CONTENT MANAGEMENT FOR AGRICULTURAL RESEARCH AND DEVELOPMENT IN INDIA

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The research and developments going on all over the world in agriculture and related subject fields have caused an information explosion in agricultural sector also. Various information systems on agriculture have come into existence at national and international levels. Our country generates huge quantum of information on agriculture during the activities of thousands of research institutions and programs existing in the country. The information generated by them is of high relevance to our farming community and scientists working for them. For optimal utilization of these developments, this information should be digitized and made accessible through the information systems existing in the country specifically systems for agricultural sector like ARIS. All those in agricultural sector like the farmers, scientists, students, extension activists and administrators should have a quick access to information on agriculture developed locally as well as internationally. For this proper content development, its organization and management as well as facilitating efficient and speedy access are of utmost importance. It is the responsibility of government and organizations putting huge investments for developing and maintaining information infrastructures to ensure that required content is created, maintained and made available to the people without which the investments in IT development will go waste.

1 Introduction

The term "content" means many things to many people and more than a dozen interpretations can be applied to it as the terminology is yet to get settled. In the context of information infrastructures, information systems of educational and research institutions and national information service programs the term means recorded information or knowledge or data copied to or prepared originally in computer readable media that is digitized information. So actually it is a collection of information or documents in digitized form and is a digital library, desktop library, virtual library, information nerve center, or electronic library. Now most of the people involved in information infrastructure developments have some allergy towards library and so we have to use the term library prefixed or suffixed

to terms digital, electronic, computer etc with care. Anyhow the term digital library or digital archives is widely used, in developed countries and it best fits the concept content or content management systems. When we consider its full meaning content is an organized and managed collection of digitized information in a variety of media that may be text, still image, moving image, sound, or combinations or any other. The only common aspect is all are transferred to digitized form. The collection is organized and managed for the benefit of an actual or potential user population, for example in an Agricultural University, the students, scientists and extension activists and the farmers who are to be served by the university. The text prepared in word processors, the images scanned into computer memory, video or sound copied into computer

memory, or any beautiful synthesis of all these with a purpose in digital form are as per the literal meaning to be considered content. Presently that is the type of content kept by many information systems if they are having any locally developed content. But when retrieval is considered they are not useful. So in the eyes of the librarian content is something more than mere digitized data. To be very specific the multimedia documents such as pictures and video clips that will become more important as the number of multimedia documents increases.

Information retrieval applications include content management systems; online search services, the Internet and media for digitized information storage. Current awareness services and printed indexes are other examples of special purpose information retrieval systems. Content management systems may be created to manage the corporate document collection within an organization; the document management system may store the documents in digitized form and provide appropriate retrieval mechanisms so that individual documents, or sets of documents on specific topics, can be retrieved. The Internet is a worldwide network of networks, which provides access to a number of computers, or servers, which connect us, to content kept in lakhs and lakhs of institutions worldwide. Search engines support retrieval in this undefined and enormous bank of information. Some of the computers or servers are those or the online search services, which provide access to selected and evaluated databases as a commercial concern. Another way of accessing some of the same databases, and also others that are not available over the Internet, is to acquire the database on digital form organizations may then choose to store them in their digital storage systems and make it available through the network. Normally such content is supplied with search or information retrieval software, so that it is possible to locate specific information from its content, which may be equivalent to lakhs of printed pages.

2 Digital Library

Introduction of the digital library has gradually eroded the distinction between library management systems and information retrieval systems. This has commenced with improvements in the information retrieval facilities available in online public access catalogues, but needs to progress much further. In the long run the way in which information or documents are retrieved should be dependent upon the needs of the expected user group, and not on the type of publlication like journal, book or directory, or its form of publication like print or electronic or its location like in a local or remote database. In such an environment, it will also be necessary to reflect on the nature of access. The copy and ownership of content, which appears to be best method at present has hindrances due to the laws related copyright. Once such issues have been resolved there will be no distinction between library management systems and content management systems, but in the meantime they are likely to continue to coexist, with overlapping but largely complementary functions.

