

# E-learning in information accessibility of disabled assistant technology

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## 1. E-learning in information accessibility of disabled assistant technology

### 1.1 The disabled higher education and network teaching

#### 1.1.1 Development of higher education for the disabled

Around the 18th century, the European started to take cognizance of disability and disabled people scientifically. In 1864, American congress passed a resolution on merging the Washington schools for the blind and for the deaf into Gallaudet University, and it became the first university in the world for the disabled.

The famous IDEA (the Individuals with Disabilities Education Act) is mainly about the stage of compulsory education for the disabled students. But the protected by the Act also includes the people who accepted higher education. The Act strengthened the disabilities' awareness on right to protect the personal needs and use the facilities in higher education, enhanced the people's awareness of the possibility and legitimacy on the disabled sharing the higher education. Data shows that the U.S. has more than 1500 universities that accept disabled students, almost one the thirds of the American university. In 1995, almost all the disabled people at the proper age enrolled into the universities or colleges. And there were 42.8 million disabled students in American colleges in 1999. For example, in the famous University of Michigan, there are 200 disabled students among each 3500 ones. The colleges provide all kinds of services for disabled students to adapt their special needs of material conditions, such as the use of braille books, reading software, etc. Each school has its accessible environment for the various needs of the special students.

In Japan, the higher education for disabilities follows the principles of democratic education with neither special preferential policies nor the restrictions. While in previous Soviet Union, it runs in two ways, study together with the common students or in the special education institute. After the collapse of the Soviet Union, Russia retained partial special schools. In the United Kingdom and some other countries, almost all the people with disabilities study in ordinary colleges or universities in ordinary class. Most of the people with disabilities of Yugoslavia have obtained higher education levels, many of them became masters or doctors. Any chance is equal to people with disabilities in the aspect of education. In China, the higher education for people with disabilities can be traced back to the early 20<sup>th</sup> century. The government approved the establishment of the formal department for the blind and dumb schools, and the excellent graduates will be sent to the special educational college of

National Central University without examination. After new China was founded, Communist Party of China and the government attached great importance to the cause of the handicapped and the higher education for the disabled. Higher education for the disabled planned by government began after the mid-1980s in China. Since the recent 20 years, there has more than 30000 disabled students studying in Chinese universities and the Changchun University keeps the Chinese level on special higher education.

### **1.1.2 Network resources of higher education for disabled**

In most countries, people with disabilities shared equally college education with common students. So the services provided by library must meet the different needs arisen due to all kinds of physiological defects. The first digital library for the blind of Paraguay is created in 2007 offering free service for the blind in Spanish. At the web site, a reading-software called JAWS is available to help the blinds "view" pages or "read" electronic books.

Another digital library for the blind where the visually impaired can listen to electronic books, music or on-line lectures for free has been opened in the National Library of China. About 200 electronic books, 500 audio programs and 500 video programs are available in the library, covering ancient Chinese culture, medicine, modern literature and daily life. Some of the materials were provided according to the requests from the blind. The library plans to add at least 200 electronic books, 30 lecture videos and 500 audio programs every year.

Australia, Canada, Croatia, Denmark, Japan, Korea, Netherlands, South Africa, Sweden, UK and the USA have joined to issue a report on the governance and funding of library and information services for visually impaired people. The report is aimed to support a long-term dialogue among stakeholders about how to meet opportunities and challenges for widening access to reading materials for visually impaired people best.

The professional membership organization AHEAD (Association on Higher Education And Disability, <http://www.ahead.org>) is organized for individuals involved in the development of policy and in the provision of quality services to meet the needs of people with disabilities involved in all areas of higher education. Nowadays, it has more than 2,500 members throughout the United States, Canada, England, Australia, Ireland, Northern Ireland, New Zealand, South Africa, Sweden, Japan and Greece. In addition to the international membership, AHEAD has formal partnerships with 30 regional affiliates and numerous other professional organizations working to advance equity in higher education for people with disabilities. Since 1977 AHEAD has delivered quality training to higher education personnel through conferences, workshops, publications and consultation. AHEAD members represent a diverse network for professionals who actively address disability issues on their campuses and in the field of higher education.

There are many websites of "Educational Resources", "Job Training/Placement", "University Resources" for people with disabilities in higher education. Such as "College Funding for Students with Disabilities" at <http://www.washington.edu/doi>, "Financial Aid for Students with Disabilities" at <http://www.finaid.org/otheraid/disabled.phtml>, "Scholarships Available for College Students with Disabilities" at <http://www.spinalcord.org/>, "On-line Disability Information System (ODIS)" at <http://dll.umaine.edu/cd/html/online.html>, etc. The National Science Foundation, the State of Washington, and the U.S. Department of education have provided the primary funding for DO-IT (Disabilities, Opportunities, Internetworking, and Technology) to serve to increase the successful participation for people with disabilities in challenging academic

programs and careers. ODIS is created by the center for Community Inclusion and Disability Studies of the University of Maine to offer courses in many disciplines throughout the year. Courses are delivered through various technologies and formats including interactive television, compressed video, internet, intranet, video streaming technologies and combinations of these systems. Depending on the technology utilized, students participate in the class "live" or asynchronously through materials archived online.

Besides, some universities have open courses that are offered by Tufts Open Course, UMass Boston Open Course, MIT Open Course, Utah State University Open course Yale Open Course, Notre Dame Open Course, Uclrvine, Johns Hopkins Open Course, etc.

Also, some other university resources are available at George Washington University, Iowa State University, Johns Hopkins University, Northwestern University, Oklahoma State University, Ohio State University, Oklahoma State University, Tarleton State University, University of Delaware, University Of Georgia, University of Illinois at Urbana-Champaign, University of Iowa Division of Developmental Disabilities, University of Kansas Medical Center, University of Minnesota, University of New Hampshire, University of Virginia, University of Washington, Victorian University, Wright State University.

## **1.2 The e-learning system**

### **1.2.1 The ideas and goals of e-learning**

E-learning is a new education concept which has been applied in various fields beyond formal education, such as adult education, corporate or enterprise training, business training institutions. The original interpretation of e-learning refers to the study action assisted by electronic means and that the learning process is usually created by interaction with digitally delivered content, network-based services. These lessons can be made more interesting using multimedia i.e. combination of text, graphics, sound and animation. Lessons can be delivered to the learner via various means e.g. CD-ROM, video conference, Internet. Nowadays, the much talked about e-learning is referred to its narrow sense that the learning by Internet.

The main goals of e-learning are to make learning more convenient, more effective, to reduce more educational cost, and what's more to do great benefit to the resource sharing throughout the world. It delivers the digital content, provides a learner-oriented environment for the providers and learners. It promotes the construction of life-long learning opinions and learning society. To both the provider and the learner, web-based learning options offer terrific flexibility and cost savings. The learning process can be carried at anytime, anywhere by anyone via any media and anyway. Benefit from the powerful combination of audio, animation and software simulations that produce highly engaging multimedia training. Courses today use realistic simulations, hands-on exercises, and role-playing scenarios to help learners "learn while doing".

