A Model of Accessibility Services Provision for Students with Disabilities in Higher Education

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Abstract

The number of universities offering services for students with disabilities has grown considerably over the last decade worldwide. Nevertheless, not all students with a disability receive adequate level of support, even in the same country. Providing effective academic services for students with disabilities demands among others thorough planning, appropriate organizational scheme, human resources with specific expertise, advanced technological support, considerable implementation effort and functional evaluation. This paper presents a model of accessibility service provision for students with disabilities in higher education. The development of the model is based on the analysis of the requirements of students with disabilities. The methodological designing of the services critically takes into account both Design for All and Individual Accommodation approaches. We emphasise the important role of advanced ICT systems for the effective service organization, management and provision and we describe the necessary specific applications. The involvement of public (environmental modifications e.g. in the libraries, student laboratories, infokiosks, etc.) as well as personal Computer Assistive Technologies is also presented. The services for the students with disabilities discussed in the paper include: recording of the needs of the students, evaluation of students' abilities, provision of Personal Assistive Technologies, accessibility of structure environment, transportation, psychological cancelling, provision of accessible text books and other educational content, training of the staff and the volunteers, developing of guidelines (e.g. for tests and examinations, for producing accessible educational content), accessible workstations in libraries and labs, evaluation of websites' accessibly, structural arrange of volunteer work for helping the disabled students, Video Relay Service and Sign Language Interpretation for deaf students, organizing seminars and meetings, dissemination of accessibility know-how (website, leaflets, posters, booklets). The organizational structure (at university, faculty and department levels for both the academic staff and the other employees), the involvement of disable students in the decisions along with legislative, financial and standardisation issues are also discussed. The application of the above model over the past few years in the University of Athens, the largest higher education institution in Greece, will be also presented.

1 Introduction

The number of universities offering services for students with disabilities has grown considerably over the last decade worldwide. Nevertheless, not all students with a disability receive adequate and equal level of support across countries or even nationwide. Providing effective academic services for students with disabilities demands among others thorough planning, appropriate organizational scheme, human resources with specific expertise, advanced technological support, considerable implementation effort and functional evaluation. In this domain there are only some very basic original metaphors, theories and models that have been developed to describe, explain, and develop good practices [Killean & Hubka, 1999], [Banes & Seale, 2002], [Embry et al, 2005], [Seale, 2006], [Boguz & Buxzynski, 2009], [Kiss-Glavas & Zubak 2009]. This paper presents a model of accessibility services provision for students with disabilities in higher education. The methodological designing of the services takes into account both the "Design for All" and the "Individual Accommodation" approaches. We emphasize the important role of advanced Information and Communication Technologies (ICT) for the effective service organization, management, and provision and we describe the necessary specific applications. The involvement of public environmental modifications (e.g., in the libraries, student laboratories, etc.) as well as personal Computer Assistive Technologies is also discussed. The proposed model has been successfully applied over the past years for the design and implementation of the Accessibility Unit for Students with Disabilities in the University of Athens, the largest higher education institution in Hellas.

2 Accessibility Services' Model

The basic requirements of the students with disabilities include:
  – access to interpersonal communication with the members of the academic community,
  – access to the structured environment of the university,
  – access to the printed or electronic educational material,
  – access to the board and the presentations in the classrooms,
  – access to the exams/tests, and
  – access to the information and the WWW content.

The proposed accessibility services provision model follows a student-oriented approach. It is based on the requirements' analysis of the students with disabilities during their studies. Moreover, this model influences their academic environment and the accessibility policy inside and outside the educational institution. The main pillar of this model is the "Accessibility Unit" which provides a number of supportive services, arranged in a three-tier architecture according to their "proximity" to the student: (i) accessibility services addressed directly to the student, (ii) accessibility services applied to the student's environment, and (iii) accessibility promoting services. Figure 1 presents a general overview of these logical layers (tiers) of the model, along with their services that are described in the next sections.
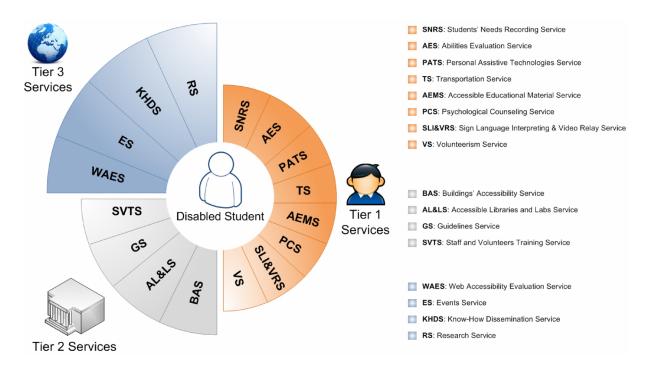
Figure 1. Accessibility services provision model architecture for students with disabilities.