Anyhow library management systems and information or content management systems cannot be treated as distinct fields. We are now operating in an environment in which innovative use of information technology in organizations in general has led to the creation of new products, improved service and dramatically reduced costs. These types of information use can be described as strategic, and are generally managed by strategic informa-

tion systems. Strategic information systems allow the organization to achieve competitive advantage. Such systems differ from traditional IT systems in that their focus is on treating information as a strategic resource. Specifically strategic information systems are outward-looking with a focus on the service to customer offers real benefit to the customer and are capable of changing the public perception of the organization. Progress in different aspects of the technology continues at an unprecedented speed. Multimedia documents can only be stored and transmitted with technologies that offer increased storage capacity and increased communication bandwidth. Perhaps, since no workstation is standalone any more, the major trends in technology can be encapsulated through an examination of the changes in the now not so humble personal computer. In the last five years, new chips with different processing technology offer increased and faster processing capacity. To accommodate multimedia operation computers have sound cards, speakers, high capacity removable disk drives and video cards. To accommodate transfer of content, sophisticated high-speed modems have become available.

When content management and dissemination or access is considered Internet is the ultimate open system. This would not have been achieved without the range of open systems standards that are now well established and widely recognized. Having achieved a platform in which many systems can communicate with each other, and user can benefit from relatively cheap international communication and content exchange, applications are emerging in which the need for security, data protection and controlled access to content is more pressing. Open systems now offer a very important avenue through which organizations can now communicate.

The widespread penetration of graphical user interface, the use of multimedia interfaces and the implementation of other publlic access interfaces have been essential prerequisites to wider public use of content. Public access systems demand highly user-friendly front ends.

3 Natonal Level Attempts in Agriculture

In the country the research and development activities going on at the 49 Central Institutes, 10 Porject Directorates, 27 National Researcn Centers, 86 All India Coordinated Research Projects, 261 Krishi Vigyan Kerydras, 29 State Agricultural Universities, 120 Zonal Research Stations, one Central Agricultural University, numerous regional stations and other research centers has been generating information of high relevance to our agricultural scientists, administrators and the farming community. The ICAR has initiated a project called Agricultural Research Information System (ARIS) to utilize the power of information technology for managing this information and making it useful for our agricultural sector. For developing agricultural and rural sectors, the following three of users of information system are identified by the studies conducted under this program. They are managers, scientists and farmers.

Managers include research managers at ICAR headquarters and directors of its central institutes, vice-chancellors, deans and directors of SAUS, secretaries and other decision-making authorities of Agriculture and Rural Development Departments of States and NGOs. For effective decision-making, they may require information on human and physical resources, research, extension and development projects, budgeting, and physical targets.

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Scientists include personnel working in NARS, extension and development departments. Their information requirement can be related to research and extension trends in various disciplines plant, animal & fisheries genetic resources, soil profiles, natural resources; agro-climate; economic and social indicators; feedback from fields; and results of previous research at both national and international levels.

The farmers may require information on input/output prices, market information, location specific inproved varieties, farm machinery, cattle breed, fish, etc. improved techniques and methods, complete package of practices, value additions (post harvest), and information about input supply system.

Keeping in view the total agricultural and rural development system, constraints and limitations, and information requirements at different levels, in formulating a comprehensive information system for effective agricultural and rural development the proposed objective were; improved research and planning, checking the duplication of research and extension projects and programming, dissemination of research findings, improvement in feedback mechanism, better coordination and linkage between and among different rural development agencies and banking institutions like Department of Agriculture, Department of Rural Development, NABARD, lead banks, NGOs, and private sector, evolving effective information sharing mechanisms, and electronic interface among scientists, development agents and farmers.

To exploit the potential of modern computing power in planning and management of agricultural research and scientific communication, ICAR started an Agricultural Research Information System (ARIS). It consisted of five modules listed below.