As a Internet-based learning, e-learning has the following three characteristics:

- i. Network: Knowledge can be updated in time, and meanwhile ensuring knowledge consistency.
- ii. Personalization: The terminals can be computers or mobile telephones. Learners can arrange personal progress according to his (her) time, can decide the appropriate

content he (her) need.

- iii. Trackability: All learning activities can be recorded as the basis for the assessment of the learning result and the analysis of training needs.

### 1.2.2 Some typical e-learning systems

The original concept of e-learning is presented about 30 years ago, and the narrow concept is appeared about over 10 years ago, but its real use began only few years ago. In the most recent period, especially since 1998, network-based "e-Learning" concept began frequently in the mass media as well as in the industry, and gradually become a "popular language". The application spreads rapidly around the world. Learning management systems (LMSs) and course management systems (CMLs) are the two similar modes of e-learning.

#### 1.2.2.1 LMSs

LMSs refer to software that primarily acts as an electronic registrar by electronically performing various enrollment and related tasks. LMSs were originally designed for workplace learning environments, and specifically perform some or all of the following tasks:

- Registration
- Track participation (classroom attendance, sign-ons and sign-offs of online courses)
- Track of completions (including final scores or grades)
- Testing
- Follow-up discussions with participants
- Aggregated reports, such as the number of people registered for particular courses
- Transfer of information to other systems, such as human resource information systems
- Process charges for courses, such as tuition payments and transfer payments among departments
- Course catalog
- Skills management.

From a participant perspective, an LMS provides a central point from which learners access activities. It provides a list of courses available, and lets learners enroll in courses. If learners must complete prerequisite courses, the system can check that. After learners enroll in a course, the system can automatically generate an enrollment confirmation and, later, a reminder about the class. After class, the system can be used to test knowledge, record a course completion, and send the information to the learner's permanent employment record, as well as send follow-up correspondence to the learner. For an e-learning course, the system can launch the course, track student progress, record completions, and send information to learner's permanent employment record

For administrators, LMSs can be used to manage both classroom courses and e-learning. For e-learning, the system starts the course after the learner registers in the course. For classroom courses, the LMS can provide a variety of resources, including schedules for individual classrooms (that is, facilities tracking capabilities) and class lists for instructors. LMSs can also be used to record and assess training satisfaction (Level 1). In addition, LMSs can generate a number of reports, from the number of students enrolling in particular courses to aggregated records of student performance in particular courses.

Many LMSs are available on the market. Here, we will take the SkillSoft PLC, Saba, and SumTotal Systems as examples.

**Case 1: SkillSoft PLC**[<http://www.skillsoft.com>]

SkillSoft was incorporated in Ireland on Aug. 8, 1989. After completing a merger with SmartForce in 2002 became known as SkillSoft PLC. It is a leading provider of e-learning and performance support solutions for global enterprises, government, education and businesses with small to medium-sized. SkillSoft enables business organizations to maximize business performance through a combination of comprehensive e-learning content, online information resources, flexible learning technologies and support services. Their products offer the most comprehensive content alongside the most experienced and qualified consulting team in the e-learning industry. Content offerings include business, IT, desktop, compliance and consumer/SMB courseware collections, as well as complementary content assets such as Leadership Development Channel video products, KnowledgeCenter™ portals, virtual instructor-led training services and online mentoring services. The main models include the following.

- Digitized business books and reports, learning management system and virtual classroom
- Online business and IT training
- SkillPort: learning management system
- Books 24x7: online business and technical books resource
- SkillSoft Dialogue: web collaboration tool

**Case 2: Saba**[<http://www.saba.com>]

Founded in 1997, Saba is the premier global provider of strategic human capital management (HCM) software and services. Saba's people management solutions are used by more than 1,300 organizations and over 17 million end users worldwide. Saba's solutions increase organizational performance by aligning workforce goals with organizational strategy; developing, managing and rewarding their people; and improving collaboration. Here, we introduce Saba learning suite.

Saba learning suite is the most comprehensive solution available for addressing the strategic goals of learning organizations. It delivers effective formal and informal learning that is tied to clear business outcomes and strategic human capital management initiatives. Combined with Saba Centra, Saba Learning Suite is the first product from a single company that offers the full continuum of learning methods – formal, informal, self-paced, live, and a blend to provide seamless and truly effective learning that builds organizational competencies. The suite gives learners the ability to target competencies and capabilities, measure improvements, and assess the impact of those improvements on performance, revenues, and cost savings.

The Saba Learning Suite includes capabilities for: enterprise learning management, Certification management, For-profit customer education, Learning content management systems, Content authoring tool, Saba Centra: Virtual classrooms, Informal learning and collaboration, Career and competency management.

**Case 3: SumTotal Systems**[<http://www.sumtotalsystems.com>]

SumTotal Systems, Inc. is a global No.1 provider of learning, performance, and talent management solutions[<http://www.hiray.net/No.1-a.htm>], its partners spread over Asia Pacific, Europe, Middle East, Africa, Latin America, North America. Their Learning Management System (TotalLMS) is an industry's leading and the backbone of SumTotal's learning management offerings. TotalLMS combines best-of-breed functionality with simple

configuration to help companies easily administer a variety of learning activities for both internal and external audiences. By providing the latest information, training and certifications, companies can help their customers to use their products more effectively, become productive more quickly and decrease their need for support. SumTotal's customer education solutions provide global, scalable capabilities to maximize the effectiveness, coverage and consistency of training to a company's customers. The recently released ResultsOnDemand Learning provides a best-of-breed learning management platform in an easy-to-use, rapidly deployed solution. This Software-as-a-Service (SaaS) solution provides organizations a low risk opportunity to leverage the robust functionality in ResultsOnDemand Learning. More than 1,500 organizations, large and small, depend on SumTotal learning solutions to improve learning management efficacy, meet training compliance requirements, and report on training's impact.

### 1.2.2.2 CMSs

CMSs are online systems that were originally designed to support classroom learning in academic settings, such as universities and high schools. CMSs provide instructors with the ability to perform the following tasks:

- Place course materials online: Most CMSs provide pre-programmed buttons for the course syllabus, course schedule, and course materials linked to specific lessons, such as copies of readings and PowerPoint slides from lectures.
- Track student progress through assessment features, which enable instructors to give quizzes and tests online, and an online grade book, where instructors can post student grades
- Discussion board, where instructors and students can discuss readings and continue class discussions between formal class sessions
- Other communication tools, which let instructors send announcements to classes and communicate individually with students
- Lock box for students, where students can store class materials in a safe place—either a presentation to give later in class or backing up class assignments in a safe place
- Course statistics, which provide information on the use of the course site, including who and when used the course site

Because CMSs enable instructors to easily create a course website by following a template and uploading existing documents in PowerPoint, Word, Excel, Acrobat and other popular formats without converting them to a web format (like HTML), they require few specialized skills. As a result, CMSs are easy to learn and were quickly adopted by instructors, even those who might claim to be luddites. Indeed, some universities report that well over 70 percent of their instructors have created course websites using CMSs.

