

# Developing Effective Educational Tools for Deaf and Hard of Hearing People

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*Abstract:* - The increase in numbers of registered disabled persons in Europe over recent years has been an alarming development. Dialogue is now taking place at formal and informal levels all over Europe, about how to respond to this trend and how it might be reversed. For this purpose, a three-year project entitled Social Return has been designed within the Leonardo da Vinci Community Vocational Training Action Programme and approved by the European Commission in 2004. A holistic, multi-disciplinary approach enhancing integration in training and work is emphasised throughout all of the foreseen project activities. The Social Return approach will be established in several different communities in Europe, recognising the reality of the need to rehabilitate individuals into the reality of individuals' own communities. This contribution deals with the development of educational technologies and tools specially assigned to the people with special needs, especially for deaf and hard of hearing people. Special attention has been made to the development and testing of interactive web applications for people with special needs. Special adjustments are required when developing video webcasting systems for deaf and hard of hearing people.

*Key-Words:* - Educational technologies, people with special needs, deaf and hard of hearing people, e-learning, video webcasting, Internet, Social Return Project

## 1 Introduction

It has been estimated that about 2500 deaf people and about 5000 hard of hearing people live in Slovenia [1]. This is a significant number considering the total population of such a small country as Slovenia. Many projects at national and international levels have been dealing with the problem of social inclusion and return to the society of people with special needs, also deaf and hard of hearing people. One of the recently designed and active projects is Social Return project from the Leonardo da Vinci Community Vocational Training Action Programme.

The project aims at implementing the equal opportunities for disadvantaged people, by applying a holistic, multi-disciplinary approach (providing that experts from several scientific disciplines work together), customized to the needs of the persons involved in small scale settings at local levels.

It is the fact that information technology, suitable modern computer and internet based technologies and tools can, and must contribute significantly to the success of such sophisticated and innovative accession.

One of the newest technologies that can be successfully used for education of deaf and hard of

hearing people is a streaming video. Its usability and use has increased significantly by the development of high speed internet connections. Streaming video in simultaneous combination with presentation slides presents a medium, which offers outstanding chance for distance education with its dynamic image and audio presentation. Special requirements and adjustments have to be considered when developing interactive web applications for people with special needs, such as deaf and hard of hearing people.

The description and main goals of the Social Return project are given in the first part of this contribution. Project partners and the structure of the project are briefly described.

In the second part, the paper deals with streaming video technology and discusses the possibilities of its application for developing the video supported applications that can be effectively used for educating deaf and hard of hearing people.

## 2 Social Return Project

The project entitled Social Return, proposed within the Leonardo da Vinci Community Vocational Training

Action Programme, was approved by the European Commission in the year 2004. The main goal of the project is to develop a holistic and multi-disciplined rehabilitation programme and to offer it to disabled individuals, with limited employment capability.

The project should be perceived as a necessary response to the risk of social exclusion of increasing numbers of disabled individuals in various European countries. For instance in North East Iceland, presently 6,6% of the local population is considered disabled, as compared to a national average of 5,6%. Reducing the yearly influx of new disabled people losing their capability to work and entering the system of unemployment allowances has been one of the highest political priorities of the last five years in The Netherlands and many other Western European countries. Isolation has been of old the typical fate of disabled and chronically sick especially in less developed European countries, like Lithuania. Inclusion in society of people with special needs stands out as one of the European Commission's top priorities, which was emphasised especially in the year 2003, European Year of the Disabled.

The project activities will straightforwardly enhance the implementation of equal opportunities for disadvantaged people, by applying a holistic, multi-disciplinary approach, customized to the needs of the persons involved in small scale settings at local levels. People will not be temporarily pulled away from their community and families, as is the case in many of the existing large rehabilitation centres. In some of these centres, disabled people may live from the age of four until they die, completely serviced but totally isolated from society and literally out of sight.

The project will improve the quality and also the access to continuing vocational training by developing, testing and implementing a holistic, multi-disciplined, integrated programme, aimed at the specific needs of individuals in the target group. Without proper, individual guidance and support, just few people with disabilities manage to enter any vocational training programme.

