Accessibility and Inclusion at the Technical University of Lisbon

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ABSTRACT
Activity limitations may be defined as the gap between a person’s performance level and task requirements. The least restrictive environment possible is in general the most accessible one and has an important role on the performance activity level of those persons. On the other hand, new products are introduced into the market everyday, which promote new ways to fulfill a task without taking into account users with disabilities thus creating new accessibility problems causing social exclusion of those persons.

In 2006, three faculties of the Technical University of Lisbon started a joint research project. This project intended to obtain an evaluation and a methodology to promote qualitative change to those terms on the grounds of an analysis of the efficiency of current practices and the experimentation with alternative solutions for physical environment design and learning tools. The design of such a methodology at its dissemination among schools and universities will be a major contribution to reverse current situations, making university attendance more universal and inclusive. This paper presents the final findings of the project.

Keywords: Accessibility; Disability; Ergonomics; Discrimination; Inclusive Design.

1. INTRODUCTION
During the last decade, concerning people with disabilities, accessibility was considered one of the most relevant aspects to achieve social participation and a better quality of life. Accessibility plays also an important role in inclusive schools and work integration. The accessibility achievement is related with ergonomics in services and urban space and with more and better functionality security and comfort.

Limitations faced by People with disabilities performing activities related with the use of school equipment, instruments, materials and limitations to move around usually leads to restrictions to their social participation and to their inclusion in school activities.

The study of social participation restriction imposed by social organization, beliefs and values and other environmental factors like interaction with services terminals and equipment has become progressively more important putting the focus on the external factors and how they contribute to produce barriers instead of facilitators to people with disabilities social participation taking into account their activity limitations.

As environment factors have an important role on the performance level of those people, to study possible solutions to creating the least restrictive environment as possible is then a priority.

In spite of having subscribed documents like the World Program of Action Concerning Disabled People (ONU, 1981) and the Standard Rules on Equalization of Opportunities for Disabled People (ONU, 1996), where is possible to find clear objectives to be achieved in the near future concerning accessibility, Portugal has experienced difficulties to implement them. Those difficulties are expressed in the proposal for the National Plan to Promote Accessibility. With the diagnosis made in
those documents it is possible to observe that Portugal doesn't have enough data to characterize the majority of the situations presented.

2. PROJECT PRESENTATION

Currently society social participation is the main focus of studies on people with disabilities. Their abilities, performance levels, activity limitations and social participation restrictions are the most relevant aspects to be studied. Activity limitations may be defined as the gap between a person performance level and task requirements. The least restrictive environment possible is in general the most accessible one and has an important role on the performance activity level of those persons. The needs of an individual or of a group can be characterized by their ability to do, to decide and to adapt themselves to a certain task taking into account its accessibility.

Accessibility studies need to consider the definition of user groups and their demographic estimates. Those definitions are usually profoundly influenced by impairment and functional abilities definitions, task requirements considered, and social expectations on the quality of services.

The first main problem is the identification of groups and their definition in terms of functional abilities and activities limitations as defined by WHO (2001). The application to the Portuguese population of the proposed new classification is still under study and as not yet been applied to learning, communication and movement activities, because evaluation methods and criteria remain to be defined.

On the other hand, new products are introduced into the market everyday. Such products promote new ways to fulfil a task without taken into account their ergonomics dimension and the users with disabilities thus creating new accessibility problems causing social exclusion of those persons. This project tries to find solutions to fulfil the gap between mainstream and assistive technology and activities limitations imposed by what is generally considered the "normal way to perform a task". So, it was very important the identification of the more frequent tasks performed in learning activities at university level, school services and campus mobility at the Technical University of Lisbon (TULisbon); the definition of groups of people with disabilities presenting limitations to perform those activities; and the establishment of a set of priorities and tools, guidelines and checklists contributing to solve the problems identified.

During the project the group of researchers tried to develop a set of methodologies and tools based on modern education/(re)habilitation theories, information technology and inclusive design contributing to support the bio-psychosocial disability model and to objective description of human functioning in activities related with moving around, communication and learning, taking into account the built environment and the use of information technology.

This project started in 2006 having has partners the Faculty of Architecture, the Faculty of Human Kinetics and the Technical Superior Institute of the Technical University of Lisbon, Portugal, and it was funded by FCT – The Foundation for The Science and Technology of Portugal (POCI/AUR/61223/2004). It had as exterior consultants, Professor Marcus Ormerod from the University of Salford, and Professor Klaus Miesenberger from the University of Linz. This project continues the research in the Inclusive Design area which started with a funded EQUAL project (2001/EQUAL/A2/AD/053) led by the Faculty of Architecture of TULisbon, in conjunction with CPD – Portuguese Design Centre.