CMSs also have been proven popular in managing asynchronous academic distance courses, too, because of their ability to manage discussions. In addition, given that CMSs were already installed and in wide use only adds to their popularity. When using a CMS to manage a distance course, instructors post a core lesson—a master script, of sorts, that guides students through readings, discussions, and learning activities—instead of merely posting readings and PowerPoint slides for each lesson. Instructors then use the discussion board to manage the course discussions, which are usually more extensive than those used in classroom courses.

Examples of CMSs include the commercial products Blackboard and WebCT (emerged with Blackboard), and the open source system, Moodle, but not limited to these. The following are the simply introduce to them.

**Case 4: Blackboard Learning System [<http://www.blackboard.com>]**

The Blackboard Learning System of Blackboard Inc. is an industry –leading software application used to power virtual learning environments, supplement classroom education and as a platform for distance learning programs. Featuring a robust core set of capabilities that enable instructors to efficiently manage courses, author content, create assignments, and foster collaboration, among other key functions, the Blackboard Learning System help institutions accomplish mission-critical objectives related to instruction, communication and assessment. These key capabilities include:

- Course Management
- Content Authoring
- Adaptive Release
- Syllabus Builder
- Learning Units
- Online Textbook Content (Course Cartridges)
- Teaching and Learning Tools
- Personal Information Management
- Discussion Board
- Virtual Classroom / Collaboration Tool
- Group Projects
- Assessments and Surveys
- Assignments
- Gradebook
- Reporting and Performance Dashboard
- Enterprise Scalability
- Multi-Language Support
- Standards
- Blackboard Building Blocks (Open APIs)
- System Integration

**Case 5: Moodle [<http://moodle.org>]**

Moodle is an Open Source Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It has become very popular among educators around the world as a tool for creating online dynamic web sites for their students. To work, it needs to be installed on a web server somewhere, either on one of your own computers or one at a web hosting company. The current version is 1.9, which was released in March of 2008. It has been translated into 61 different languages. Major improvements in accessibility and display flexibility were developed in 1.5. As of March 2008, the Moodle user community with over 400,000 registered users on their site alone. As there are no license fees or limits to growth, an institution can add as many Moodle servers as needed. The largest single site has reported over 19,000 courses and over 41,000 students, and the Open University of the UK is building a Moodle installation for their 200,000 users. Its capabilities will be divided into two aspects, i.e. the system

management functions and the network teaching functions.

### **I The system management functions**

- Site integration
- The easy-to-use design
- Dynamic modular design
- The role management
- User Registration Management
- Styles in a variety of themes
- Multi-language supported
- Well opened
- Perfect management tools
- Other new technical features

### **II Network teaching functions**

- Multiple types of courses supported
- Flexible curriculum management
- Tracking analysis of study record
- Classing and grouping functions
- Courses resource management
- Two-way evaluation
- Test & item bank
- Multi-styles online teaching module
- Industry-standard supporting
- Other new features

### **1.2.3 Discussion on the application of e-learning in the HEFD**

As we covered at the beginning of section 1.2.1, the much talked about e-learning is referred to the learning by Internet, and which has contributed a lot to the higher education. In this part we will review the application among universities around the world.

#### **1.2.3.1 E-learning in higher education**

Since the middle of the 1990s, the number of colleges and universities which provide courses and degree programs via e-learning has been growing dramatically. Internet-based e-learning has become one of the most concerned paths for people to acquire their expected knowledge. More and more universities have been invested a huge amount of resources to implement their Internet-based e-learning platform or environment. Many universities established its e-learning system based on the commercial platforms. Following are the details.

Cornell University offers over 2,000 SkillSoft courses in information technology and business-related topics such as administrative support, communication, customer service, human resources, leadership, management, personal development and team building. The University of Houston became SkillSoft's first enterprise-wide education partner in the United States in 2004, offering the SkillChoice Complete business skills, IT and desktop solution to the entire campus community. University of North Carolina Wilmington had used SkillSoft IT courseware since 1998. In 2005, the university became enterprise-wide users and began offering SkillSoft's SkillChoice Complete solution of business skills, IT and



desktop courseware, etc. to all faculty, staff and students. Besides, The Western Governors University and Minnesota School of Business are all the costumers of SkillSofst. What's more, SkillSoft has extended its service to Chinese market. East Carolina University puts a new face on academic outreach with Saba Centra Live, Hosei University Builds a New Education Model With Saba Centra Live, University of Tennessee Nearing a Decade of Distance Education Using Saba Centra Live. The University of Manchester, a Blackboard client since 2003 recently made a strategic decision to adopt the Blackboard Managed HostingSM solution for its Blackboard Learn - Vista™ delivery. The University of Manchester aims to be one of the top 25 universities in the world and is committed to achieving this by 2015. Moodle is an open source system and its known sites have reached to 55,499 till January in 2009.

Besides the commercial platform-based ones, there are also various kinds of e-learning systems around the world. The first pioneer intelligent and adaptive Web-based educational systems were developed in University of Pittsburgh 1995-1996 by Brusilovsky<sup>[1]</sup> named Adaptive and Intelligent Web-based Educational Systems (AIWBES). Since then many interesting systems have been developed and reported. In 2004, Brusilovsky presented a distributed architecture for adaptive e-learning: Knowledge Tree<sup>[2]</sup>. Subsequently, He worked out the ontology-based framework for user model interoperability in distributed learning environments in 2005<sup>[3]</sup>.

In 2001, the Department of Education, Training and Youth Affairs (DETYA) commissioned one of the largest educational research projects ever undertaken in Australia, to focus on innovation in schools<sup>[4]</sup>. The Innovation and Best Practice Project (IBPP) consisted of research into 107 schools throughout Australia in relation to teaching and learning toward a 'knowledge society'. Through the innovation of e-learning environments, teachers found they were more able to cater to the differences of different students than previously attempted in the conventional classroom.