To maintain computerized bio data and service history of scientific, technical and administrative Personnel Information System (ARPIS) has been planned at ICAR headquarters so as to provide easy access on different types of information like cadre strength, number of scientists in position, type of trained manpower available, distribution of scientists according to sex, caste, state, institute and discipline,etc. The information on awards won by different scientists has also been included. This will help the management in planning the personnel policies, manpower planning, recruitment, identification of subject matter specialists in various fields, research work being undertaken on different commodities with respect to agro-climatic zones and resources used, etc. The software and database of all ICAR scientists numbering about 4500 has already been created. It can generate 36 types of predefined reports and any number of queries. This will further be expanded for all staff at KVKs and scientists working at SAUS.

Agricultural Research Financial Information System (ARFIS) the second module will maintain computerized monthly accounts of all ICAR institutes and ICAR headquarters, grants to SAUS, All India Coordinated Research Projects (AICRP), AP Cess Fund Research Projects, Revolving Fund Schemes and General Provident Fund (CPF) Scheme of all ICAR institutes. In consultation with selected SAUS, a financial information system will also be developed for SAUS after examining the financial information systems already in-place at some of the SAUS. A software package (ARFIS) has already been developed to computerize the monthly accounts of ICAR institutes and has been successfully imple-

mented in most of the institutes. Its use has been made mandatory from April 1, 1997. More than 300 personnel from account sections of these institutes have been trained on use of this package. Codification of all accounting heads (institutes, regional stations, schemes, etc.) has also been carried out.

Content Management will come under Agricultural Research Library Information System (ARLIS). It will be the most important exercise under ARIS and attempts will be made to modernize libraries and to put the library information on the ARIS network. All libraries of ICAR and SAUS will be computerized and linked to LARI library, which has been identified as National Agricultural Library. This will provide scientists an opportunity to access information in India or abroad electronically. Thus, library automation and their networking will form a significant part of the ARIS. Besides modernization and networking of libraries of ICAR institutes and SAUS, the creation of databases and CDs on both national and international agricultural research contents will be a major work under ARLIS.

Agricultural Research Management Information System (ARMIS) will provide access to research managers/administrators computerized management tools using software packages to information on different resources maintained under various databases. Reports generation related to particular aspect will be easy to facilitate decision-making. Procurement of equipment & inventory, providing connectivity, system operation and overseeing, and information on parliamentary questions and answers will also come under purview of ARMI. A database on parlliament questions and answers has been developed and being successfully implemented at Parliament Section of ICAR. This is helping research

managers in quickly establishing relationship between current questions and answers provided in the past of similar questions.

4 Models Developed and Experimented

Under the intiative of Dr. A. M. Michael, Kerala Agricultural University has initiated in 1995 a system named KAULIS, which can be taken as a model for various activities envisaged by ARIS. The project gives stress for digitized content management, which is the most important aspect of any information system or infrastructue, meant for supporting agricultural, education, research, extension and development activities. The infrastructure for this developed during 1995–98; with support from various national and international agencies is known as Kerala Agricultural University Library and Information System (KAULIS). The system has the capacity to digitize, organize and manage agricultural information resources available at various centers in the state and outside as well as permit access to it from anywhere.

4.1 The Physical Infrastructure

The University Library and its Digital Library and Networks completed in 1997 were formally commissioned in 1998. It is located in the most prominent site in the main campus at Vellanikkara in Trichur. The University Library has a Building LAN. During the construction stage of the library building itself LAN cabling was also done and 260 points spread horizontally and vertically over the building were identified for plugging in workstations for the use of staff, library users, trainees, lecturers during presentation etc and plug in points and computer furniture were provided at all these points. Through these at present 65 users can at the same time access textual and multimedia information stored in

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the electronic libraries of KAU and also from data-bases of outsides sources through Internet. They can read the text or see the video on their topic or hear the talk by experts. Forty workstations and access terminals were plugged in to the LAN on the day of inauguration and more will be provided according to increase in usage. Through the campus network to be established at main campus any student or staff member in the colleges and other buildings and lecture/seminar halls in the main campus can access library from the terminal in their table. As per the KAULIS project, terminals will be provided at student's hostels for day and night online access to the library and Internet. Library databases and digitized books in its electronic storage systems can be accessed online from distant college campuses also. Central Library will also co-ordinate the linkages and co-operate with external sources of information from worldwide sources.

