EURIDICE project: The evaluation of image database use in online learning

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Digital images and image databases can support a wide range of learning objectives. The EURIDICE project aims to assess the requirements for the image databases, on one hand, and to incorporate images into HEI teaching, on the other. The aim of this paper is to analyse the tasks and process of evaluation of the EURIDICE image repository offered for e-learning purposes as a part of the whole Project. It relates image use to the e-learning methodologies adopted at the partner universities, describes the project and the evaluation process that was designed to assess the contents and scope, the search capabilities, indexing and description of images, and incorporation of the offered resource into the study process. The results of evaluation by one educational partner show that image databases can be effectively integrated with e-learning platforms. It also makes clear that the requirements for image databases expressed by students and teachers are high. Therefore, the design of the database and retrieval system has to meet these demands before the service could be fully developed on a commercial basis.

1. Introduction

Virtual Learning Environments (VLE) are being used in growing numbers in higher education, in part as a response to the idea of lifelong learning. This presents new challenges to educators to use different kinds of methods effectively in teaching and to take advantage of online multimedia resources. Educators are being presented with new opportunities to enhance the learning experience using digital images and image databases. What should be kept in mind is that images can support a wide range of learning objectives; they can do a lot more than simply making presentations livelier. To help higher education institutions (HEI) incorporate images into teaching a European project was established.

The aim of this paper is mainly to analyse the tasks and process of evaluation of a specific information product offered for e-learning purposes. The objectives are: to introduce the project and the service that is validated in the project, to explore the idea of using images in e-learning as a basis for the service assessment from the point of view of the users, to provide background information about the educational partners' e-learning experience; to introduce the tasks that were pursued by a partner responsible for the assessment process, and to discuss the evaluation process that has taken place at one pilot site.

EURIDICE (European Recommended Materials for Distance Learning Courses for Educators) is a European Union project funded under the eTen programme which involves partners from seven countries (Italy, Poland, Belgium, Austria, Spain, Sweden, Greece). Borås University College (BUC) is the Swedish partner and is responsible, in addition to running a pilot implementation, for evaluation of the 'EURIDICE service'. EURIDICE is based on a combination of technical instruments, content, networking platforms and community of users and providers, who jointly aim at offering an open and reliable environment to educational institutions across Europe. The intention is to offer to these educational institutions a wide range of unique, high-quality and mostly unpublished content from different providers, i.e., archives, libraries and photographic repositories. This content will be accessible through a multilingual, Web-based interface, within a client/server architecture [6].

The EURIDICE service consists of online learning platforms (Galatea or Moodle) and two sets of images in a single database: one of these sets is provided by the commercial partner, Fratelli Alinari from Italy, the other by two Polish partners. The project seeks to explore the new market for EURIDICE in the public education sector and to validate it from the point of view of educational users. The duration of the project is 18 months starting in August 2005.

The principal database for the project is provided by Fratelli Alinari, which is the world's oldest photographic archive and museum of photography located in Florence. Fratelli Alinari was founded in 1852 and now has over 3,500,000 photographs of its own from the invention of photography to the present. The Archives and the Museum of the History of Photography preserve the originals (glass plates, negatives on film, vintage prints, colour photographs) of the most famous Italian and non-Italian photographers of the nineteenth and twentieth centuries, beginning with the Alinari production. It is also a provider of digital images. The Alinari collection is of particular value in online learning because of its historic significance and wide range of images, which cover virtually all aspects of social life. For the EURIDICE project over 5000 images from this vast collection were selected for use by teachers designing online courses and students using them [7].

The other two image providers come from Poland. The Nicolaus Copernicus Library in Toruñ, which provided approximately 2000 images of the front pages of old prints from the 16th and 17th centuries, printed in the biggest towns of the Pomerania region (Gdańsk, Toruń, Elbląg, Braniewo and Królewiec) and a variety of images of Toruñ's architecture from the Middle Ages to the present [11]. The other partner, the Head Office of the State Archives in Poland (NDAP) provides 3000 scanned historical documents from the regional historical archives of Poland. The history of Poland and other European states and nations from ancient to present times, genealogy, sfragistics, historical cartography, heraldry, diplomatics and archival science are included.