Jianming Yong<sup>[5]</sup> proposed a new method to design an efficient Internet-based e-learning platform by combining an Internet-based e-learning environment with the Internet-based workflow mechanism in University of Southern Queensland, Australia. The whole system can be divided into four parts, Teaching Workflow System (T), Learning Workflow System (L), Admin Workflow System (A), Infrastructure Workflow System (I). Mirko Cesarini<sup>[6]</sup> has described a platform designed on the power of process management abstractions provided by WFMS. When teachers set a course, they can benefit of the flexibility, expressiveness and control capabilities. At the same time a student, having its learning process driven by a workflow designed by a teacher, earns the possibility to customize her/his learning path while maintaining it within the bounds of practicability and usefulness. Teachers' effort in creating courses for the new platform is eased by some visual tools and by improving reusability. Every created course can be a topic of another course. A new visual designed course is translated into workflow code through intermediate representation levels. These levels allow a teacher to customize the course for different situations by explicitly cutting some branches in the resulting learning paths. The use of an orchestration engine allows enrich a course not only with static learning material but also with the services provided by third programs or institutions.

Fox on Trinidad (2006)<sup>[7]</sup> developed a structural framework to assist educationalists implementing e-learning or as they refer to "technology-enhanced learning". This framework is based on the work of Herrington (2001)<sup>[8]</sup> and describes three components of

importance when developing new resources and providing professional development for staff. These components are resources, pedagogies and delivery strategies. The resources are the learning content and forms of information that are provided to the learner. These resources are best provided as a variety of forms, which need not be all online. Pedagogies are the activities used to engage the learner. This underpins the manner in which the environment is structured and should include opportunities for people with disabilities learner to construct their own meaning through collaboration and a learner-centred environment. The delivery strategies element refers to the reliability and accessibility to the e-learning environment. The ability to design inclusively for learners who may be geographically located from the teacher is critical to this component (Oliver & Herrington, 2001) <sup>[9]</sup>.

Since 1999, the Chinese Ministry of Education has authorized 67 ordinary universities and the central committee Radio and Television University does the modern distance learning pilot work, allows them to develop the certificate and non-certificate education. Related resources are available at the site <http://www.ceta.edu.cn/Plone/resource>.

### 1.2.3.2 E-learning in the HEFD

The advantages of the online learning have been widely described in the literature. However, the prospect promised with the digital era has not become the reality for most people with disabilities, especially in educational context. Some studies of the statistical accesses of e-learning web pages of the major organizations have revealed a high percentage of inaccessible pages. A large number of organizations have realized the importance of the services for people with disabilities.

A survey on e-learning for disabled people is been make by Electronic Training Village (ETV) (<http://www.trainingvillage.gr>). In the survey over 320 respondents across Europe gave their views about accessibility to e-learning for people with disabilities. Over one fifth of disabled e-learners require voice or speech recognition software to communicate with computers. Half the respondents thought e-learning would offer users with disabilities more opportunities to learn. 54.8% expected it to open up new and innovative opportunities. From the survey it appears that most people still believe modern e-learning involves merely reading off a screen. In fact e-learning technology has now evolved into a set of interactive multimedia applications.

The Web Accessibility Initiative of W3C has presented the Web Content Accessibility Guidelines and its current version is 2.0 (WCAG2.0). WCAG 2.0 covers a wide range of recommendations for making Web content more accessible. Publicly Available Specification (PAS) 78 has been developed by the Disability Rights Commission (DRC) in collaboration with BSI. This PAS outlines good practice in commissioning websites that are accessible to and usable by disabled people.

Besides, various actions have been taken to help disabled persons attain the e-learning education they deserve. In European Union, the "European Network for Visually Impaired Training, Education and Research" has worked a lot including the completed and actual projects, the following are the detailed.

- MEBUS/Let's Vitalize (1998-2000)  
Developing a training course for IT trainer to educate ViP.
- MARQUISA/UMBRELLA (1998-2000)

- Developing a training course long term unemployed ViP.
  - EVASA (2000-2002)
    - Developing a training course long term unemployed ViP with low qualification
  - PROBAT I-III (2000-2003)
    - Developing a helpdesk software for Microsoft Office optimized for blind computer-user.
  - PROBIQ (2000-2003)
    - Developing a BORLAND 5.0 C++ training course for ViP
  - SOBES (2003-2005)
    - Developing interactive & case-sensitive diagnosis software to analyze the optimal computer setup for computer users with visual handicaps
  - E-Learn-ViP (2005-2006)
    - Evaluation of available E-Learning products for ViP.
  - PROVIPTRAIN (2004-2006)
    - Developing a modular training course for trainer in institutes for ViP.
  - PROZESS (2006-2007)
    - Self diagnosis software for eye test considering computer setup and driving licence
  - PRIAMOS (2006-2007)
    - Pilot project for empowering people with low vision to achieve a driving licence by using Bioptics and technical driving assistance systems
  - SEE-ViP (2005-2007)
    - An E-Learning project aimed to develop an accessible LMS and CBT. Creating blended learning courses for the subjects English and Information Management.
  - ValorViP (2007.1-2007.2)
    - Evaluation of EC funded project for the target group of visually impaired people.
  - DICOMP-S.NET (2007.1-2008.6)
    - Developing a free screenreader.
  - Discovering Hands (R) (2006.8-2008.7)
    - Education of blind women as doctors assistant in palpation diagnostics.
  - AHVIIT-ACCESS (2006.10 - 2008.9)
    - Developing innovative audio-tactile learning materials
  - eYES (2006-2008)
    - Creation of an e-learning interface for the blind and the visually impaired
  - KnowProViP(2007.10-2009.9)
    - Developing a Knowledge Management and training system for trainers who educate:
      - visually impaired
      - and elderly people
      - immigrants
  - E-COVIP (2006.10-2008.9)
    - Developing a network and certified blended learning course for E-Learning Coaches for visually impaired people
    - Developing a network and certified blended learning course for E-Learning Coaches for visually impaired people
- Apart from the above, Margaret E.S <sup>[10]</sup> describes a case study undertaken by the University of Dundee at its library in 2006-2007 in which an e-learning module was developed to support library staff training in disability awareness. Jane Seale published a book named "E-learning and Disability in Higher Education" <sup>[11]</sup>. Examining the social, educational and

political background behind making e-learning accessible in higher and further education, this book considers the role of, and provides advice for, the key stake-holders involved in e-learning provision: lecturers, learning technologists, student support services, staff developers and senior managers. M.Arrigo[12] introduces an online learning environment designed for blind students based on the client-server model. F. Colace, et. al.<sup>[13]</sup> presented a standardized design approach to e-learning contents for people with disabilities based on the use of accessibility and usability guidelines.

In America, 54 million Americans with disabilities use information technology (IT) at colleges and universities, which accounts for 20 percent of the population. So there starts a movement on many college campuses to become more proactive in using e-Learning as a strategic tool for students with disabilities.