4.2 KAULIS Digital Library

KAULIS has designed and developed a Digital Library. Various national and international institutions have provided support toward this. The Library and Information Science professionals joining with IT solution providers have customized some search engines according to requirement which will enable automatic pooling of content in a subject group and retrieving information from that at a single stroke of the key. The electonic library storage systems that can manage storage in a cost effective way and disseminate information efficiently consist of three types of hardware, meant for highly used information, middle level usage information and less or rarely used information. In this Electronic Library the storage systems with Alpha Server 1000A; under high security stores very costly specialized software and databases and agricultural research infor-

mation worth about approximately Rs. 2.87 crore received and downloaded under various MOUs and licenses. The PhD dissertations of KAU are available in this electronic library. The Electronic Library has a storage capacity of approximately 6.5 crore printed pages and it already has content copied under various MOUs and books and other documents acquired in electronic medium consisting of approximately 5.5 crore pages and about hundred and twenty hours video/audio files in its storage system.

While the dedicated connectivity forming part of the project is provided the university library the books, interactive multimedia programs, video films on agriculture related aspects and other content stored here would become accessible from any distant campuses or Krishi Bhavans of the State. The digital library systems installed here has the capacity to maintain a web – protal on agriculture for the State. This can provide online information to farmers on cropping agricultural practices, technical aspects of agriculture, and government schemes. Farmers can also get customized information from agricultural scientists of the university through this system. Extension activists can take access equipments to remote areas and there the whole multimedia information resource kept at this library will be accessible for their presentation and demonstration through the portable access systems. This can improve the efficiency of extension activities tremendously. The digital library has all the facilities for hosting a virtual university on agriculture.

5 The Nature of Content

In a digital library it is not essential that digitized content is kept in the same physical location or held by the same institution or organization. Nor-

mally, locally or in-house developed content will be present in the location or in more than one location under the organization. Acquired digitized content will be added to that. The remaining content is content to which access is facilitated.

In KAULIS content of the digital library comprises specialized information on : genetic engineering, animal cell culture and virology, plant tissue culture, photosynthesis, and plant molecular biology, oncogenes, reproduction physiology, cell transformation, nucleic acid and protein sequences, immunology, enzyme engineering, immobilized biocatalysts, microbial fermentation and bioprocess engineering received from DBT and other agencies which can be accessed online by KAU scientists and students.

The software collection include those provided by Information and Library Network Programme (INFLIBNET) under Govt of India which connects universities and research and development institutions of national improtance using a hybrid version of communication architecture using satellite and terrestrial networking. NIC supported software for developing digital library of full text databases as well as digitized multimedia document collections, web server modules of these packages that can be used for developing digitized collections and databases from all 48 stations of the university and pooling the information instantly for online access by any user from any station is available in the digital library for use of libraries under KAU.

5.1 Acquired Content

The digital library at KAULIS contains the content that is full text of all the publications originally brought out by 19 international agricultural research centers including ICRISAT of India. It contains in full results of 24 years agricultural research recorded in documents including key books, serials, conference proceedings, reprots, maps, graphs and photographs produced by research centers worldwide on practical problem solving research in key areas like productivity, management of natural resources, improving policy environment, institution building, germless conservation and building linkages in agricultural system. In print the items will cost more than one crore. All this collections are available for use through KAULIS Network.

The full database of International Development Research Center, (IDRC) Ottawa containing information on development research going on all over the world supported by World Bank, FAO and other international organizations is also available on this electronic library under a resource sharing programme it is accessible through KAULIS.