The following institutions and fields of expertise will be involved:

- local social services (social workers, psychologists, therapists),
- local health services (G.P., occupational therapists, physiotherapists),
- local education services (teachers, educational psychologist, special needs consultants).

Working closely together, supported by communications companies from the private sector and in dialogue with relevant agencies and regional platforms in all participating countries, these multi-disciplinary teams will ensure the maximum level of

participation in vocational training and life long learning for the target groups.

To further ensure success of the approach, some of the most innovative training methods and employment assistance facilities will be applied, such as:

- business simulation,
- supported employment/job coaching,
- teleservice centres that will provide an adapted work environment from which distant employers and individual customers can be served by those who have completed their training and development scheme to a sufficient level.

## 2.1 Project Partners

The project was designed and will be carried out by the project partners from five European countries: Island, The Netherlands, Lithuania, Italy and Slovenia [2].

The programme should preferably be carried out in the participant's local or regional area. Pilots will be set up in Húsavík (a remote and sparsely populated area in N.E. Iceland), in South Limburg (a densely populated but partially rural region in The Netherlands), in Vilnius, the capital of Lithuania, in the Firenze region in Italy and in the region of Maribor in Slovenia.

Target group of people with special needs will initially be individuals receiving disability pensions or rehabilitation allowances who will be selected or invited to enter the programme. In a second stage of the project, the aim is to offer such programmes to a larger group of individuals, including long term unemployed people, young people without employment experience or a suitable job qualification, inactive drug addicts and others with limited employment capabilities. In the Netherlands these categories of disadvantaged people are in a fairly equal position with regard to promoting employment and social integration. Atrium, the partner organisation from The Netherlands, already provides training programmes to all these groups.

## 2.2 The Structure of the Project

The rehabilitation project is based upon a professionally administered multi-disciplinary programme, involving healthcare, psychological guidance, social development support, general education and vocational training, job acquisition support and on the job coaching.

The main goal of this integrated project is to offer disabled individuals complete rehabilitation and social inclusion in their own and into their own local community, increasing the quality of life for participants and their families. As a logical outcome of the individual's participation in this programme, he or she might be expected to find suitable employment or to

continue education. One should keep in mind however that the project covers the whole personal development continuum, ranging from a very low level of education (computer illiteracy), severe disabilities and low self esteem to full participation in work and community activities. Some may start from the most basic level and reach a fair level of secondary education; others may start at this secondary level, achieve a job qualification and become employed. Both (and other) forms of

personal development are valuable, although the project is likely to focus on those who may successfully complete vocational training.

The specific characteristics and innovative aspects of the Social Return approach are visualized in the schematic overview of project activities and the stages of the personal development process that will be influenced by the input as foreseen, Figure 1 [3].

