D.I.M.A. on-line multimedia resources for Music Education

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Abstract: On-line multimedia resources in music teaching can offer a wide scale of tools leading to the shift of the teaching process from one closed and rigid, teacher-oriented to an inciting and interactive educational process centered on learners. Multimedia is defined as media made up of various contents, including both visual support (photographs of scores, videos) and texts that one may access interactively. As teaching support, multimedia has an increasingly role for providing education. The research made by the specialists of the Romanian Music Academy “Gheorghe Dima” aims to explore the possibilities and the most efficient ways of adapting the online multimedia resources to music education’s specific requirements. This is achieved through the development and monitoring of an interactive pilot application called D.I.M.A. (direct impact multimedia application), functioning as an online terminological anthology, useful for information gathering and study. This article will provide theoretical insights into the on-line musical instruction process. D.I.M.A. shall be implemented on an e-learning platform.

Keywords: multimedia, on-line, anthology, education, music.

1 Introduction
The education through media contributes to the development of each individual’s personality and integration into the contemporary society, the impact of these changes being summarized by Folkestad (2005). The efficacy of multimedia in the training field results from its fundaments: interactivity and the possibility of using different environments; it is a form of modern virtual reality being situated at the contents and creative inventions crossroads in multimedia. The maximum potential of using the new technologies in education is achieved through training systems Web based „with and for internet” (Fourmentraux, 2005). Exploring the adaptation of online learning is currently a mandatory task in the music education, within the framework of the applications for consumer digital media. Comparing with traditional text and data, multimedia objects are typically larger in size and include images, video, audio and some other visualization components. Education issues have changed profoundly, the alternative to an insufficient and pricy knowledge being the discovery of some efficient teaching methods through which the students could attend actively to their own formation and not only passively receive learning experiences (Young, 2003).

2 ICT in musical education
The ICT (information and technological communication by electronic means) represent the core of progress in all areas. The phenomenon has been deeply involved in the education structures. Today there are programs facilitating the implementation of basic musical knowledge which will be used to elaborate other programs of learning process diversification. New opportunities will arise through information and communication technology in education. Even if one will meet difficulties in using at highest capacity the technology, benefits will be felt by all persons involved in the process (Crow, 2006). There are various musical fields where ICT is applied, e.g.: musical composition, sound generation researches developed within the last 40 years (materialized by the synthesizer and audio processors production, musical interfaces created with the aim of recording performing gestures through sound production modules), music listening and understanding which will interpose between acoustics, musical structure, cognition and emotion.

Obviously, the teacher should get familiar with all the possibilities and opportunities that ICT holds as a compensatory and/or supporting tool and must be able to determine the students’ needs. In terms of ICT as a music teaching tool, teachers must strive to achieve an appropriate blend of musical activities, concepts and technology with
technological tools being used correctly and appropriately in order to enhance the music and not diminish it. There are many ways technology can help teachers to meet their instructional goals. These include:

- Programs designed to help students develop their musicianship or improve their knowledge and skills in reading notation;
- Simultaneous appearance of sound and notation;
- Means for improving their improvisation skills;
- Programs which focus on teaching music notation or performing aural tests involving recognition and dictation of rhythm patterns, melody patterns, musical intervals, chord sequences and harmonic progressions;
- Notation and sequencing programs which assist students in composing activities;
- CD-ROMs focusing on music history and listening activities;
- The pace of lessons can be uniform and appropriate. For example, musical excerpts can be located and/or replayed quickly;
- Virtual instruments allow experimentation through changes in tempo, modality, voice and transpositions.

Most importantly, these new technologies hold the key to improved musical learning. Placing the tools of technology into pupils’ hands will guide them to active music making. Studies indicate that when students become active participants in learning, they gain confidence, learn more effectively and are drawn to further study (Hamel 2004). Music technology helps pupils to learn to become more appreciative on music as an art, it gives the opportunity to link their musical experiences outside the classroom to the learning process inside, thus becoming active participants in the joy of music-making. Using music technology inside the classroom can offer alternative ways of learning to children who may experience difficulties with more conventional approaches (Cox 2006).

Using music technology effectively can enable pupils to work more effectively at their own pace and according to their individual abilities as well as limiting any performance anxiety by focusing on learning and not on peer competition. The evolution of musical technologies was prompted by the ICT development, as well as by the evolution of research in other areas of activity.

### 2.1 Educational platform

The e-learning platforms provide specific instruments of implementation to the education institutions, with courses and other multimedia materials in electronic format, by applying a complex synchronous and asynchronous communication system.

The elaboration of an e-learning platform devoted to music education is a requirement that must observe cognitive ergonomic demands to ensure the highest level of efficiency. The cognitive ergonomics are a branch of economy, emphasizing the analysis of the cognitive processes (making decisions, planning, etc) needed for the equipment and apparatus operation of modern informatics. Cognitive ergonomics concentrate on the increase in performance of cognitive tasks through actions like: user-oriented organizing within man-machine interaction (HCI-Human Computer Interaction) and instruction achievement and task re-organizing to intensify the degree of cognitive loading, etc.