The providers of the images describe and index them and supply metadata for them. They then deliver the digitised material to Fratelli Alinari, which takes responsibility

for managing the common database and multilingual search facility. At present it uses English, German, Spanish, French, Italian, and Polish.

The Belgian partner Leuven Katholieke Universiteit (LKU), together with Alinari, provides access and takes care of the e-learning platforms, Galatea and Moodle, through which the database is accessible. It is also possible to load course material on to these platforms. At present there is a course "Notes on photo analysis. How to read a photographic image?" on the Galatea platform provided by LKU and a course "Intercultural communication" on the Moodle platform provided by BUC.

The seven educational partners in the project comprise five universities (Krakow University, Leuven University, Barcelona Virtual University, Borås University College, and Vienna University) and two agencies providing training courses: ICIMSS (a professional development centre in Torún) and e-ISOTIS (an information society for people with visual impairments). The educational partners contribute to EURIDICE the online courses that serve as the basis of market validation. But their main role is to assess the EURIDICE service and the database uses from the point of view of the educational customers and users.

2. Previous research on image use in e-learning

The use of visual materials and images in education is not a new experience for lecturers and higher education students. Teachers of art, anthropology, geography, etc., have long used photographs, maps and other forms of illustration. Studies of medicine are impossible without detailed medical atlases representing the structure of the human body and its physiological processes. A variety of visual aids is used in biology and zoology, and drawings, plans and images are common in engineering. Physics, chemistry, and mathematics are helped by a variety of visualisations. Within Library and Information Science, images are valuable teaching aids in a number of areas, for example, interface design, human-machine interaction, library building design, and if the images are moving images then the reference interview.

It has not been easy for educators to make good use of images in teaching. Photocopying images leads to a deterioration in quality, it is difficult to project high quality colour pictures, and neither teacher nor students have many opportunities to find and integrate images into their lectures or course work. Besides, new learning modes, especially online learning, require new forms of images. In this case digitised images can help to solve the problem of presentation and access to visual materials.

At present, there are several things to consider when using images in education and especially in e-learning. Do the images need to be digitized, what are the costs, who should do the digitization, what criteria should be used in selection of the images, copyright, formats to use, standards, whether to make a database of the images, how they should be catalogued and indexed, what are the pedagogical objectives in using images, how sustainable is image use, how can the needs of students with impairments be accommodated, etc. [15].

One of the bigger issues is the content. As Lecher [10] reports, teachers try to convert their own analogue slides to digital; however, the process is lengthy and often the quality of images is poor. Images can be retrieved from the Internet but their quality also varies and the copyright position may not be clear. They also experience problems with the software and hardware required to store, access and use digitised images.

"Traditional approaches to the development, management, and delivery of institutional collections and services cannot support the evolving and expanding need for images. A role is being envisioned for a trusted third party whose place in this evolving ecosystem would be both to foster cross-institutional collaboration and help alleviate organizational redundancies in order to contain system-wide costs." [14].

The ARTstor online database of images (produced by the A.W. Mellon Foundation) is one of many emerging providers of collections and software tools for scholars, teachers, and students wanting to make the transition from slides to digital images [14].

Digitization of images has produced tens of thousands of digital images for educational use, but the extent to which images are used varies from discipline to discipline. As said earlier, some subjects (medicine, biology, visual arts etc.) have always used images in teaching while other subjects have a weaker tradition in taking advantage of images as source of information. Now, virtual learning environments and digitization enable educators further to incorporate and interact with images. Elaine Mowat [13] at SCRAN, which aims to provide educational access to digital materials representing culture and history, suggests that these new possibilities can take the educator into new directions when looking for course material.