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### **1.3 Technology of information accessibility**

#### **1.3.1 Solutions to information accessibility**

Accessibility is initially used in the environment construction referred to that the surrounding environment is accessible to all kinds of people with disabilities to live, study and work. Then it is introduced into the field of information science and technology which generates the concept of information accessibility. Information accessibility refers to that any one (whether disabled or not, whether young or not) at any circumstance can equally, conveniently, access and make use of information. Information accessibility including two main areas, one is the accessible design of the hardware and software related to the electronic and information technology and its assisted products and techniques, and the other is the network accessibility which included the accessibility of web site content, web application, etc.. In this chapter we will pay much attention to the accessibility with the help of computer technology especially the network technology.

Most people today can hardly imagine life without the internet. It provides access to news, email, shopping, and entertainment, at any hour of the day or night. But these are all based on the facts that you can use a mouse and see the screen and hear the audio – in other words, if you don't have a disability of any kind. So the solution to information accessibility is to do everything to make all people with various kinds of disabilities can easily access the web. And it can be concluded into the category of web accessibility.

Web accessibility<sup>[1]</sup> refers to the practice of making websites usable by people of all abilities and disabilities. When sites are correctly designed, developed and edited, all users can have equal access to information and functionality. For example, when a site is coded with semantically meaningful HTML, with textual equivalents provided for images and with links named meaningfully, this helps blind users using text-to-speech software and/or text-to-Braille hardware. When text and images are large and/or enlargeable, it is easier for users with poor sight to read and understand the content. When links are underlined (or otherwise differentiated) as well as colored, this ensures that color blind users will be able to notice them. When clickable links and areas are large, this helps users who cannot control a mouse with precision. When pages are coded so that users can navigate by means of the keyboard alone, or a single switch access device alone, this helps users who cannot use a mouse or even a standard keyboard. When videos are closed captioned or a sign language

version is available, deaf and hearing impaired users can understand the video. When flashing effect is avoided or made optional, users who are prone to seizure are not put at risk. And when content is written in plain language and illustrated with instructional diagrams and animations, users with dyslexia and learning difficulties are better able to understand the content. When sites are correctly built and maintained, all of these users can be accommodated while not impacting on the usability of the site for non-disabled users.

The needs that Web accessibility aims to address include:

- i. **Visually impaired:** Visual impairments including blindness, various common types of low vision and poor eyesight, various types of color blindness;
- ii. **Motor/Mobility:** e.g. difficulty or inability to use the hands, including tremors, muscle slowness, loss of fine muscle control, etc., due to conditions such as Parkinson's Disease, muscular dystrophy, cerebral palsy, stroke;
- iii. **Hearing impaired:** Deafness or hearing impairments, including individuals who are have difficulties in hearing;
- iv. **Seizures:** Photo epileptic seizures caused by visual strobe or flashing effects.
- v. **Cognitive/Intellectual impaired:** Developmental disabilities, learning disabilities (dyslexia, dyscalculia, etc.), and cognitive disabilities of various origins, affecting memory, attention, developmental "maturity," problem-solving and logic skills, etc.

Individuals living with a disability use assistive technologies such as the following to enable and assist web browsing:

- i. Screen reader software, which can read out, using synthesized speech, either selected elements of what is being displayed on the monitor (helpful for users with reading or learning difficulties), or which can read out everything that appears on the computer (used by blind and vision impaired users).
- ii. Braille terminals, consisting of a Refreshable Braille display which renders text as Braille characters (usually by means of raising pegs through holes in a flat surface) and either a QWERTY or Braille keyboard.
- iii. Screen magnification software which enlarges what is displayed on the computer monitor, making it easier to read for vision impaired users.
- iv. Speech recognition software that can accept spoken commands to the computer, or turn dictation into grammatically correct text - useful for those who have difficulty using a mouse or a keyboard.
- v. Keyboard overlays, which can make typing easier and more accurate for those who have motor control difficulties.

### 1.3.2 International developing process of information accessibility

Every region in the world has experienced over 100 percent growth in Internet usage in the last five years according to the table of World Internet Usage and Population Statistics provided by Internetworldstats.com. With the Internet becoming a more important part of society throughout the world, many countries are recognizing and acting upon the need to ensure access to the web for people with disabilities.

It seems as if each nation is taking a slightly different approach to the problem of Internet access for people with disabilities. Some have established laws that provide human or civil rights. Others, like the United States, have addressed the access issue through the technology procurement process. One fairly common approach throughout the world is for

nations to support and adopt the Web accessibility guidelines (WCAG 2.0) created by the Web Accessibility Initiative (WAI).

In 1998 the US Congress amended the Rehabilitation Act to require Federal agencies to make their electronic and information technology accessible to people with disabilities. Section 508<sup>[2]</sup> was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law is applied to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508, agencies must give disabled employees and members of the public access to information that is comparable to the access available to others.

Summary of Section 508 technical standards :

- i. **Software Applications and Operating Systems:** include usability for people that are visually impaired, such as alternative keyboard navigation.
- ii. **Web-based Intranet and Internet Information and Applications:** assure accessibility to web page graphics by the visually impaired using assistive technology such as screen readers and refreshable Braille displays. This is accomplished by using text labels and descriptors for graphics.
- iii. **Telecommunications Products:** address accessibility for people who are deaf or hard of hearing. This includes technology compatibility with hearing aids, assistive listening devices, and TTYs.
- iv. **Videos or Multimedia Products:** include requirements for captioning of multimedia products such as training or informational multimedia productions. Captioning or video descriptors must be able to be turned on or off.
- v. **Self Contained, Closed Products:** product with embedded software, such as information kiosks, copiers, and fax machines, cannot be used with assistive technology. This standard requires that access features be built into these systems.
- vi. **Desktop and Portable Computers:** discuss accessibility related to mechanically operated controls such as keyboards and touch screens.

**The Disability Discrimination Act 1995** (c.13) (DDA 1995)<sup>[3]</sup> is an Act of the Parliament of the United Kingdom which makes it unlawful to discriminate against people in respect of their disabilities in relation to employment, the provision of goods and services, education and transport. It is a civil rights law. Other countries use constitutional, social rights or criminal law to make similar provisions. The Equality and Human Rights Commission provides support for people with disabilities Act. Equivalent legislation exists in Northern Ireland, which is enforced by the Northern Ireland Equality Commission. In 2001, the United Kingdom passed the special education regulations of disabilities, requiring all educational institutions and education-related services necessary to anticipate on people with disabilities in the educational services required. For example, while organizations do not have the visually impaired access to services, but they have required the agency to provide services immediately when necessary.

Some internal companies involved into the area of information accessibility at a very long time ago. For example, IBM began hiring the employees with disabilities in 1914.

IBM has eight research centers all over the world, the IBM global accessibility center "IBM Ability and Accessibility Center" is linked under the rank of IBM's research centers. The essential mission is to collect the best and the most advanced technology from the 8 centers to serve the R&D of accessibility. Up to date, IBM has established information accessibility

centers in America, Japan, German, France and Australia.