2.1 *Accessibility Services Addressed Directly to the Student (Tier 1)*

Services included in the first tier are directly dealing with specific requirements of disabled students. They have an immediate impact in a number of their activities, namely:

- participation in the educational process,
- interpersonal communication with the fellow students, the professors, and the university staff,
- transportation and housing accommodation, and
- interaction with their academic environment (e.g. libraries, labs).

2.1.1   Students' Needs Recording Service (SNRS)

The first contact of the disabled student with the Accessibility Unit is made through the Students' Needs Recording Service (SNRS). The service aims at a systematic and detailed registration of the disabled students' needs, and the main obstacles that might arise during their studies. Students are informed about the Accessibility Unit before entering the University through its website or during their registration. They are encouraged to fill out a Students' Needs Recording Form. This form is provided in alternative formats (paper, Braille, auditory, electronic) and can be submitted in various ways (online, email, telephone, fax). The SNRS is available during all the years of studies and can be revisited when students' needs change.

2.1.2   Abilities Evaluation Service (AES)

Trained staff of the Accessibility Unit meets with disabled students, after studying the output of the SNRS, and discuss the possible accommodations that are applicable to each one of them. Together, they conduct individual diagnostic assessments in order to determine main obstacles through the educational process, such as reading printed books, accessing libraries, navigating to university campus, test taking, etc., and figure out ways to accommodate them.

The ultimate goal of the AES is to assign the services each individual student with disabilities needs. This goal is accomplish using the mapping of the student's accessibility needs with the services described in the model (Fig. 1).

2.1.3 Personal Assistive Technologies Service (PATS)

The PATS offers the infrastructure and the appropriate tools needed for testing and assessing a wide variety of Assistive Technologies (AT). Nowadays, computer based AT aim to augment and enhance the capabilities of students with disabilities towards independent and equal academic participation [Parette & Peterson-Karlan, 2010], [Voytecki et al, 2009]. Open Source and freely available AT software partially solve their cost problem and online inventories [Pino et al, 2010] facilitate the search for the appropriate product. The student's needs for AT and the potential efficiency of using a specific AT are evaluated based on the AES output. Personal AT is suggested or offered / donated to the student. Then, one-to-one training, technical support and consulting on AT is provided by the PATS.

2.1.4 Transportation Service (TS)

The Transportation Service provides accommodations on how motor-impaired students come to university from their home and go back. The students have to apply for transportation in the beginning of each semester and each examination period. This service comprises the use of special vehicles (usually vans in an urban environment) that can transport wheelchair users. The personnel of the TS include drivers and dedicated secretary.

2.1.5 Accessible Educational Material Service (AEMS)

The AEMS has the task of converting academic educational material into accessible format, in order to facilitate equity of access to information and knowledge especially for print-disabled students. The production procedure include number of steps: (i) receiving applications for a specific item (e.g., textbook), (ii) contacting publisher or author in order to acquire it (possibly in electronic form), (iii) scanning printed material; (iv) optical character recognition (OCR), (v) correction of the OCR output, (vi) transcribing text in order to conform with accessibility guidelines (e.g., description of figures, scientific formulas in MathML[1], etc.), (vii) securing and distributing accessible material (in various formats such as e-book, Braille ready, and large print). For some disciplines, like Physics, Mathematics, Chemistry, etc., the production of accessible books requires dedicated methodologies [Klaus, 2009], [Federsel & Miesenberger, 2009], [Kouroupetroglou & Kacorri, 2010]. Students can submit their application for accessible transcripts at the beginning of each semester.