The databases developed by Centre for Agriculture and Biosciences International an intergovernmental organization covering subjects like agricultural engineering, animal breeding, animal diseases, arid lands, diary sciences, forestry, forest products, horticulture, nutrition, veterinary science, entomology, plant breeding, plant pathology, soils and fertilizers, weeds and world agricultural economics is also available in the electronic library. This database contains information including abstracts of papers published in 8500 journal on agricultural topics in 37 different languages, and also books, reports, thesis, conference proceedings, patents, annual reprots and guides. The coverage is since 1970. Over 1,60 000 items are included in the database every year and is added to KAU electronic Library also. This database on agriculture and allied subjects covering the period from 1970 to present consisting of 3,000,000 records is an as-

set to the state's agricultural research and development programs. KAU library being one that can be accessed through Internet; by taking a network license for such databases all agricultural research institutions in the country can make use of these resources.

5.2 In-house Content Development

The unit has facilities for in-house content digitalization, digital publication and other related activities. The present plan of the KAULIS is to digitize all the PhD dissertations accepted by Kerala Agricultural University, All the publication of the university and all the documents of the major reprots and studies conducted by the university. The first phase of digitizing the PhD dissertations has been successfully carried out.

The KAU Thesis Collection in Digital Library is the collection of PhD dissertations accepted by KAU for awarding Doctoral Degree of the university. The instant search service mechanism provided extensive search and retrieval features on this collection. The digitized content in this collection incorporates abstract of the thesis and wherever available the images of thesis in roaster format. Its index has all the search capabilities and contains the abstract of the thesis in text format. Once the user has selected a thesis then all the pages of the thesis can be viewed as image from the image collections. This section of the digital library provides tools for very extensive search on text or images. The user has the option to create his own bookshelves, which contains the selected thesis. This reduces the effort of searching a particular thesis of users choice again and again.

In the thesis library searching is done by a search mechanism. Bibliographic Information of the documents is stored by and handled by it where as the full text is kept in Acrobat pdf form. Full text information in pdf form is stored and handled by Adobe Acrobat the most efficient package available for the purpose. When we hit the results of the search done using the search mechanism of this program for author, title or subject terms the exact page in the concerned document opens. User can also browse through the authors, titles, chapters, and even headings and figures. The abstracts of the documents can be opened first and then if the document is found relevant user can go to the contents page and then to chapters or figures by clicking them till the exact page opens in Acrobat Reader. Once the user has selected a document he can reach it and all the pages of the document can be viewed as images.

By clicking on any of the results we can go directly to the first page of the document, then by clicking on the book marks which is equivalent to the contents page of the book we can go to the exact chapter or position of subheading or sub sub heading in the full text and proceed further on using the document. PhD dissertation produced by State Agricultural Universities, IARI and other institutions are the most important content to be incorporated into the ARIS if that programme is to be of its expected value and utility. Even though attempts have been made to scan and keep pages of such dissertations in computer memory by many institutions and programs a similar attempt to develop a digital library with powerful search capabilities have never been attempted. KULIS has the power to digitize all such documents existing in the country and make it available for use through Internet.

5.3 Access to Content Developed Worldwide

The unit has already entered into resource sharing

programmes with library and information divisions of various national and international agricultural research institutes. The main achievement of the unit in this sector is the facility for accessing the content made available by Consultative Group on International Agricultural Research (CGIAR), which contributes through research and dissemination of knowledge for pormoting sustainable agriculture for food security in developing countries. The content generated by the CGIAR Research Centres available at their websites are linked to the digital library of KAULIS. All earlier publications of these institutions copied into digital media were available in the digital library of the unit. The information generated by the Centre International de Agricultural Tropical, Centre for International Forestry Research, Centre International de Mejoramiento de Maizy Trigo, Centre International de la Papa, International Centre for Agricultural Research in the Dry Areas, International Centre for Research in Agroforestry, International Crops Research Institute for the Semi-Arid Tropics, International Food Policy Research Institute, International Irrigation Management Institute, International Institute of Tropical Institute Agriculture, International Livestock Research Institute, International Plant Genetic Resources Institute, International Rice Research Institute, International Service for National Agricultural Research, West Africa Rice Development Association and various other national and international agricultural research institutions can be used through the digital library system of KAULIS.