3. OBJECTIVES

The project main objectives were: to collect standards, legislation and existing studies on accessibility in university campus; to identify a place to develop the study at
the university campus; to identify students with special needs depending on the existence of accessibility conditions to participate in academic life without restrictions; to identify the most frequent services and equipments used in academic and social tasks; to define the network of routes more frequently used by students; to define scenarios and evaluation methodologies related with those routes and equipments interaction regarding its accessibility and usability; to create a set of guidelines and to propose future work.

4. PROJECT DESCRIPTION

Between 2006 and 2009, the project tried to enlarge and consolidate a network with national and international partnerships, which had in common the subject of Inclusive Design, Accessibility and Social Inclusion in Higher Education.

Having this objective in mind, the project, through the Faculty of Human Kinetics, started to integrate a group of 29 entities which formed an ERASMUS MUNDUS program (Action 4: Enhancing Attractiveness).

These candidates belong to 28 countries, being 21 Universities, 8 governmental supporting services for people with special needs and 1 enterprise of Internet services.

The European Agency for Development in Special Needs Education (EADSNE), one of the original partners of this net, asked the collaboration of one of the researchers, Professor Leonor Moniz Pereira, in the way to integrate the Disability Support Experts group of that entity. Using the data collection produced in this project, of summary characterization of the Portuguese Public Teaching, she was able to answer the solicitations of EADSNE, producing a thematic publication chapter of this entity. The book with the title, “Special Needs Education in Europe (Volume 2) Provision in Post-primary Education”, had as editors: Cor Meijer, Victoria Soriano, Amanda Watkins. It is available in electronic format, translated in 19 different languages, in the EADSNE site:

For a better understanding of the project, we have divided the project’s description by the different tasks performed.

4.1 Survey of Standards, Legal Documents and Existing Studies

The objectives of this task were to conduct a survey to acquire a comprehensive view of the standards and legal documents applying to the use of physical spaces by disabled people and the rights of such persons; to acquire a view of the state-of-the-art in making such physical spaces adequate for people with impairments by type and degree of disability; to identify types of technical help, either existing or available, for the use of such spaces with focus on IT based technical helps; to contact and secure the cooperation of organizations carrying out work in this field; to collect data required by the following tasks of “Target Spaces and Group Identification”, “Building and Validation of Instruments to Carry out the Studies” and “Dissemination”.

During this task we collected and reviewed standards, legal documents and published studies on the accessibility offered to people with impairments to university physical spaces (buildings and other facilities) in view of disability type and disability

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1 This network was established during a former project HEAG (Higher Education Accessibility Guide) whose result may be consulted in http://www.european-agency.org/heag/
degree. The review also focused existing help provided in such spaces and identified available technical help, especially those that are IT based. The review of published studies was focused on obtaining the "state-of-the-art" of the university physical spaces that are used by disabled people and identified the types of spaces which cause barriers. The review also assessed the methodologies used in such studies and drew conclusions on existing accessibility and/or desirable practices, examples of good practice and negative effects (e.g., course rejection on the grounds of no accessibility).

The existence and efficiency of technical help were reviewed together with the impact of such helps in providing better accessibility.

The results obtained in this task were published as a report and were then used by the following tasks.

4.2 Target Spaces and Group Identification

The second task was the identification of the physical spaces (university buildings and attached facilities) that were to be the object of the studies that were carried out by the following tasks, including the identification of characteristics of the spaces, type and frequency of use and architectural barriers to their use by disabled people. Three Faculty buildings of UTL were selected for the study: The faculty of Architecture, the Faculty of Human Kinetics and The Superior Institute of Politic and Social Sciences. The selection was founded in the diversity and type of structures, different periods of construction and complexity of problems; identification of the disabled population based on the disability type, degree and characteristics, including identification of the population that is able to use the existing spaces and the ones who are barred to use them; identification of the types, specifics and efficiency of help which are available in these physical spaces; selection and further characterization of the physical spaces that will be the subject of the following studies and of the population groups whose interaction with the selected spaces will be studied, including the definition of representative groups and sample populations.

This task began by the surveying of the physical spaces of the three partner institutions (buildings and related facilities) (fig 1). The spaces characteristics were classified according to parameters such as use, its frequency and the existence or absence of architectural barriers or the existence of accessibility promoting facilities. The aim was to select the buildings or spaces to be studied by this project.

Fig. 1 - Surveying of the physical spaces of the three selected institutions

At the same time, the population of disabled people was identified according to characteristics such as type and degree of impairment, need, ease or impossibility to use some spaces, with the aim of identifying representative groups of the impaired
population whose interaction with the selected spaces were studied. Such groups were set according to specific accessibility requirements.

We also addressed the existence, type, frequency and efficiency of use of any existing technical help in the buildings and spaces of the three faculties.