2.1.6 Psychological Counseling Service (PCS)

The PCS provides individual and group psychological counseling to students with disabilities. Disabled students may request advice on any of the following difficulties: (i) interpersonal and social relationships (difficulties in relationships with family, the other sex, and friends), (ii) academic difficulties and stress through study and test-taking period, (iii) low self-esteem, (iv) anxiety and phobias, (v) mood and eating disorders, and (vi) whatever makes it harder for them to function in everyday academic life.

2.1.7 Sign Language Interpreting and Video Relay Service (SLI & VRS)

The Accessibility Unit provides both SLI and VRS. Deaf students can ask for a sign language interpreter for a course. SL interpreters can be permanent personnel or outsourced. The VRS service addresses students with total or partial loss of hearing, dysarthria and severe speech disorders and generally those who cannot use the phone for interpersonal communication.

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[1] http://www.w3.org/Math/

This service intends to provide immediate remote interpersonal communication with fellow students, professors and administrative staff of the university.

2.1.8   Volunteerism Service (VS)

A disabled student, who needs assistance on a day-to-day basis, can apply for a volunteer help through the VS. Volunteers, who may be students or persons from the local community, are coordinated by the VS to aid and facilitate disabled students in various activities, such as transportation, mobility, communication, accessible educational material, note-taking, tutoring in courses, tutoring in computer use, and other academic activities.

2.2   Accessibility Services Applied to the Student's Environment (Tier 2)

Services included in the second tier are related to adjustments made on the academic environment that are required to improve accessibility. These services, although not applied directly on the student, have a direct impact on student's participation in the educational process since they deal with physical access on university's facilities, training of volunteers and university staff, developing guidelines, and providing accessible libraries and labs. The student-oriented approach is still applicable in this layer in the sense that a lot of emphasis and priority on the students needs is placed on the implemented services.

2.2.1   Buildings' Accessibility Service (BAS)

The staff of the BAS (such as civil engineer and mechanical engineer) evaluates the physical accessibility of structured environment in the university campus. It inspects buildings and the external structured environment in perspective of accessibility legislation compliance, and monitors construction of new buildings in order to ensure a high level of physical accessibility to students, employees, and visitors. BAS also provides assistance on facility managers with accessibility concerns in their buildings such as placing ramps, elevators, handrails, and accessible toilets, putting specific markers for people with vision loss, low wall payphones and water coolers, and car parking spaces for the disabled.

2.2.2   Accessible Libraries and Labs Service (AL&LS)

The AL&LS provides the specifications, installation and technical support of public workstations in university libraries and labs with AT hardware and software for students with various disabilities. Alternative computer access systems include voice recognition, speech synthesizers, screen readers, screen magnifiers, large displays, Braille translation and embossing, Braille displays, scanning and reading machines, closed circuit television magnification systems, a variety of switches and mounts, screen keyboards, alternate pointing devices, wands and sticks, trackball and joysticks, and a variety of devices to accommodate special seating and positioning needs. Moreover, AL&LS maintains a website that includes all information on the available assistive technologies, user manuals, and tutorials as well as physical access information for libraries and labs.

2.2.3   Guidelines Service (GS)

One of most important services in the second service tier is the GS. It provides guidelines and standardization on procedures and services applied on students with disabilities during their studies, so that all students are treated and assessed fairly through different courses and departments. The activities of the GS include the development of: (i) guidelines for the accommodations in exams or test-taking, including media and proctoring adaptations such as computers with AT, reading and writing assistants, extended time, and alternative testing locations, (ii) guidelines for the production of accessible educational content (e.g. accessible

DOCs, slides or presentations, web pages), and (iii) standards for the services and procedures of the Accessibility Unit.