5.4 Content for HRD in Agriculture

KAULIS has under it a Centre for Library and Information Science intended to demystify the digital world to agricultural scientists, teachers, extension workers, students and researchers. The Center is established at the University Library, which has lecture halls other modern facilities required for offering such programmers. The division has designed and implemented various national level innovative HRD programs in Information Technology for Ministry of Science and Technology, ICAR, and other organizations. The programs successfully conducted include 'Computer Application to LIS", Digital Presentation.',' Internet for Scientific Communication and Research', 'World wide web for Managing Agricultural Information', 'Managing Digital Libraries in Agriculture', 'Modern Information Access facilities', Advanced CDS/ISIS' as well as an 'IT workshop for managers' a course meant for Directors, Secretaries to Government and Heads of the institutions who are to approve or play an important role in implementing IT strategies, to give them necessary IT literacy for taking informed decisions. Various computer based training programs were developed by KAU for these programs as well as online registration; selection announcements etc were tried in the university for the first time in these programs.

The Lab and familiarization facilities trainees available include the plug and play type of Building LAN, digital library, systems running on Windows NT and Digital Unix platforms, facilities for familiarizing DOS, Windows, NT, Unix, MS Office, Basis Plus, Techlib Plus, CDS/ISIS and various other library packages, CD networking, digital library management etc. Electronic Library hardware includes Alpha Server for Digital Unix and other applications, Priories for Windows NT Server, Meridian CD Server, JVC Juke box systems and Pentium Workstations. Computer based interactive multimedia packages to support twelve HRD programs in Information Technology developed by a team of re-

source persons with expertise in various aspects of IT that gave voluntary support for the project; has been preserved in the Alpha Server. Lecture hall is equipped with latest audiovisual aids, which include multimedia computers, VCR, Television and Davis Multimedia Projector for video and computer projection of presentations as well as CBT programs. A need based collection on computer application and other IT aspects consisting of textbooks, journals, CBT programs, etc are available at the CLIS for the reference of the participants during the programs.

Human beings are the most important components of a system. The first and most important requirements for the effective functioning of any content management or information system are the availability of qualified and experienced staff. The University has provided Information Technology training and exposure worth about Rs. Fifteen lakhs to the University Librarian who is to manage the high tech system worth about Rs. Nineteen crore at various specialized institutions as well as during the system development stage and an average one lakh worth training programs to all other staff members working in automated divisions as part of adopting new technologies and for content management as well as information system modernization programs.

6 Content Management

Considering all these in a wider context, and examining the cumulative effect on content management, it can be seen that the past two decades have witnessed more content transmitted from a greater range of sources, through a wider range of channels, many of which have faster response and turnaround times. The competitiveness and effectiveness of individuals, organizations and societies is increasingly dependent on their content manage-

ment and knowledge-creation capacity, which means that there is a greater focus on individual, organizational and societal competencies in relation to communication, content management and knowledge creation.

Content management is concerned with the facilitation of this information processing through, in the widest sense of the term, the creation and evolution of systems. There are a number of challenges that will need to be tackled, and issues that will need resolution. These are issues concerned with the structure of the information service systems, and a range of societal issues associated with access to, and ownership of content. The first is that Governments, organizations and individuals will put a top priority on content within a short while. In the global information economy our country also has to achieve minimum possibilities in connectivity, standards, content development, management and mediation skills. Industry and commerce will have to be more knowledge intensive learning organizations. Also there will be an information economy which empowers citizens through a network of content or knowledcge bases acting as flagships of acces in their community. There will be a digitized content source coordinated nationally and internationally embracing the world's knowledge and creativity in which the India's heritage of intellectual property also should be made globally available in digital form. Value added content and universal connectivity would ensure that every individual would have unregulated access to global content or knowledge. And the last but not the least individuals will need a range of literacy to enable them to maximize their potential individually and collectively.