### 2.2 The multimedia resources

Multimedia is the result of combining three innovations developed within the last century: telecommunication, audiovisual means and computer science; it refers to the integration within a unitary document of texts, static or animated images, sounds, and radio sequences on electronic support. (Fig. 1)

![Multimedia](image)

**Fig. 1. Multimedia – various media of information Retrieval**

Multimedia (multi – more; media – media, means) refers to the capacity of a system to communicate (present) simultaneously the information by way of several presentation media, such as text, graphics, photographers, animation, sound, video clips, etc. Although images are carrying the biggest information bulk among all the communication means, the sound is the more expressive and subtle way of transmitting a specific message. Having really access to the human heart, the sound has the quality of inducing, in the most direct, rapid and efficient manner, a large sphere of feelings, unlike images and texts that are firstly and mainly filtered by the brain.
Animations can be used for conveying a more dynamic and attractive aspect to the students through the visual impact generated in the receiver during the communication process. The course participant can control the order, coherence, duration and multitude of data received via the transmission channel- the TV screen-, a process that subsequently influence the perception and vision on the subject in hand.

The opening towards multimedia does not reject the classical education; on the contrary, by multimedia is promoted the communication side of media, Internet being the new exponent of the mass-media.

The multimedia technologies are designated as the totality of creating, storing, retrieving, spreading and utilizing modalities of documents composed of multiple media, such as texts, graphics, static images, animation, sound and video objects.

Associating graphical elements and the discourse has a double role: besides transmitting concrete information it induces a special approach to the discussed subject.

Multimedia offers the advantage of various forms of messages integration. Each multimedia element uses specific files with well-defined characteristics. Before selecting a type of file, it is recommended to find out what computer type is disposal at concerned group. A multimedia application includes various kinds of information, giving the appearance of movement, directed on basis of a script established according to the message to be transmitted.

Interactive multimedia is constantly growing, and is also starting to have a major role in our lives. As we are going towards a digital world, people communicate interacting with a multimedia interface. A system in which the items of information are connected and can be presented together is called an interactive multimedia system. The opportunities for creating combinations of sound and image for multimedia projects stimulate the learning interest. (Kumpalainen 1998, Koutsoninos 2005)

A multimedia system comprises a multimedia engine, a database and a human-machine interface. The multimedia engine may be adapted to access multimedia files from a number of multimedia data sources for playback on one or more different multimedia output devices. The database has to record information relating to the multimedia files stored from those data sources. The multimedia file information from these sources will be compiled in a commonly accessible format. The human-machine interface will provide a graphical interface to the information stored on the database for playback of corresponding multimedia files from the multiple multimedia data sources.

3 D.I.M.A. (Direct Impact Multimedia Application)

D.I.M.A. was conceived as an exploratory project, organized in the “Gheorghe Dima” Music Academy from Cluj Napoca, Romania, which aims to explore the possibilities and to establish the most efficient ways of adapting the on-line educational means to the music education.

Fig. 2 The project’s screen

DIMA is a multimedia anthology of terminology consisting of more than 1000 musical creations focusing on the Romanian creation and performing. The Core of musical examples will be a fund for all education, study degree and research levels.

An anthology of musical terminology interactively connected to information on the cultural and historical context, with links to other sites. The anthology will be made on the basis of a Romanian bibliography (works in the field, courses, didactic books, dictionaries, lexicons)

The DIMA project was elaborated by means of MediaWiki, a free wiki software package, PHP written initially for Wikipedia use. Currently, it is used in several non-profit Wikimedia Foundation projects, and in many other wikis.

Application basic facilities:
- Navigation
- Search
- Changes follow-up
- Editing
- Formatting
- Add, delete, page (sub page) modification
- Link, video, audio recordings addition
- Safety

D.I.M.A. will be implemented on an e-learning platform, thus requiring a serious interdisciplinary approach, prospectively benefiting the educational system.
Starting with the objective of musical education which aims to develop the performing abilities (vocal and instrumental), the perception of music, the use of elements of musical language, the cultivation of the sensitivity and musical creativity, we foresee the using of alternative environments of learning that have a meaningful component defined by new technologies (Nedelcuţ, Plăian 2010). The purpose of the application is to create an easy access database where each term/concept/notion would be associated with multimedia content (texts, images, sounds), thus stimulating the interest in learning.

Fig. 3 Platform facilities

The program’s basic fund will cover certain domains.