2.2.4   Staff and Volunteers Training Service (SVTS)

Via the abovementioned services of layers 1 and 2, a student will interact with the Accessibility Unit staff, his/her academic advisor, volunteers, secretaries, and librarians. The accessibility stakeholders' interactions are shown in Figure 2 (The representative Student and Accessibility Committee shown are further explained in section 3.2). It is the Accessibility Unit's responsibility to inform these people about the newly introduced role they have. As part of that responsibility, the SVTS raises general staff's and professors' awareness on disability issues. For example, faculty secretaries who deal with disable students are trained on: how to communicate with them using alternative means, how to provide support to them, the Accessibility Unit's services in order to notify the student in turn, and they are familiarized with the Students' Needs Recording Form. Librarians, on the other hand, are attending special seminars on using and demonstrating the available assistive technologies installed in the libraries. The advisor professor for students with disabilities in each faculty is informed by the SVTS about the course attendance, examination arrangements, and of all the alternative options for the disabled students. Finally, all volunteers involved with the VS, are trained on how to aid the disabled students.
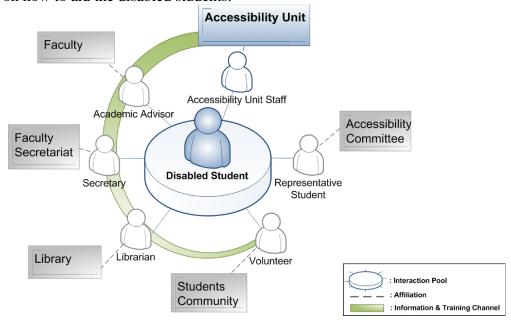

Figure 2. Accessibility stakeholders' interactions.

2.3   Accessibility Promoting Services

The third layer of the proposed model includes services that attempt to disseminate good practices and reach more people in the community. An effort is made to promote accessibility issues within the university community, the educational system, and even to other social groups outside the academic institution. This influence is achieved through a number of activities like web accessibility evaluations, meetings and events, know-how dissemination, and research projects.

2.3.1   Web Accessibility Evaluation Service (WAES)

The WAES provides accessible web page and document templates to the university's web developers and educational content providers. It also helps web developers to analyze and

take the most of accessibility reports and to create accessibility documentation, facilitates AT enhancements and accessibility modifications to university websites, and when requested, conducts web evaluation reports for W3C accessibility compliance on a national level such as e-government services, e-newspapers, libraries websites, etc.

2.3.2   Events Service (SES)

Social and informal events like meetings, galas, press conferences, training camps, etc., are very important for promoting the Accessibility Services Provision Model, the Accessibility Unit and the University itself. Such events help all stakeholders to come together, know each other, interact, and interchange knowledge and views. Moreover, such events disseminate the services and activities to the community, nationwide and internationally.

2.3.3   Know-How Dissemination Service (KHDS)

The KHDS is responsible for organizing or participating in workshops, seminars, and scientific conferences in the domain of accessibility, Information and Computer Technologies, Assistive Technologies and inclusive education. Through this service the Accessibility Unit cooperates with other institutions on training and specialization programs for education. This service also issues leaflets, posters, and other dissemination material, useful to other institutions and organizations or similar Accessibility Units. It also develops and maintains the Accessibility Unit's website presenting its services, the provision model, and the information on the available AT.

2.3.4   Research Service (RS)

The Accessibility Unit and its scientific personnel is leading or participating in research projects related to facilitating equity of access to learning and teaching for students with disabilities. Such projects can extend to various scientific domains such as Web Accessibility, Design for All, Universal Learning, Assistive Technologies, etc.

3   Implementation

The proposed model was applied on the Accessibility Unit of the University of Athens in Hellas. The University of Athens has 98.675 undergraduate students, 2.128 professors, 2.536 employees, and 34 faculties. The Accessibility Unit was officially founded in 2006.

The Unit's mission officially is "*to actively realize coequal access to academic studies for students with different abilities and needs, through environmental modifications, assistive technologies and access services*". The Unit mainly deals with students with deafness, blindness or visual impairment, learning disabilities, such as dyslexia and dyscalculia, students with chronic diseases, those with complex or multiple physical, mental, and emotional disorders, and the motion impaired. As shown in Table 1, over the past four years 288 students have been recorded by the SNRS and 427 by the faculties' secretariats. The merging of these figures, after removing duplicates, is 497 disabled students. Some of them have multiple disabilities, and that is why the sum of the separate disabilities numbers shown in Table 1 is larger than the total numbers of the recorded disabled students. Not all students are recorded, mainly because they don't want to be classified as disabled. The total number of the disabled students is estimated to more than 1.000.

