partners to secure assistance to institutions in Africa and member States in the area of content development and building Web sites.

3. In order to promote the right of all citizens, especially those in underserved areas, to access affordable means of communication, member States should be encouraged to privatise and liberalise communications services.

4. In view of the inevitable forces of globalisation and the information revolution, African Members states are urged to consider the importance of the information economy, including the development of information industries and e-commerce, as an area of economic growth that can drive other sectors.

5. Member States are urged to recall the adoption of the African Information Society Initiative by the ECA Conference of Ministers in 1996 and to redouble their efforts to work towards its implementation. They are further urged to establish national coordination mechanisms to work towards harmonization and coordination of ICT initiatives in their countries.

6. ECA should recognize the pressing needs of tertiary level and research institutions in Africa with respect to information and communication technologies and develop activities to serve their needs. NGOs and lcal authorities also have special requirements that deserve attention.

7. African Governments should give high priority to the solution of the Year 2000 problem in order for our information systems to survive the new millenium.

8. To CODI-given the growing convergence between various information and communication technologies and the shared aim of moving towards knowledge societies, Governments should try to include information specialists from as many disciplines as possible in their delegations to CODI.

9. To CODI- the inconsistencies between Sub-Committee texts in the revised terms of reference should be eliminated. The Sub-Committee on Information and Communication Technologies should insert a point on Member States' monitoring and reporting by submitting reports on their ICT activities to CODI.

Other presentations[1]

Council for the Development of Social Science Research in Africa (CODESRIA).

Having full access to the Internet since 1996 CODESRIA designed its web page the same year. The objectives of CODESRIA in using Internet are: to disseminate scientific and technical information; to enhance the visibility of African research at the world wide level. The contents of the web site are: institutional information; announcements of research programs, conferences, publications; electronic version of periodicals and documentary products. CODESRIA plans to put on-line databases (bibliographic and non-bibliographic) and to publish on the web documents such as reports and conference papers.

Inter-Governmental Authority on Development (IGAD)

IGAD activities being undertaken in member states include the strengthening of library and documentation services aims at improving the accessibility, availability, and quality of information and promoting information sharing and exchange among member states. The electronic communication network project has provided Internet connectivity to about 40 ministries and government institutions and trained beneficiaries to ensure existence of skilled users in each country. Finally, the Regional Integrated Information System (RIIS) project will enhance the sustainable production and dissemination of information for use in decision making. The RIIS will establish operational linkages with existing data/information providers and users.

Towards Linking the Sudan Research Community to Information Society

The paper reviews the current situation of research institutes, documentation and information services and communication infrastructure in the Sudan with regard to telecommunications and computers availability in the Sudan.

United Nations Environment Program (UNEP-INFOTERRA)

INFOTERRA is the global environmental information exchange network of the United Nations Environment Program. The material included a network fact sheet, The Southern Africa Sub-regional Infoterra Network (SASIN) and it presented to the Conference two publications: Multilingual thesaurus of Environmental Terms (Envoc) and the Guide to Environment and Development Sources of Information on CD-ROM and the Internet.

[1]Summaries are given for papers not presented in session.