Many might not see image use as anything more than a way of making teaching materials more attractive and interesting. In reality, images can be a helpful aid for learning, providing a unique kind of course content, important opportunities for discussion, analysis and group activity. Educators should explore and evaluate the potential of the available digital resources in learning and teaching. Images can be worth more than a thousand words and attract the learner's attention, provoke curiosity and help bring material to life. Images are rich in information and can aid in communicating ideas and help experience the subject area, which might be hard to describe in verbal terms. We learn through different senses and the more senses are involved in the learning experience the more information is likely to be remembered [13].

Mowat [13] suggests that images can be used as a part of course materials. This use would enhance the presentation, and attract the learner's attention and curiosity. It would probably engage the learner emotionally by using thought-provoking images. Using multimedia material could also enhance learning as many people learn better by stimulating different senses in the learning process. Students learn better when they interact and process information rather than when they just hear or read about it. Image use stimulates social interaction which makes the learning situation more active and helps students to understand subjects at hand. In a learning situation all

stimuli for conversation, interaction with the material, group actions, etc, promote understanding, problem solving, interest and enjoyment, which all result in enhanced learning [13].

Mowat [13] also writes that image use supports learner activity, and promotes reflection and interest. If images could be accessed by students directly they could then be used in illustrating projects and other course work. Accessing images directly also supports various kinds of activities such as organizing, analysing and comparing images, which could be an aid to learning and understanding through reflection. To enjoy learning is an important factor in how quickly people learn. Depending on the context and the user any images can have several potential meanings and images can capture just what fascinates us about the subject being studied.

It is not easy to evaluate the use of learning objects in learning or e-learning environments. A number of e-learning material evaluations and assessments have been made using different tools and for different purposes: e-learning course tasks [1], e-learning courses from the user's point of view [2], usability of digital libraries [8], digital library use in e-learning [4]. We have found these evaluations useful and combined them with some evaluation methods used for evaluation of digital image resources.

Researchers from UC Berkeley were examining the costs of digital image distribution for educational purposes. In addition they interviewed the faculty (using focus group techniques) to identify important issues for the adoption of digital images in teaching and learning. They found that image quality, technical support and training, tools (software and hardware), and metadata were regarded as major factors in acceptance [3].

The study performed by Choi and Rasmussen [5] on users' relevance criteria in image retrieval has confirmed that the topicality (or content of the image) is still the most important factor for searching images. The title and descriptors were used as "interpreters of image content and meaning" [5, p. 717]. The search for images according to title, date, and other features was also used to find relevant images. In addition, image quality and clarity was important. This research was also important in developing an assessment methodology.

3. Confusion in terminology

During our project it became clear that all the participants have their own terms and definitions for e-learning. This confusion in terminology is also obvious among other parties offering e-learning courses. The terms in use for this project are e-learning, distance learning, blended learning and flexible learning, all meaning slightly different things but sometimes used synonymously. Strictly speaking, however, flexible learning refers to the possibility of adopting a range of different learning strategies in a variety of learning environments to cater for differences in learning styles, learning interest and in needs and variations in learning opportunities; e-learning or distance

learning only refer to learning facilitated and supported through ICT. In distance learning the teachers and the students are also often separated by geography and time. The term blended learning means that the course is using both face-to-face contact between students and teachers and ICT outside the classroom. The term e-learning is generally used within this project even though most of the universities are actually involved in blended learning education.

The Department of Library and Information Science at the University College of Borås and the University College of Borås as a whole use the terms e-learning, distance learning and flexible learning. K.U. Leuven does not offer distance learning courses so e-learning is only a component in how learning in general is organized at the university, meaning that the method for learning at K.U. Leuven is blended learning. The Jagiellonian University uses the term blended learning as does Vienna University whereas the University of Barcelona UBVirtual uses the term distance learning. So far, all courses at UBVirtual have been distance learning with no face-to-face education at all, but this is changing. Its courses are also the closest to the idea of flexible learning, where students may choose themselves how they want to organize their learning although a general course calendar is offered.

4. E-learning policies

All the involved partners have an e-learning policy, but what is included in the policy differs from partner to partner. In Borås the aim of the policy is to set a goal of increasing the number of e-learning courses offered. Each department is expected to write a long-term plan for development of flexible courses and programmes. Also, the library at the University College of Borås has a policy to support students taking part in e-learning courses.