Microsoft introduced two ways to support the technology of information accessibility. One is to adding accessibility performance to the popular products. Such as pre-setting some APIs to extend the products' existing practicabilities, some accessible products are developed for the people with disabilities. In addition, Microsoft has associated with more than 100 companies for the accessibility on the products R&D and manufacturing, so that its windows and other products can provide better services for all people. In Chinese, Microsoft has been a partner of China Braille Press on promoting application of information technology for the blind. On Microsoft's website, there are accessibility information technologies pages providing mass free resources for the developers.

### **1.3.3 Design criterion for network recourse accessibility**

The World Wide Web Consortium (W3C)<sup>[4]</sup> is an international consortium where member organizations, a full-time staff, and the public work together to develop Web standards and guidelines designed to ensure long-term growth for the Web. Over 400 organizations are members of the consortium. W3C is jointly run by the MIT Computer Science and Artificial Intelligence Laboratory (MIT CSAIL) in the USA, the European Research Consortium for Informatics and Mathematics (ERCIM) headquartered in France and Keio University in Japan, and has seventeen outreach offices worldwide.

W3C's Web Accessibility Initiative (WAI)<sup>[5]</sup> works with organizations around world to make the web more accessible for people with disabilities and older users. WAI pursues web accessibility by ensuring that web technologies support accessibility; developing guidelines for Web content, browsers and media players, and authoring tools; developing resources to support improved evaluation tools; developing resources for education outreach; and coordinating with research and development efforts that can affect future accessibility of the Web. WAI is supported in part by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR), European Commission's Information Society Technologies Programmed, HP, IBM, Microsoft Corporation, SAP, and Wells Fargo.

On 11th December 2008 W3C announces a new standard that will help Web designers and developers to create sites that better meet the needs of users with disabilities and older users. Drawing on extensive experience and community feedback, the Web Content Accessibility Guidelines (WCAG) 2.0<sup>[6]</sup> improve upon W3C's groundbreaking initial standard for accessible web content.

This new standard from the WAI will advance accessibility across the full range of Web content (such as text, images, audio, and video) and Web applications. WCAG 2.0 can be more precisely tested, yet it allows Web developers more flexibility and potential for innovation. Together with supporting technical and educational materials, WCAG 2.0 is easier to understand and use.

Web Content Accessibility Guidelines (WCAG) 2.0 defines how to make Web content more accessible to people with disabilities. Accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. Although these guidelines cover a wide range of issues, they are not able to address the needs of people with all types, degrees, and combinations of disability. These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general.



WCAG 2.0 is developed through the W3C process in cooperation with individuals and organizations around the world, with a goal of providing a shared standard for Web content accessibility that meets the needs of individuals, organizations, and governments internationally. WCAG 2.0 builds on WCAG 1.0 [WCAG10] and is designed to apply broadly to different Web technologies now and in the future, and to be testable with a combination of automated testing and human evaluation.

The individuals and organizations that use WCAG vary widely and include Web designers and developers, policy makers, purchasing agents, teachers, and students. In order to meet the varying needs of this audience, several layers of guidance are provided including overall *principles*, *general guidelines*, *testable success criteria* and a rich collection of *sufficient techniques*, *advisory techniques*, and *documented common failures* with examples, resource links and code.

The WCAG is of the most effect all over the world. And many other standards made by many countries have made references to it. The Disabilities' Right Committee and the British Institute of Standard have set down a criterion about the web accessibility and the government has introduced it into the technology standard for governmental stock. In Jun 2004, Japan Industry Standard Association released JISX 8341. In its third section, accessible demands on web service are regulated according to the WCAG.

### 1.3.4 Some cases of information accessibility

- **Kyoto City Web**

**The challenge:** Leverage the Internet to increase tourism in Kyoto City, a large, culture-rich metropolis in Japan. Help make sure that the Kyoto City Web site is more accessible to all people regardless of ability or disability. Include both foreign language support and text-to-speech functionality for Japanese, English, Korean and Chinese.

**The solution:** IBM Easy Web Browsing technology is being offered, at no charge to end users, on the Kyoto City Web site, to allow users who have low vision to enlarge text or read text aloud.

**The benefit:** follows the direction and "Grand Vision" of Kyoto for the 21st Century. Helped establish an accessible Web site that is attracting the global community. Increased traffic on the Web site.

1) Kyoto City government uses Easy Web Browsing as part of its 'Grand Vision' for 21st Century :

Seeking to create a direction for civic life and city development, the Kyoto City government devised a "Grand Vision" for the 21st Century. In 1978, the city made a declaration to the world that Kyoto would be "a city open to the free exchange of world cultures." As part of the plan to achieve this ideal, Kyoto formulated "The Master Concept of Kyoto City" in 1983 with the aim of meeting many of its goals by the year 2000. This Master Concept asserts that the city will keep developing, but at the same time preserve its tradition. From Kyoto City Web site: (see Figure 1)



Fig. 1. Kyoto City Web site home

"To attract the world's cultures, Kyoto City created a Web site that allowed all people, regardless of their abilities or native language, to be able to access information. The Web site is available in four languages, and uses IBM Easy Web Browsing technology to enlarge text and read it aloud. The technology is very easy to use and is offered free to the user. Senior citizens, who often have vision difficulties such as low vision or cataracts, can now access all the information on the Kyoto City Web site through enlarged text or as a "screen reader." The screen size can be customized from 50% to 600%. It also enables the user to change the color of the Web site background to help those with color blindness and other color-related vision impairments. For children and non-Kyoto natives, the IBM Easy Web Browsing "reading aloud" function helps increase comprehension. Offering this enhanced communications functionality as part of its Web site increases the user's comfort level with technology – even for novice users."

## 2) Vision for the future of Kyoto City

In the coming years, government agencies, local municipalities and private companies will plan how to prepare their Web content in various languages – such as English, Hangul and Chinese – in order to enhance global information transmission. They can use the Kyoto City Web site as the model. By adopting the multilingual text-to-speech technology from IBM, Easy Web Browsing can be used to help those agencies address the needs of their constituents.