Table 1. Domains covered by D.I.M.A. application

<table>
<thead>
<tr>
<th>Domain of performing disciplines</th>
<th>Key instruments</th>
<th>String instruments</th>
<th>Wind instruments</th>
<th>Religious music</th>
<th>Sheet music</th>
<th>Landmarks of the study</th>
<th>technical solutions</th>
<th>Performing examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain of historical - humanistic discipline</td>
<td>History of music</td>
<td>Esthetic</td>
<td>Stylistics</td>
<td>Musicology</td>
<td>Personalities of the worldwide music</td>
<td>Panorama of the 20th century music</td>
<td>Romanian composers</td>
<td>Romanian folk traditions</td>
</tr>
<tr>
<td>Applied music disciplines</td>
<td>Theory of music</td>
<td>Harmony</td>
<td>Counterpoint</td>
<td>Sheet music reading</td>
<td>Systematizations on stylistic stages</td>
<td>Examples</td>
<td>Reference sources</td>
<td></td>
</tr>
</tbody>
</table>

Additionally, D.I.M.A. will also contain:
- an on-line tutorial for improving basic computer skills,
- an introductory tutorial to musical writing.

D.I.M.A. will provide the musician with the information on a given subject from numerous analytical angles. The user of the anthology will be able to access information in different forms: audio, text and images. The novelty of this project consists in the analytical - musicological approach of the registered terms, presenting terminology from different perspectives:
- the history and evolution of the term;
- the reference of the term to be performed on various instruments and in different stylistic stages;
- bibliographical references and selective auditions;
- interactive, practical applications of the term;
- the term in the context of the 20th century Romanian music creations based on the musical patrimony of the „Gh. Dima” Music Academy.

The idea behind this approach is to secure resources that can help pupils to understand the cultural and historical contexts of musical styles and genres in an interactive way (Hamel 2004).

The activities in all areas should be closely connected with the training activity by:
- incorporating the learning opportunities into the working processes;
- extending the focus from single- learning to team- learning , as an organization;
- establishing a curriculum containing subjects directly connected with the tasks of a certain moment;
- sharing the information resources with other partners within the training process.

3.1 System architecture

Project approach is a key to the successful completion of each project. The D.I.M.A. is split up into individual phases, each with its own tasks and deliverables. Each phase provides functionality and payback for the beneficiary. Several steps are necessary to ensure the solution is developed in the most effective, and efficient way according to the main objectives.

The task of a multimedia database server is to build up a system that can manage huge collections of
multimedia data efficiently. Figure 4 depicts the overall request processing of the database server. Fig. 4 Multithreaded database engine architecture

The database is organized according to the domains specified by the users to support multiple media types (text, video, audio and imagery) and operations upon those media. File retrieval and playback are also supported for all media types. Currently, the server in our system supports the following operations: analyzing the multimedia data and retrieving the useful features; processing content-based retrieval for images and videos; listing the contents of a media type.

3.2 Students Feedback
The D.I.M.A. application was tested during the information/instruction process by a group of Gheorghe Dima Music Academy students included in distance learning programs. The content is an open source, as the teachers and students may upload now or in the future new articles or musical examples.

Students were given pre- and post-questionnaires for evaluating the application at its current e-learning platform implementation stage; the students’ feedback referring to the intervention upon the product quality suggested the undertaking of the following beneficial actions:

- on-line availability of educational and information resources;
- informal feedback at the sections’ end to make possible the evaluation of the understanding level of information at the beginning of a new chapter;
- the use of on-line multimedia resources is decisive to the teaching methods improvement;
- ICTs are extremely useful to the learning process;
- these type of resources can be used to the creativity process development;
- DIMA applications allow students to freely use a large variety of learning technologies (video, educational and music soft, etc.)

Students were also involved in creating educational content. It must be said that such an implementation requires a lot of effort but offers plenty of advantages, such as:

- acquisition of teamwork abilities;
- the development of competitive spirit.

By this research we intend to supply a pertinent theoretical framework concerning the registered data methodology, which will guide the development of this interdisciplinary domain. The original elements of this research are referring to an intensified technological approach to the cultural heritage (performance, theoretical concepts and Romanian creations) by discerning the critical aspects needed to design the specific multimedia application – an interactive instrument that will facilitate digital access to the use of scientific and cultural resources. Another opportunity is to create a sound-image combination for multimedia projects in order to stimulate the learning interest.

4 Conclusions
Multimedia is an exciting technology that gives technical communicators a broad range of tools for information designing. Considerations such as: content and organization, style, installation and distribution, legal, and cultural issues bring new challenges for technical communicators. D.I.M.A. will represent a significant resource which, after implementation, will prove its usefulness and efficiency. The goal of the researchers involved in this program is to promote the educational process through modern technology.

In this context, the applications of IT in the educational system represent a dynamic, fully extended field, a central point of interest for both schools and commercial societies active on the education market. In this context, the need for creating standards which should allow interoperability through transfer and use of educational materials in different systems requires immediate attention.

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