K.U. Leuven's e-learning policy is part of its educational policy. E-learning is considered as the main tool towards the innovation of education and the realisation of its pedagogical aim of guided independent learning. This means that the university emphasizes the relation between research and education; every student should gain a critical insight into the structure and origins of scientific knowledge, know where to find good sources of information, and understand how to judge the quality of new information.

The Jagiellonian University has established a Centre for E-learning in order to promote and organize e-learning. The Centre's task is to support those educators from all faculties who implement e-learning methods in their courses. The future of e-learning at the Jagiellonian University depends on the policy which is to be developed by the university authorities in 2007 and on the purchase of new e-learning software. Poland has also new legislation for higher education which addresses e-learning in universities. This is likely to stimulate the development of e-learning in the country.

At the University of Vienna the e-learning policy is a part of overall educational policy. Research and development in the area of e-learning is promoted by financing projects. Results from these projects are expected to have direct implications for the study programs. Faculties are also encouraged to develop specific didactic solutions integrating e-learning methods.

UBVirtual produces e-learning (distance learning according to them) courses on a commercial basis. The e-learning policy emphasizes the need to be versatile in designing courses and delivering to customers what they want and need. Therefore, customer needs are studied to define the optimal combination of online, face-to-face or blended learning methods.

All the involved partners, then, do not have a similar idea of what e-learning is and use different terminology to describe it. There is also a difference between the partners in the extent to which they offer e-learning courses and this naturally has an effect on policy making and what should be included in the policy. There is also a question as to whether e-learning policy should stand on its own or be included in the overall educational policy, since it can be argued that e-learning is only another pedagogical method and not a stand-alone form of education.

Some partners, like e-ISOTIS, do not have much experience in e-learning or associated policies. But the role of e-ISOTIS in the assessment was crucial for the evaluation because it is dealing with the learning needs and requirements of a very specific users with visual impairments. Representation of images online for this group has specific features, which are also supplemented by the learning situation.

4.1. Role of the Swedish School of Library and Information Science (SSLIS) in the project

The Swedish School of Library and Information Science is one of the key partners within the project and plays several roles:

1. It serves as one of the pilot sites validating the EURIDICE service together with the other four universities. There are also two demonstration sites for the project established by Alinari at Florence University and by ICIMSS for Polish users. Each of the pilot sites organizes the evaluation according to their needs. Borås tested the EURIDICE service with one teacher designing a course, two teachers evaluating it from the point of view of the information professional, seven teachers evaluating it as potential users of the content, and 23 students from a variety of departments following a common course.
2. SSLIS also is responsible for the development of the evaluation methodology and monitoring of the assessment process. For this purpose together with other partners SSLIS created a set of principles and instruments to be used for the evaluation of the service. It also conducted a workshop for the evaluators in Borås (February, 2006). Finally, it also monitored the situation in two of the pilot sites by visiting them and interviewing people responsible for the evaluation process.

3. SSLIS took part in other activities of the project. It provided a survey of e-learning methodologies and image use practice in Borås University College (BUC), conducted a market analysis of similar services in Sweden and contributed to dissemination of information about the project and the EURIDICE service.

Four people working part-time on the project form the EURIDICE project team. They have received administrative, professional, research and other professional support from more than 15 people, mainly from SSLIS but also from other departments in BUC.

At present BUC has completed its main task as a pilot site and has produced a report on the evaluation of the EURIDICE service from the BUC users' point of view. The main goal of this paper is to introduce the EURIDICE service evaluation process for e-learning and its outcomes in BUC.

4.2. The evaluation process

The assessment of the EURIDICE service is based on two elements: the evaluation of the service from the customers' point of view and the end users' evaluation of various aspects of the service. In relation to learning and e-learning, according to Thorpe, *"Evaluation is the collection of, analysis and interpretation of information about any aspect of a programme of education or training as part of a recognised process of judging its effectiveness, its efficiency and any other outcomes it may have."* [16, p32] The incorporation of a specific digital resource into the learning process can be regarded as one of the stages within the design of an educational intervention [9]. The evaluation of the EURIDICE service falls into the type of practical product and service evaluation rather than evaluation research and focuses on the use of an image resource dedicated to humanities e-learning courses [12].