Table 1: Students with disabilities in the University of Athens

Recorded by the Accessibility Unit (2007-2010)	288
Recorded by Faculty Secretariats (2006-2010)	427
Merged	497
Estimated (not all are registered)	>1.000
Blind or low vision	69
Deaf	56
Speech impaired (except from the deaf)	40
Motion impaired	174
Other (+ chronic diseases)	307

The proposed model of Accessibility Services Provision can be extended with Organization and Management schemes, which are presented in the next two sections. The reason that these extensions are included in the implementation section is that an Accessibility Unit organization and management is very tightly dependent on the institution's size and organogram, as well as on governmental policy and legislation environment, which are different between countries. So we present here the organization and management schemes that are suited for the Hellenic context as a good practice, and suggest to accommodate them according to each institution's or country's individual requirements.

3.1 Organization

The University of Athens Accessibility Unit includes four departments, namely, a) Electronic Accessibility (e-access), b) Structured Environment Accessibility, c) Transportation, and d) Psychological Counseling. We mostly focus on the e-access department for three reasons: firstly, we believe that access to computers and electronic information sources like the World Wide Web and digital books is the most important tool for successfully and efficiently study in a higher education institution nowadays, secondly because ICT and AT are the strongest means of overcoming one's disability especially in the educational environment, and thirdly because we head towards computerizing most of the services the Accessibility Unit provides. By "computerizing" we mean the use of innovative service-supportive information systems and computer applications, which we develop in order to facilitate, monitor, speed up, and optimize each service.

Figure 3 presents the "Accessibility Unit" section, the organization described above, and the services as they are distributed to its departments. The permanent personnel that is currently employed in our Accessibility Unit (totally 12 persons) includes: in the e-access department one Electrical Engineer with an MSc in IT and one Computer scientist, both specialized in accessibility, one Digital Document Technician, one Sign Language Interpreter, and one Sociologist for supporting the VS; in the Structured Environment Accessibility department one Civil Engineer and one Mechanical Engineer, both boarded in the University's Technical Services offices for practical reasons; in Transportation department we have 3 drivers (and 2 specially modified Vans) and one secretary; finally, one Clinical Psychologist works in the Psychological Counseling department of the Unit.
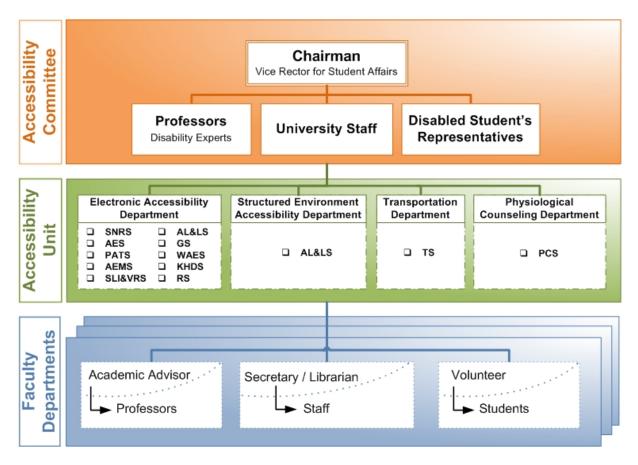
Figure 3. Organization and Management of the University of Athens' Accessibility Unit.

3.2 Management

The Accessibility Unit was founded after a formal decision of the Academic Senate and was introduced in the University's organization chart as an autonomous entity which comes directly under the Vice Rector for Student Affairs. There is also a supervisory Committee for Students with Disabilities, with 10 members, which comprises besides the Vice-Rector, three professors with expertise on Accessible Computing, Special Education, and Psychology respectively, the head of the Students' Club, a representative of the Technical Services of the University and three delegate students appointed by their National Associations of the Disabled, namely one visually impaired, one motion impaired and one hearing impaired student.

4 Future Work

Future plans of the Accessibility Unit of the University of Athens and potential extensions of our model include:
  – The creation of a digital library with accessible transcripts, and its integration with other digital libraries of the same content.
  – Development of a larger accessible educational material production unit, in order to quickly produce all necessary formats (like Braille, DAISY, large prints) and in larger quantities.
  – Funding Assistive Technologies for all the disabled students who need them.

– Electronic archives for disabled students merged with the general student records of the University.
– The creation of an Open Source AT community.
– Participation in new research and development projects.
– Focusing on Global Academic Networking for knowledge dissemination and exchange.

Acknowledgments

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