Then we proceeded to select the physical spaces that were the subject of the studies carried out in later tasks on the basis of the previous space characterization and also selected the impaired user representative groups. This way, the target spaces and user groups were selected.

4.3 Building and Validation of Instruments to Carry out the Studies

At this stage, the main aim was to select the methodologies that appeared to be more adequate to carry out this project's studies; to build the protocols and procedural guidelines to be applied in the interviews, observation activities and surveys, as well as all other instruments that were necessary to carry out the proposed studies; the pre-testing of the instruments, protocols and procedural guidelines to collect data to validate and/or correct them; the validation and/or correction of the instruments, protocols and procedural guidelines on the basis of pre-testing results; the final selection of the methodologies that were applied and of the protocols, instruments and procedural guidelines used in the following task “Realization of Field Studies”.

The first result of this task took the form of proposals for protocols, experimental instruments and guidelines for the fieldwork developed in the next task. The project developed two methods of analysis (one of check-list type), obtaining data concerning the physical and communicational accessibility to a certain place, according to two different adopted criteria: the most recent Portuguese legislation about inclusive design and disabled people (163/2006) and the international references (UFAS and ADA). The second method is the SAP – Synthesis of Analyses of Paths (fig. 2-5).

Fig. 2 - Synthesis Form of paths analyses: red frame focusing the area of analysis.

Fig. 3 - Example of SAP form (Synthesis of Analysis of Paths)
These elements were then validated and corrections were introduced. For this, a pre-testing took place. Pre-testing tested these elements on a small-scale experiment applied to a reduced number of representative spaces and users: in two faculties, the Faculty of Architecture and the Faculty of Human Kinetics. Several students with disabilities took part in the project as important users of the spaces (fig. 6-8).

Pre-testing results data helped the evaluation of the experimental hypothesis, instruments and protocols and their correctness, mainly what concerns the physical barriers and the cognitive and communicational aspects. Corrections and amendments
to the instruments and protocols were introduced as shown by evaluation and the new versions were then tested again.

![Staff member accessing one of the public phones inside a building.](image)

In this phase there was an independent review by Professor Marcus Ormerod from SURFACE – Inclusive Design research Centre.

At the end of this task, the final version for the experimental for the guidelines, protocols and instruments were validated and available for the next task in the project "Realisation of Field Studies".

4.4 Realisation of Field Studies

At this moment we addressed the realisation of the large-scale field studies following the methodologies, experimental procedures, protocols and instruments developed and validated in the previous task in the form of field observation, surveys and interviews. It was expected that the results showed and characterized the needs of the various target groups of disabled users in their interaction with the physical spaces or the spaces they would like to interact with and are currently enable to, and evaluate the appropriateness of such spaces to accommodate the different needs of such disabled user groups.

Identification of the existing technical help, how are they used and how efficient they are, if they are used at all and the user needs totally supported by such help; to build small-scale experimental prototypes of technical help whose lack was detected by the experiments and to evaluate them. We developed a pre-treatment of the results obtained, including experimenters’ debriefing reports and logs.

We involved all representative user groups that were previously identified and were carried out in the selected physical spaces used by such groups of users or the spaces they are unable to use. The layout of this task depended on the results of the previous task. Therefore, the realization of, e.g., surveys, interviews and field observations, their sequence and combination were depended on the above results.

A specific questionnaire was produced to answer the main questions of the research project, which are, to know and understand the main access and integration difficulties at the university level by users with special needs, which can be of physical, communicational or social-economic order, among other.

The researchers were trained on the experimental tasks in accordance to the protocols that were previously developed. After each experiment, both users and researchers were debriefed.

The aim for this task was to collect the largest possible data on physical space usage as well as the quality and efficiency of any technical help that are available. It was
expected to identify opportunities for accessibility and technical help improvement. The raw data collected was subject to preliminary processing, including statistical processing, to guarantee the significance and validity of the data itself and any early findings.

There was a definition of scenarios and evaluation methodologies about accessibility of the paths and interaction with the services and equipment. Then it was very important the definition of the more used services and the creation of specific paths for usage.

After analyzing the collected data, and in function of the priorities, the group of researchers decided as a methodology to establish a circular preferential path for each building and each faculty (exterior and interior), allowing the derivation in small secondary paths, obtaining, this way, better results and better use of the spaces in each case. To validate the option and the project's impact, a group of disabled people in wheelchairs were included in the study, which helped to widen the scope and to improve the accessibility methods and results that were taken, and to clarify how and why these were adopted in this access audit.

It was also developed a record of all the physical and communicational barriers (fig. 9). We also verified the need of Braille information about the accessibility and so we produced it (fig. 10-12).

Fig. 9 - Exterior circular path inclusively designed as proposal for the accessibility at the Faculty of Architecture.

Fig. 10 - Braille information for the Faculty of Architecture.