The user sample is self-determined, being those students (and others taking less formal courses or training programmes) who are associated with the courses identified by the partners as appropriate for testing the resource base. It also included the teachers and their perception of the training needs.

The specific elements of evaluation were:

a) *technical validation from the customer's point of view*, where the main issue was the compatibility of the service with the e-learning platforms and other tools used by the customer;

b) *use of the resources in e-learning*, which concerned mainly teachers developing e-learning courses and/or materials. This involved such factors as the ease of learning, how to use the service, the time taken for learning, and actual use for a specific course, and understanding the potential of the service in e-learning;

c) *the content of the databases*, that is, the actual images, which were used by students from a variety of disciplines and, consequently, may have had greater or lesser value depending upon the nature of the discipline and the relevance

of the range of images available. Consequently, the key question was, 'How useful are the resources for the particular purpose intended?'

d) *search engine, indexing, etc.*; a technical evaluation of retrieval performance was not intended; instead the user's perception of performance was obtained, and this involved a number of subsidiary issues. For example: Are the indexing terms associated with the images appropriate for the search intentions of the users? Are the search capabilities of the search engine presented effectively and are they fully utilised by the user? Is the speed of response from an enquiry perceived to be adequate? Is the presentation of the search results helpful? Do the images provided in response to an enquiry satisfy the needs represented by the enquiry?

e) *interface:* a full usability study of interface issues was beyond the capacity of the project, but two main issues were dealt with under this heading: the general clarity of the interface to guide the user to the available features of the system and the scope of the collections and the ease of use of the navigation features provided. In the case of visually impaired users, the same additional issues occurred as with the interface usability in general: for example, if graphic navigation buttons were used, they had to be 'under laid' with text that was readable by the appropriate software.

4.3. Training for evaluation

Information was collected principally by one-to-one interviewing and focus groups. Most of the partner organizations were not familiar with evaluation or with the interviewing techniques. Consequently, it was necessary to develop the data collection instruments and to provide training in their use.

4.3.1. Preparation of the evaluation instruments

The instruments developed reflected directly the evaluation aims set out earlier. This can be seen in the 'topics of interest' prepared to guide the conduct of a focus group interview with students:

1. The contribution of EURIDICE service to whatever course you are studying
2. The potential usefulness of the service for particular studies or studies in general.
3. Ease of use of the service
4. The extent of satisfaction with the coverage of the image library in relation to the nature of the course or specific course tasks.
5. Satisfaction with search possibilities.
6. Problems discovered while using the service.
7. Satisfaction with the quality of the images.

Instruments were designed for focus group interviews, as well as one-to-one interviews with both teachers and students: coding manuals were produced for the latter to enable the consistent recording of results and subsequent amalgamation into a single

evaluation report. Guidelines were also produced to enable a consistent approach to the observation of both students and teachers using the service. The appendix gives an example of a search task set for students and the associated elements of observation.

4.3.2. Training workshop

A two-day training workshop for partners, covering the use of the instruments was held in Borås in February 2006. Practical training was provided on one-to-one interviewing, with participants working in pairs, and on running a focus group, with the participants acting as a focus group – the 'fishbowl' technique was employed in this exercise, with half of the participants forming the group and half observing. Following the initial group discussion, the two sets changed places. Participants found the Workshop extremely valuable, not only from the point of view of their work for the Project, but also for other situations in which such techniques might be of value to them. The participants were also able to discuss and reach decisions on local issues that were of concern, such as the numbers of students to be involved, the specific courses to which the image bank might relate, and so forth.

5. Implementation

For the assessment of the EURIDICE service at Borås University College, apart from the planning, development of instruments, and training the evaluators, we also had to set up a local pilot environment for the students and the teachers.