### 1.3.5 References :

- 1、 <http://en.wikipedia.org/wiki>
- 2、 [http://usability.gov/web\\_508/tut-b.html](http://usability.gov/web_508/tut-b.html)
- 3、 [http://www.york.ac.uk/admin/hr/resources/policy/disability\\_dda\\_1995.htm](http://www.york.ac.uk/admin/hr/resources/policy/disability_dda_1995.htm)
- 4、 <http://www.w3.org/>
- 5、 <http://www.webaim.org/>
- 6、 <http://www.w3.org/TR/WCAG20/>
- 7、 <http://www-03.ibm.com/able/index.html>

## 1.4 Higher education grid for disabled

### 1.4.1 Grid and education

Grid is the forefront technology in the field of IT and Internet. It is considered the most significant breakthrough at computer architecture, operating system, user interface since 1995 to 2010. It integrates the whole Internet into one huge super computer and will keep it to share the resources of compute, storage, data, information, knowledge, expert, etc. There is no fixed definition for grid but the following features:

- Distribution and Resource Sharing
- High degree of abstraction
- Self-similarity
- Dynamic nature and diversity
- Autonomy and the multiple of management

The classified method of grid can be various. According to the type of managed resources, grid can be categorized into compute grid, data grid, information grid, service grid, knowledge grid, semantic grid, etc. Applying the grid to education to provide all kinds of educational resource becomes the education grid. Here, the educational resources include the course ware and very type of media materiel as well as the computing ability, storage space, databases, sensors and demote devices.

China Education and Research Grid (ChinaGrid[1]) is an important project of the fifteenth national "211 project" and is responsible by Chinese Ministry of Education. Up to now[2], it has integrated a large number of grid resources of 20 famous universities from 13 provinces and cities, the computing power of polymerization is more than 16 trillion times per second, the storage capacity is more than 170 TB, it has become one of the world's largest super grid. Five application grid have been developed successfully on the bioinformatics, image processing, computational fluid dynamics, mass information processing and online university courses.

There are more than 120 types of bioinformatics software tools, 30 kinds of services related to database, about 100,000 medical images, 10,000 pieces of diagnostic data. Chinagrid supports the typical grid application such as the optimized design of digitized virtual man and aircraft, integrates digital museum resources of 18 universities, provides more than 300 college courses and approximately 3,500 hours course videos. It can provide many grid services such as the video-on-demand education system through the 22 servers distributed in 17 cities.

The Kerala Education Grid Project is a path-breaking initiative of the Kerala government to provide quality education to all the students pursuing higher studies in the state. The project vision is to provide quality education to all, independent of geography. The project aims to facilitate multiple independent course-specific collaborative information and knowledge networks across distributed servers over the Internet as well as affordable and pedagogically effective online assisting learning environment for the colleges in any subject. American Education Grid Portal[3] is provided as a platform for the educational community to support generation and sharing of education resources across the different institutions, universities and colleges of higher education. The portal is also intended to facilitate collaboration, sharing of knowledge, best practices and co-operation to improve the quality of education offered in the colleges and in the open learning mode. In many ways, Education Grid is complementary to the National Program on Technology Enhanced Learning that is being executed by the IITs and IISc to develop content in large number of courses for engineering colleges. It provides development and deployment of systems and processes that use NPTEL and other open content for conducting quality education in the colleges.

## **1.4.2 Grid resources for special education**

### **1.4.2.1 The status of higher special education**

The higher special education in China began in the medium 80s in 20<sup>th</sup> century. From 1985, limb-impaired students have been recruited by Shandong Binzhou medicine college. In 1987, the special education school of Changchun University was established and became the first higher special education academy in China. Till now, there are more than 10 high schools recruits the various disabilities.

There are four manners exist present, such as establishing special education academy or setting the corresponding department and major in common colleges, let the people with disabilities study together with the healthy students, setting up some junior colleges to recruit people with disabilities and is managed by the cooperation of independent vocational school and adult education college, and all other regular and irregular network education forms [4].

The prevalent computer & network technology has penetrated into the high special education colleges to assist the teaching and researching and many relevant works have been reported. In the teaching application of network technology in higher special educational colleges, study on how to exert the function of multimedia and how to make full use of the advantages that network resources made to teaching is worth to investigate. Studies show that information technologies have laid out obvious advantages at the compensating the dumps for their physiology limitation and increasing the interests in study.

British Staffordshire University began the development of virtual learning system COSE in 1996 and now the third version is come into birth. In 2001, an e-learning junior college was held in Shenzhen Radio & Television University that is serviced to the people with disabilities and is aroused strong reverberation. It shows that modern distance education model is the efficient method to make the disabilities get the equality education and obtain employment. Subsequently the education academy for disabled people of central Radio &

TV University is established. But the e-learning study on the high special education in high school is of no reports.

According to the result of the second countrywide disabilities sampling investigation, the total number of disabled people in China is 8296 and it takes the portion of 6.34% to the national total. Throughout the country there are only more than 10 colleges that recruit disabled students. Under the whole background of constructing socialism harmonious society, it is of most important to resolve the equality education for the disabled. Engaging in the study of special education e-learning system in common colleges can benefit to the development of our national special education and also can make more people with disabilities obtain higher education.

#### **1.4.2.2 Implementation of e-learning system for higher special education based on grid**

Distance education is one of the most important aspects of informationization education. It can enable the special needs group breakthrough the limitation of traditional teaching mode and obtain high-quality education. It's well known that the distance education system is of a distributed circumstance in which the men and men, men and computer can share the information independent of the time and space limits. As the third generation network technology, grid can provide better platform for resources sharing. Grid is a new technology based on the internet and meanwhile integrates the whole internet into a vast super computer to realize the comprehensive sharing of computer resources, data resources, information resources, knowledge resources and expert resources. Resource sharing is the most importance feature of grid and it can efficiently manage and schedule the processor time, memory, network and storage. International grid technology develops quickly and the distance education research reports based on grid are familiar, such as the Birmingham Grid for Learning, the education grid of Washington University, etc. Although they are not specialized for the special education, they provide some convenience offers to the people with disabilities and all kinds of users to meet their needs in it. By contraries, the research on high education service based on grid in Mandarin China is appeared lately. But several institutes and colleges have taken their work into different degree. The work of Beijing Jiaotong University, Zhejiang University of technology, Guangzhou University, etc. are reported. China-grid plan also includes the relevant content about distance education. By reading through all the available literature, a conclusion can be drawn that there is no instance of study on e-learning system for higher special education based on grid in colleges.

#### **1.4.3 A case study on special higher education grid**

In this section we will introduce the layout of e-learning teaching resources for higher special education worked by our group. It expands the application fields of grid and meanwhile wishes that the more convenience network study circumstances is offered to more and more people with disabilities.

##### **1.4.3.1 Grid structure**

The main purpose of the proposed grid is to establish a distributed and massive education resource library, offer a set of resource sharing and storage management mechanisms by which users can conveniently and quickly access network information anytime and

anywhere. Because of that the service objects is the special needs group, a special dealing is necessary to the preparation of educational resources and the offered services also has its special feature. The structure of the proposed system is shown in fig. 2.

Education resource servers distributed in different regions will continue to input the corresponding information into the e-learning grid included network courseware, video on demand (VOD), assistant study information and assistant supports. User can capture all kinds of information service by distance logging in and upload or storage some resources to share with other users. The physical position and topological structure of the whole network are transparent to all users. So users do not need to know that where the coursewares were stored. The relevant work is done by grid middleware. In this system, high reliable service can be obtained as far as there is one grid node in work.