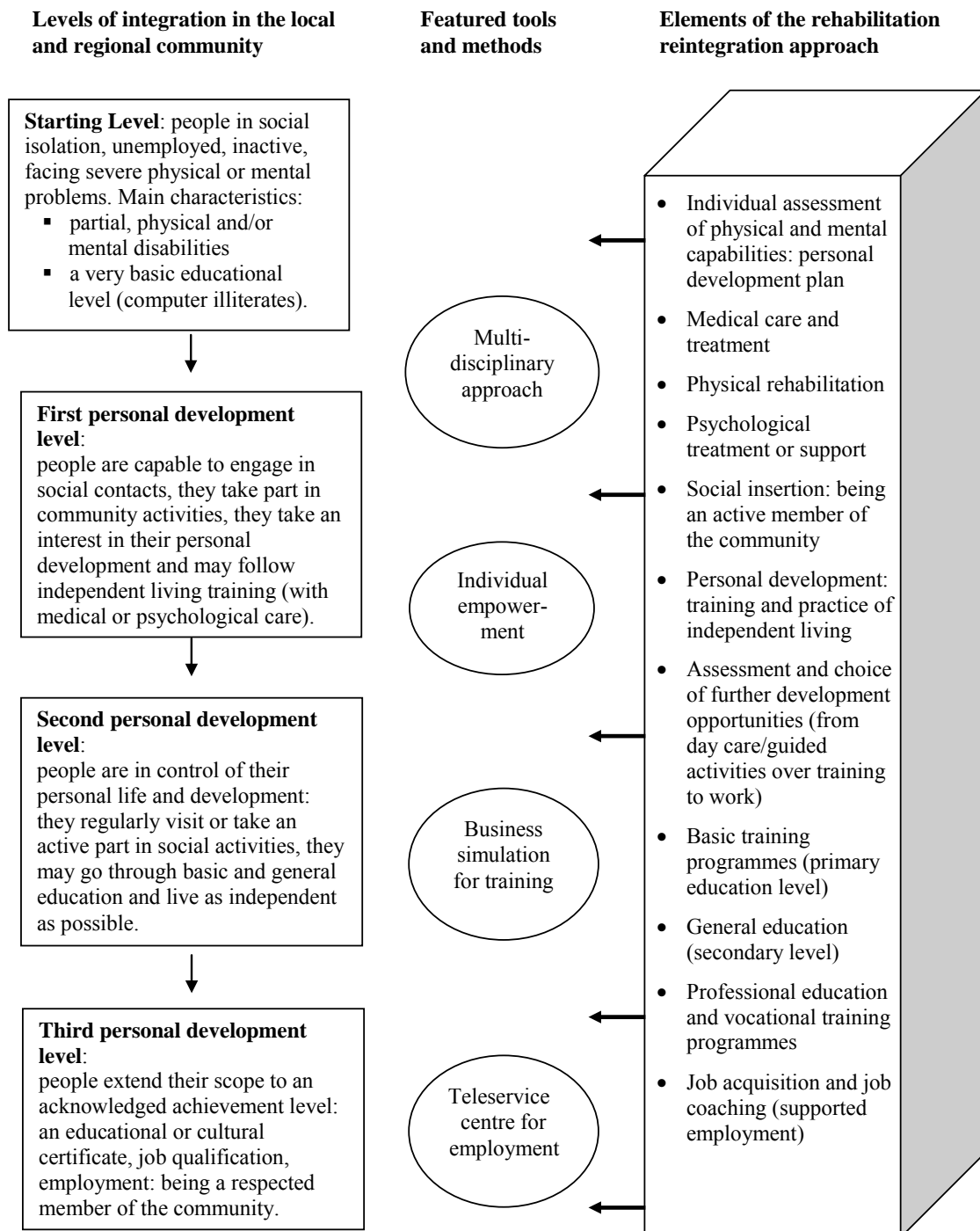


Fig. 1 Social Return project activities and stages of the personal development process

It reflects a widely accepted view that personal development, including vocational training, develops along continuous lines, referred to among others by the term life long learning. Personal development of disadvantaged and disabled people requires a more careful and multi-disciplinary planning of treatment, support, training and guidance and these elements should be integrated in a life long development process. To introduce this approach in a small scale, individualized setting, in close cooperation and communication with the personal environment (family, neighbours, friends, local employers) is truly innovative in any European country. The success of such an innovative accession, among others, highly depends on development and application of suitable modern computer and internet based technologies and tools.

### 3 Webcasting for Supporting the Social Return Project

The Telematics group of the Faculty of Electrical Engineering and Computer Sciences, University of Maribor, Slovenia, serves as the central coordinating and consulting body for the university level efforts in the field of open, flexible and distance education and especially for education for disable people using information and communication technology. The Telematics group brings together experts from various field of science, such as Distance Education, Automatics, Robotics, Remote Engineering and Information and Communication Educational Technology.

Main goals of the group are technological and educational support at the development of distance education, advising and informing about the latest technologies for distance education, including representing possible applications of these technologies for distance education (through courses, seminars, internet, CD or DVD and catalogues), representing the international cooperation and active participation in the national and international projects.

Group members and some of their external collaborators have more than ten years of experiences in the research field of distance education and human-computer interaction. Researchers were engaged in the research work in the fields of user interface design and evaluation, especially for people with disabilities, video compression methods, video streaming, video conferencing and collaboration systems.

The Centre provides the following products and solutions: Internet videoconferencing for hard of hearing and deaf population, video supported web education for hard of hearing and deaf population, distance education course development, virtual university over www, hypervideo, real-time video supported experiment over the world wide web and guidelines for using information and communication technology for the education of disabled people.