1. The pilot environment for the students was organized so that it was possible to access the EURIDICE service from the local computer classrooms. They used the course material mounted on the local server and could access the service through the Galatea VLE platform. There they could access the galleries created for the course as well as the image database. The students used images for the group task – seminar presentations given to their classmates (from any source) and also performed individual tasks under the supervision of a member of the project team (only from the EURIDICE service). The tasks were conducted in small groups (three to four students).
2. The pilot environment for the teachers consisted of access to the EURIDICE service from their personal computers in their own offices.

Another important job before the start of the evaluation was the adaptation of the course of *Intercultural Communication* materials and tasks to include EURIDICE service materials and usage. The teacher of the course incorporated images into the course material illustrating certain points and aspects of the topics taught. These materials came not only from the EURIDICE service but also from other image repositories. Four slide shows related to the lectures were also compiled within the

EURIDICE image repository resources. The examination tasks were reformulated to include the usage of the EURIDICE image database.

The course was also adapted for the visually impaired. The full version of the course materials was mounted on the Moodle VLE platform and was restructured by the local teacher to suit the requirements of the local users better. The galleries for the course conducted at Borås University College were available on the Galatea platform. The course was conducted in April and May 2006. The main teaching forms were: lectures by the teacher, lectures presented by a group of students using a variety of learning resources, study of the course material and literature, and conducting individual study tasks prepared by the project team using the EURIDICE service.

Before we started the assessment process the students were trained to use the EURIDICE service. Five small groups of students were trained by the project team members at the computer classrooms before they started using the course material and performing course tasks. Each of them also received a printed training package. Project team members were accessible throughout the assessment period for consultation.

We also had to select teachers for the assessment of different aspects of the EURIDICE service. This task was conducted during February and March. Teachers were introduced to the EURIDICE service individually during April–May. The training sessions took place in their personal offices and they could access the service using their teacher's password. Each of them received the printed training package for teachers. Teachers explored possibilities of EURIDICE service (some tasks were set by the project group, some designed by the teachers). They have accessed the service and explored its possibilities individually but during at least one session the project team members observed them. The observation and interviews with teachers and students were conducted during from the end of May, to the beginning of June 2006.

The data were coded for qualitative and quantitative analysis (to establish the information and computer skills and confidence levels).

6. Evaluation results

At present the EURIDICE evaluation data from Borås University College is fully analysed and reported. The evaluation process established that there is an emerging and already increasing need for images for general teaching and learning and also for e-learning. This need was shown by:

– the positive evaluation by students of illustrated course material and tasks;
– the fact that most of the teachers had used images previously and intended to continue using them after the pilot; and
– the fact that both students and teachers already had sufficient knowledge of electronic image resources, conditions of their usage and retrieval.

The two major questions of the EURIDICE service validation were:

1. Service acceptance: capability of the service to satisfy users' needs in terms of usability of the search/retrieval tools; completeness of the offered resources; accessibility of the service for people with disabilities.

2. Service sustainability, referring to the capability of the service to continue to satisfy the customers' needs in the operational phase.

The students and teachers were evaluating several aspects of the EURIDICE service:

The content and scope. Although a majority of the students decided that it was possible to find images useful for their task, observation showed that they were spending rather a long time looking for suitable images and that they performed more than five searches before selecting the pictures for their task. The problems related to the content of the images are expressed more explicitly in the interviews. The content was criticised as "too old" or having "no current bearing" and belonging to roughly the same historical period and place, "lacking diversity" or "too similar". To some extent this may be the result of targeting mainly history courses when compiling the images in the database, but it is clear that the criteria of database construction should be revised before offering it to the intended customers. The responses of lecturers on this aspect confirmed the opinions of the students. The teachers of historical disciplines were more satisfied with the content and scope than others.