The assist support module at the server end will offer the client downloading and video format transferring function. All the resources provided by the grid will suite to all persons including the visual impairments. So the downloaded client will offer text-to-speech function. Network courseware and VOD files can be played online or in local machine. The function of video format transferring is equipped in any grid node. Storing format

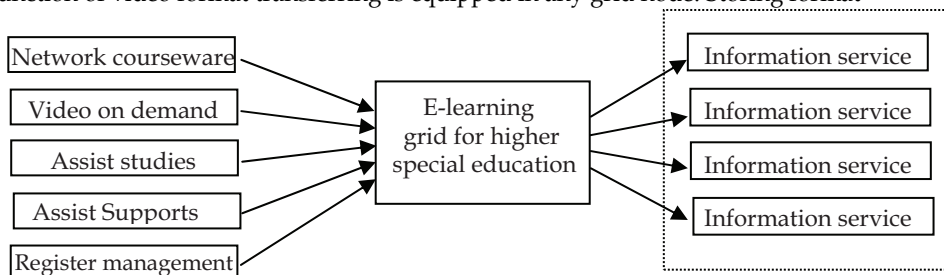


Fig. 2. Structure of e-learning grid for higher special education

transferring makes that the downloaded video can be played in computer, mp3 and even portable cellular phone. Register management is accomplished by main grid node and it includes the log in for node user and member user. Two kinds of users can share the grid service. Besides, the node user can storage its private resources or offer some service and the member users can give its own resource storage in the grid and share it with all the other users.

#### 1.4.3.2 Grid components and its access model

Three components exist in the grid, they are grid client, grid manager and grid node. There is an integrative web server at grid client but it can only send the requirement to the grid manager. In the grid node, Java technology is adopted to deal with the requirements came from client or grid manager. Grid manager is responsible to the whole grid management. It not only deals with the web requirement but also the grid database.

Grid client can directly access the grid node to obtain various services. This scheme is useful to keep the load balance. See fig. 3 for the access model.

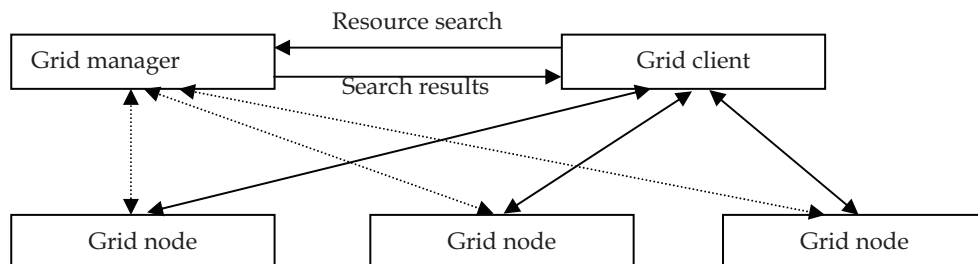


Fig. 3. Access model of e-learning grid for higher special education

From the above fig. we can see that the first role of the grid is resource storage. Both the grid node and client can submit its own teaching resource to the grid and the grid manager decides which node will be used. During the operation, the requirement is first transferred from grid node or client to grid manager, then the manager searches the management database to confirm which node can offer the service according to the requirement and then sends the result (including the node ID) to the required node or client. When the required end got the responds information it can directly get connection with the grid node signed by node ID. The second role of this grid is to offer information service. When the service requirement is sent to the grid manager from client, the grid manager also searches the inner information to find the grid nodes which can meet the needs and then send all the available nodes' IDs to client. The client can select one node, but the default setting is to connect with the first node of the nodes list. Grid manager in this access model is the kernel of the whole grid system. So we take a special server as the grid manager and its service management function is baked up in the main node. The grid manager responds to the client's requirements regularly and once the exception occurred, the main grid node takes the place of grid manager immediately. As for the important or the unique resources of the grid, it always is stored a copy on server or other nodes. The grid system can be regularly run as long as one node is in work.

The data storages at the grid manager include:

- (1)Node user information table: userID, userName, password, realName, address, nodeParameter.
- (2)Member user information table: userID, user-Name, password, realName, address, memberLevel.
- (3)Resource information table: ResourceID, cap-tion, metadata, nodeIDs.

Among the resource information table, "Resource-ID" is used to sign every teaching resource. It is confirmed when the resource is registered or uploaded. "caption" signs the resource name and "metadata" refers to the feature parameters of the resource such as the size, storage format, knowledge-point, content introduction, etc. "nodeIDs" shows the nodes' IDs that storage the resource.

#### 1.4.3.3 Design of grid resource library

The particularity of the service object determines the particularity of resource library in the proposed e-learning grid. Every teaching resource in the grid can be lies in both the video and audio media. Such as the network courseware is played as video by default and its service objects are deaf-and-dumb students. Before playing these kinds of resources user can

make selection whether needs the speech support. On the contrary, video on demand resources will be played by default for visual impairments. So before playing user can make selection that whether needs the text-caption support. The resource storage names is the integrated identifier which is composed of resource ID, course identifier, resource type, knowledge point. Each part is separated by "-". Resource ID is the unique and uniform code of all resources and is consists of year (4bits), month (2bits), day (2bits) and an order number (3bit). Course identifier implies the course name and it is expressed by the first spelling letter of Chinese word. Resource type refers to the network courseware or VOD media, etc. In this system is coded by two bits number such as 01. Knowledge point is also expressed by the first spelling letter of Chinese content. For example, if the resource code is 20060122001-jsjwhjc-01-gaishu, it means that the resource is a network courseware for computer basic knowledge (in Chinese is : ji suan ji wen hua ji chu), the knowledge point is summarize (in Chinese is: gai shu) and it is the first resource submitted on January the 22nd in 2006. The system resource list will be shown to the user when the client access grid server. The total meaning of the resource code can benefit to both the user and the management people.

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- [2] [http://news.xinhuanet.com/newmedia/2006-07/25/content\\_4875147.htm](http://news.xinhuanet.com/newmedia/2006-07/25/content_4875147.htm)
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## **E-learning Experiences and Future**

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This book is consisting of 24 chapters which are focusing on the basic and applied research regarding e-learning systems. Authors made efforts to provide theoretical as well as practical approaches to solve open problems through their elite research work. This book increases knowledge in the following topics such as e-learning, e-Government, Data mining in e-learning based systems, LMS systems, security in e-learning based systems, surveys regarding teachers to use e-learning systems, analysis of intelligent agents using e-learning, assessment methods for e-learning and barriers to use of effective e-learning systems in education. Basically this book is an open platform for creative discussion for future e-learning based systems which are essential to understand for the students, researchers, academic personals and industry related people to enhance their capabilities to capture new ideas and provides valuable solution to an international community.

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