#### 3.1 About Video Webcasting

Webcasting represents the mechanism of distributing the multimedia information to a personal computer through different types of networks, such as internet, intranet or company's own network [4]. Using this technology, the user can choose and select only information that is most interesting for her or him. Additionally, interactivity makes it possible to adjust the presentation of information on the screen according to the needs of the user. At the end, video webcasting automatically captures and mediate the information and events using internet almost in the same manner as television. The users must have at their disposal a personal computer with installed multimedia software for observing these events. The simplest versions of such software use web environment and different players, such as Microsoft Windows Media, Real Media and QuickTime. In this way it is possible to observe the events "in vivo" or later on demand with least additional equipment. An example of video webcasting and needed equipment is represented in Figure 2 [5].

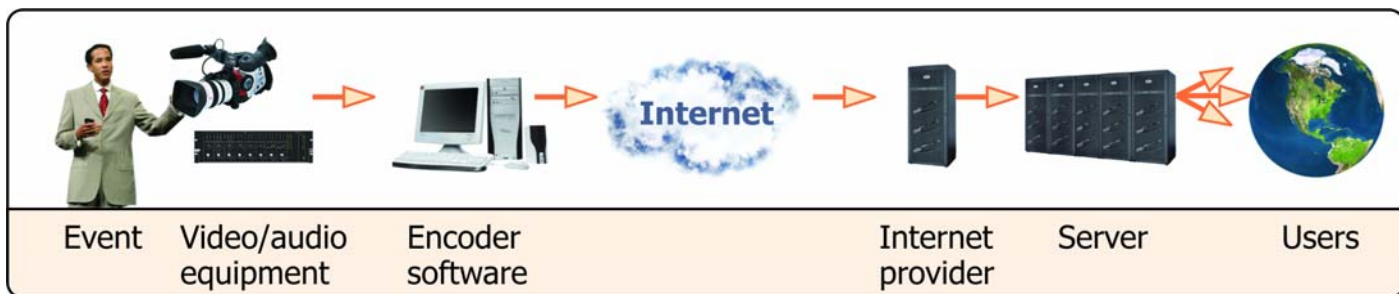


Fig.2 Example of a video webcasting system

First, the event is captured by video/audio equipment (video camera and microphone) and then inputted into the computer with encoder software, After that, the event is being emitted with the help of internet provider and suitable powerful server to the final users.

### 3.2 Video Webcasting for People With Special Needs

When dealing with the requirements of the video webcasting for people with special needs, it is advisable to analyse the current services and possibilities of the digital television. Currently this technology offers these four services in combination with the television programmes [6]: subtitles, spoken subtitles, sound descriptions and sign language.

Different categories of people with special needs have different requirements; therefore a universal video webcasting system should enable a simple choice of a suitable service.

A prototype of an interactive video supported multimedia lecture has been developed within VISIOCOM [7] and BITEMA [1] European projects for analysing the complexity and efficiency of the video webcasting system. Video, electronic slides, subtitles and a glossary were merged in this application. Figure 3 represents an example for designing, producing and demonstrating video supported multimedia contents for

deaf and hard of hearing people on destined web pages. Microsoft Windows Media Tools have been used for realising this illustrative example.

As it can be seen from Figure 2, the user interface has been divided into more parts. The left side of the screen contains the video with the sign language interpreter. The sign language, subtitles and spoken text are precisely synchronised.

The basic commands for controlling the video (play, stop, pause, rewind) have been programmed and positioned above the video window.

The main part of the screen is reserved for electronic slides. The requirements of educators and learners regarding the required domination of graphical over textual information have been considered in full extent.

An additional feature – glossary of terms – was programmed and included on the bottom of the user interface for assuring better understanding of difficult or rare expressions.

Testing of the designed system confirmed that the learners, who were using the multimedia contents, achieved better results when comparing with others who obtained the same material using the conventional way with the help of teacher and sign language interpreter. Suitability of the user interface was confirmed by the SUMI method [5].