Search capabilities and indexing. Observation of the students showed that most of them were quite experienced in searching and easily grasped the available options. They quickly identified also the hidden search features and realized that there was no possibility to use Boolean searching or truncation (referred to as "wildcard" by some). The students also mentioned indexing quality, difficulty in selecting the right keywords and descriptors, and the lack of a list of the keywords, as the problems that they experienced in performing searches. The teachers perceived the information retrieval characteristics of the system as being under development and provided useful suggestions for its improvement. For example:

- thesaurus with translations is needed;
- Boolean search capability;
- help function;
- truncation;
- search examples;
- context and definitions of terms in subject, title, etc.;
- browsing options;
- explanations of choices in advanced search menu; and
- description of the contents and limitations of the database

Presentation of the results and quality of images were rated as high and reasonable for the tasks. Both students and teachers experienced fewer problems with both of these features.

Interface and navigation. Most of the respondents learned to use the system very quickly and felt comfortable with it. However, they expressed dissatisfaction with some navigation features and suggested improvements for some of most irritating ones. For example:

- provide possibility of moving back and forth among pages through the normal browser buttons;
- provide the possibility of moving pictures between 'galleries';
- provide possibility to go back to a performed search, so that one does not have to repeat it;
- show the next picture from the slide show directly without going back to the main slide show window; and
- add a "go to bottom" button.

The following answers can be given to the major evaluation questions on the basis of the service evaluation at Borås University College:

1. At present, the EURIDICE service requires significant improvements to be accepted and capable of satisfying users' needs in terms of usability of the search and retrieval tools; completeness of the offered resources, indexing and the quality of image descriptions.
2. Neither the process of retrieval and usage of images from the EURIDICE service (efficiency), the relevance of the service, nor the effectiveness (outcome) of its use is sufficient for the intended customers and end-users for e-learning purposes. The validation phase has provided a set of recommendations that should be implemented to meet the needs of the segment of the market and to be competitive.

The extent of improvements defined during the assessment is significant and includes all elements and features of the service; especially the description, indexing and search facilities of the service have to be improved.

Outcomes of the assessment process were:

- a list of recommendations for the improvement of technical features and functions, thesauri, contents coverage, navigation, search features and indexing, and description of images;
- training packages for teachers and students were made available to the partners by the BUC team and can be revised according to changes in the system.

This general awareness also allowed us to get useful data to assess the present and future potential of the EURIDICE service through implicit benchmarking of it with other options, such as the image collections of national art galleries, collections provided by commercial photo libraries, free image collections, and collections developed for educational use, such as the JISC Education Image Gallery.

7. Conclusions

It is clear that there are many differences in both terminology for e-learning and best practice when it comes to image use. This is because of the different needs for image use and the diverse requirements and aims of the courses given at different educational institutions. This work within the framework of EURIDICE has brought the variations into focus and will increase understanding between the needs of institutions and among the user groups and therefore help content providers to adjust services to the needs of users. What is common to all is the question of intellectual property right and copyright law, who owns the images, whether the images should then be marked as the property of a third party (a commercial organization) and how the course designers could best get access to the images, by renting or purchasing rights. Teachers and lecturers are positive about the potential of enhancing the learning experience by image use but they lack the time to make the most of it.

EURIDICE, in the long run, aims to enhance learning experience by helping to bring ideas to life by providing valuable primary source material and by offering stimuli for discussion and interaction. The projects aims to accomplish this by making collections as accessible and easy to use as possible by providing flexible search tools, practical advice, teaching ideas and ready-to-use learning materials and software tools to facilitate uptake and effective use of the resources.

The project so far has shown that image databases can be effectively integrated with e-learning platforms. However, integration with platforms other than those used in the project will require rather intensive efforts and work on the part of educational users. The evaluation at Borås has revealed some significant issues relating to the overall design and the retrieval system. These features will need attention before the service could be fully developed on a commercial basis.

Acknowledgements

References

[1] V. Aitkin and S. Tabakov, Evaluation of the e-Learning material developed by EMERALD and EMIT for diagnostic imaging and radiotherapy, *Medical Engineering & Physics* **27** (2005), 633–639.

[2] H. Balzert, Evaluation of E-learning courses from the user's viewpoint - Reference frameworks and exemplary use, *Wirtschaftsinformatik* **47**(1) (2005), 69–80.