Fig. 11 - Another type of Braille information

Fig. 12 - Braille information with colour for people with impaired vision.
At this moment there was a real need to create a new tool for the treatment of the enormous and complex data, collected and analyzed during the project working. Based on the analyses of the methods, drawings and questionnaires, the project developed a software program.

With the objective to define a framing and a working methodology for the accomplishment of a field study about electronic means, the sites of the faculties with information and communication services of the users with the administration and, existing such as services and functionality, which electronic means oriented to the services and the communication serve the students in their activities and also the staff, were pre-selected and analysed. We verified the existence of a disparity of informatics’ means between the several pre-selected buildings and, simultaneously, a generalized unadapted use of these informatics’ means by people with disabilities.

The informatics’ tool Access Tek was developed in a way to allow a more correct and global analysis and representation of the physical paths used by the students, teachers and staff in general in the faculties’ buildings, the surrounding environments and, by example, the bus stops.

The software that was created, using the KML language, defined and used by Google Earth product, has a multimedia character because the information is mainly visual, (image and video), but also supporting schemes and sketches and sound (noisy environments, by example, able to promote disorientation). This informatics’ tool presents a very simple and intuitive way of working, functioning in a way similar to a georeferencing system, supporting paths inside the buildings, based on technical drawings, providing information about passages, corridors and doors (fig. 13).

Fig. 13 - Access Tek tool representing the building’s plan, sub-areas and related multimedia information.

The software also integrates an existent language for the association of the multimedia data with the different locals in the paths. This tool allows the easy addition, modification and removal of multimedia elements with the places in the paths, being a guarantee of the internal coherency of the data. It is a descriptor of the spaces/paths/accessibility through a map, which tries to solve all main problems of the analyses put by the research group, being present the large and some times inappropriate inquiries. The idea of the Access Tek is, after a map, being able to have defined areas more restricted, about which there is more information about all the possible types (images, text, film and sound). It’s a technical program which allows the creation/edition/removing of inquiries, maps, descriptions. It possesses classification of
the locals and paths, identifying founded difficulties by different levels of solution (fig. 14-15).

![Fig. 14 - Form with some areas inside a building](image)

![Fig. 15 - The same form presented in fig 4, after being completed, showing in red the not existent prerequisites.](image)

5. CONCLUSION

The terms for attending Higher education, as for accessing information and knowledge, have until now been determined by models which are exclusively designed to satisfy the needs of the supposedly “normal” or “ideal” user, making it difficult and even excluding growing sectors of the population with university potential from university attendance. As it was stated before, this project intended to obtain evaluation and a specific methodology to promote qualitative change to those terms on the ground of an analysis of the efficiency of current practices and the experimentation with alternative solutions for physical environment design and learning tools.

The group of researchers feels that the design of such a methodology and its dissemination among schools and universities will be a major contribution to reverse current situations, making university attendance more universal. The aim is to reach out to minority groups with specific needs, improving their citizenship fulfilment. This is important success factor for universities since the weight of such groups in university attendance is constantly increasing.

Although this project appears to be confined to the space of the Technical University of Lisbon, there is regional significance. The effects of the dissemination of this project and its results should in fact promote new ways to discuss and analyse the
theme of this project and, particularly, to provide the tools that will allow the implementation of processes for countrywide inclusion: inclusive design and social inclusion.

It is known that the country's most peripheral or interior regions are more strongly subjected to the transformation of traditional products systems, and simultaneously, in the global competition for resource acquisition, are the ones that reveal greatest attraction difficulties, especially in the limitations in the offer of means for the settlement of human, scientific and technologic resources that should support the powering-up of its development.

The potential of performance assumed by Universities and Polytechnic Institutes in the less favoured regions, with particular relevance for their contribution on the regional development and national cohesion, it's also very well known. This engine role assumed by the Higher Education strongly influences various axes, not only as an instrument for the local fixation of human resources, knowledge diffusion and cultural upgrade, or even production of I&D adjusted to local potentialities, but also in the attraction of external resources, especially in the domain of knowledge, technologies and information. Their success determines a more easy way to fast inclusion of those regions in the global map, and consequently improves their relevance and attractiveness.

Under these circumstances, the implementation of policies encouraging the improvement of conditions for improved accessibility and inclusion in Higher Education may acquire particular relevance for the less privileged regions. In fact, the creation of adapted infrastructures, using inclusive design, will allow the reduction of social and economic costs caused by exclusion, while increasing the value of local human resources. It will also allow Higher Education to reach a wider and more diverse public and thus improve its terms of attraction and competition for external resource acquisition.

In this perspective, we hope the current project will provide, in medium terms, a significant contribution to the promotion of regional development and the territorial, national and European cohesion. Therefore, the promotion and dissemination actions in a regional sphere of influence are considered of the utmost importance of the project.

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