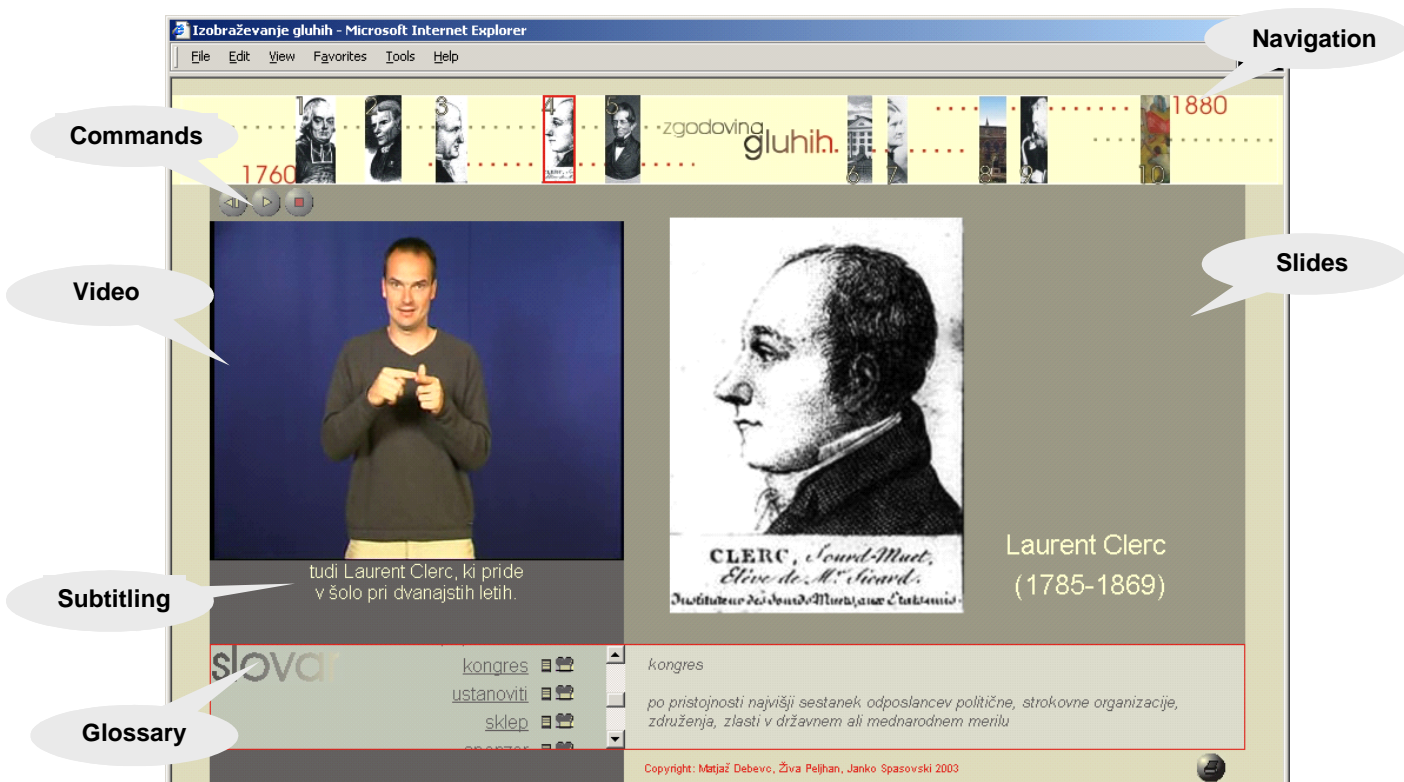


Fig. 3 Web supported video lecture on demand, adapted for deaf and hard of hearing persons

## 4 Future Work and Expectations

The conventional video webcasting systems, such as Virage Noterik, HorizonLive and GoodMood enable above all streaming video and sound, and additionally also electronic slides and interactive questioning/answering system. For the time being there is no system that would include other features, such as the second video window for sign language interpreter and subtitles or spoken descriptions for people deaf or blind people.

A scheme of an enhanced video webcasting system that is being developed within the EQUAL STUDY project [8] can be seen in Figure 4. This kind of a system will, beside the conventional streaming media, enable these additional features:

- subtitles for blind persons comprehending additional information on visible perceptions (for example, what has the lecturer in the hand),
- video interpreter of the sign language,
- subtitles for deaf and hard of hearing people,
- chat room.