[3] H. Besser, Network access to visual information: a study of costs and uses In: IFLA Council and General Conference. 65th Conference programme and proceedings, Bangkok, Thailand, 1999, available at: www.ifla.org/IV/ifla65/papers/021-112e.htm, accessed on 2006-10-06.

[4] C.L. Borgman, A.J. Gilliland-Swetland et al., Evaluating digital libraries for teaching and learning in undergraduate education: A case study of the Alexandria Digital Earth ProtoType (ADEPT), *Library Trends* **49**(2) (2000), 228–250.

[5] Y. Choi and E.M. Rasmussen, Users' relevance criteria in image retrieval in American history, *Information Processing and Management* **38**(5) (2002), 695–726.

[6] Euridice, Project overview, Florence: Euridice consortium, 2005, available at http://www.euridice-edu.org/euridice.php?lingua=en, accessed on 2005-11-28.

[7] Fratelli Alinari, Who we are. Florence: Fratelli Alinari, 2006, available at: http://www.alinari.com/en/storia.asp, accessed on 2006-10-06.

[8] A.R.C. Kassim and T.R. Kochtanek, Designing, implementing, and evaluating an educational digital library resource, *Online Information Review* **27**(3) (2003), 160–168.

[9] D.M. Laurillard, *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology,* Routledge, London, 2003.

[10] M. Lecher, Technophobes teaching with technology, In: Proceedings of the 2004 ASCUE Conference. Myrtle Beach (South Carolina), 2004, available at: www.ascue.org, accessed 2006-10-06.

[11] Library of Torun, About [the Nicolas Copernicus Provincial and Municipal] Library [of Torun]. Torun: TRINET, 2001, available at: http://www.ksiaznica.torun.pl/‿v‿eng/index.shtml, accessed 2005-11-28.

[12] G. Marchionini, Evaluating digital libraries: A longitudinal and multifaceted view, *Library Trends* **49**(2) (2000), 304–333.

[13] E. Mowat, Teaching and learning with images, *VINE* **32**(3, issue 128) (2002), 5–13.

[14] B. Rockenbach and M. Marmor, ARTstor's *Digital* Landscape: As the Image Library Turns One Year Old, It Is Finding an Expanding Audience across Disciplines, *Library Journal* **130**(12) (2005), 34.

[15] P. Standford, Digital images in education: on overview, *VINE* **32**(3, issue 128) (2002), 5–13.

[16] M. Thorpe, *Evaluating Open and Distance Learning*, Longman, Harlow, 1988.

Appendix

Examples of study tasks, associated elements of observation, and responses of the students

Task 1: Use the gallery of pictures of people in different ethnic clothing. What factors influence the differences of clothing.

Elements of observation:

1) How long does it take for a student to locate the required gallery?
2) Which search steps are taken by a student to locate the required gallery?
3) How do students treat the image for finding an answer: explore the image in a zoom window by zooming, read the description and key-words, try to find similar images, etc.?
4) Is there any obvious difficulty that they experience (lose patience, complain, etc.)?

Answer:

1. The weather/climate in different places (images 1, 3)
2. The profession and type of labour of the people (4, 5)
3. Peoples' "place" in society (2, 4)

4. The wealth of the people (1, 5)
5. The historical time when people were living (1-5)
6. The sex/gender of the people (4, 1, 3)

Task 2: Find pictures of various groups of people representing sub-cultural differences. Use EURIDICE service for that and explore the details of images. Think what kind of relations they represent.

Elements of observation:

1. How does a students start looking for images? Which search options are chosen first of all?
2. What are the key-words that a student uses? How many key-words do not lead to a result?
3. How many images are retrieved? How many images a student regards as relevant?
4. How does a student make a decision about the relevance of an image (read description, key-words, analyse image through zoom window)?

Answer:

AVQ-A-000023-0009: In this picture I can see the difference between male and female in Latin America in the last century. Women are dressed in long and nice dresses and they are taking care of children. Men, on the other hand, are dressed for hunting and look prepared.