The contexts in which content management occurs can be placed in a wide environment. Whilst so-

ciological, technological and political forces are important in the content environment, those factors which transcend national and international boundaries and are arguably the most improtant in determining access to content, with all of the associated social and political ramifications, are those of the business environment. Indeed, in recent years most governments in developed countries recognized the need to put in place infrastructures that ensure that not only their industries competitiveness in a global marketplace, but also their public sector organizations are exposed to marketplace pressures. These issues also play a significant role in determining access to content and the role that information professionals play in facilitating such access. But it is indeed very difficult to define information sector of economic activity because of the dramatic development in the technologies and all of the recent mergers in the entertainment, talecommunications and information industries.

7 Changing Scenario

But it is very important that information professionals seek to understand the kery characteristics of this environment, however elusive and changing its boundaries might be. Key issues are the nature of digitized information as a product, the identification of consumer needs and the influences that will shape the sector. The opportunities offered by enhanced digitized content and communication systems have affected the way in which organizations operate and are impacting on both internal communication and communication with service provides and users. For example, marketing with IT is beginning to establish itself with the emergence of multimedia kiosks, database marketing and commerce over the Internet. Here everything evolves around content for different purposes. The appli-

cation of such systems also fuels the drive towards an information society. All parties in the information industry are on the front line of such changes. Whilst in organizations like an Agricultural University of Research Institute effective content management may be a means to an end, or an internal product that supports in achieving organizational objectives, the primary product of most of the players in the information industry is content management, either in the form of a service, such as information management consultancy or library service, or as a product which provides packaged information, such as a database like CABCDs, Food and Nutrition Abstracts or ASFA, a CBT programme or a printed directory like Books in Print.

8 Future Possibilities

Information systems are changing the society. The ultimate scenario of the virtual society, where all communication is digital, and processes such as teleworking online learning, and teleconferencing, or even videoconferencing, substitute for actual person-to-person contact, must have significant implications for the way in which human beings satisfy their need for interaction with one another. The agricultural extension activities are going to change unimaginably in similar situations. In such a society the traditions that have evolved over centuries concerning the conventions surrounding meetings with other people, the chance associated with new social contacts and the use of non-verbal communication, will all be challenged. Most of us will be relieved to recognize that this new era will not emerge overnight. Currently, content and information systems, and the associated communication, are gradually increasing their impact; on our society and the values that we adopt. The key issues can be listed

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like this. Improved telecommunications allow people to form their own communities irrespective of geographical location. This supports the formation of groups of people like agricultural engineers, with similar interests, politics or objectives. At this level there is the potential for the development of the global village. One other consequence of the global village is that improved communication changes people's horizons and expectations of life styles.

The nature of institutions is subject to change. Shifts are towards inter institutional working. Information technology has increased organizations' capacity to form networks and networked functioning. Quality content or information, whether it is text, statistics or multimedia, costs time, effort and money to create. Producers seek to recoup their investment. Some content needs to be kept secure. In addition, we may all rightly be sensitive about the data about us that is stored in a variety of different databases. Data protection has to safeguard all this. Standards are another issue with which all have wrestled long and hard. Essentially, if a major player can achieve competitive advantage it can make its standards for a new technology the defacto standard. Libraries have long been concerned to maintain an archival record of information. Digitized content pose many problems for the maintenance of an archival record. Digitized content will be dynamic and changing documents, and the creation of a number of different versions is relatively easy . Which version should form the archive document will be a difficult question to answer. It is difficult to decide what constitutes a document, it is also difficult to maintain bibliographical control over the digitized content.

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