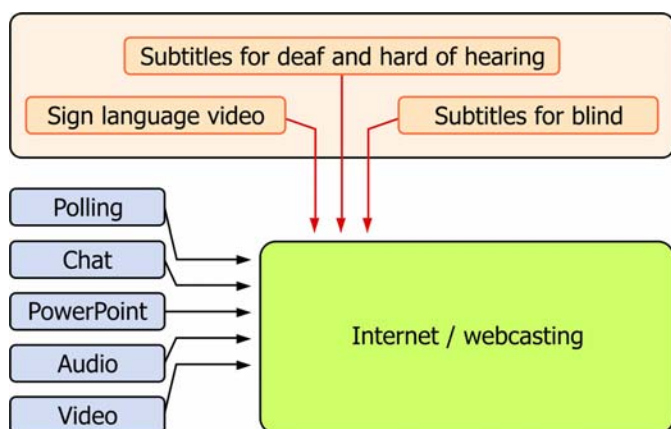


Fig. 4 Enhanced video webcasting system

The proposed system will be designed modularly. The modules will be chosen by the initialisation programme using the “wizard”, similarly as used in Microsoft programmes. The number of people, required for realisation of additional features for people with special needs, such as deaf or hard of hearing people, will be determined according to the concrete situation.

For fulfilling all the requirements and features, such an interactive system should have at least the following elements:

- powerful personal computer that will be used for encoding and sending the video signal to the server,
- touch screen for simple and user friendly setting of the system,
- wireless sound equipment and input devices,
- swivel video camera.

## 5 Conclusions

The description and main goals of the Social Return project was given in the frame of this contribution. The project was designed and will be carried out by the project partners from five European countries: Island, The Netherlands, Lithuania, Italy and Slovenia. The structure of the project was briefly described. The project aims at implementing the equal opportunities for disadvantaged people, by applying a holistic, multi-disciplinary approach, customized to the needs of the persons involved in small scale settings at local levels. Information technology and internet based technologies, such as streaming video, can contribute significantly to the success of such sophisticated and innovative accession.

The second part of the paper deals with streaming video technology for developing video supported applications that can be effectively used for educating deaf and hard of hearing people.

E-education programmes, such as eInclusion and EQUAL, as well as European projects, such as VISIOCOM, BITEMA and SOCIAL RETURN, will result in the new software, tools and systems that will in the future be used for better social inclusion of people with special needs, such as deaf and hard of hearing persons.

The results of previous works have confirmed high level of interest for multimedia supported learning tools and environments, above all in younger generation of people. On the other hand, the lecturers require the interactive video webcasting system that is easy to use and that enables inclusion of additional components, suitable for people with special needs, such as subtitles and sign language interpreter window for deaf and hard of hearing people and spoken subtitles for blind and hard of seeing people. Testing of the designed system confirmed that the learners, who were using the multimedia contents, achieved better results when comparing with others who obtained the same material using the conventional way with the help of teacher and sign language interpreter.

For a successful video webcasting we need a powerful computer hardware and software, as well as suitably qualified staff and infrastructure. Solid audio and video equipment can be stated as extremely important for the success of the video webcasting system. The success and application of video webcasting systems also depends on the speed of data communication, which increased significantly over the last few years. More and more users have at their disposal fast internet connections, such as cable internet or ADSL, therefore an increase regarding the use of video webcasting systems can be expected in the future.

Especially for dissemination purposes related to the results of a project, University of Maribor will have a close cooperation with the Ministry of School and Sports, with a specialist, M.Sc. Bojana Globačnik, who is responsible for institutions for education of persons with special needs, also deaf and hard of hearing people. Together with her we will spread information to all appropriate institutions. We will use selected results of the project to some special institutions, which are relevant for use of results from the project.

*Acknowledgment:* - This work has been done within and has been supported by the European project SOCIAL RETURN (EU Leonardo da Vinci Programme, project no. IS/04/B/F/PP-164002), project EQUAL STUDY (European project EQUAL, project no. 2611-04-0312104) and European project VISIOCOM (Phare Access Programme, project no. ACCESS/zz9914-SLO-01).

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