New application for Music Libraries: Electronic Music Library

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ABSTRACT

The music and the history of people are almost the same age. However only modern technology opened the door to store music in such forms that we are able to listen. These new document carriers quickly appeared in the libraries and finally instituted the music libraries.
The second part of the 20th century produced the growth of informatics and computer science. The revolution of informatics created new technologies and concepts like digitalizing, digital formats, networks, internet etc. It became visible in life of libraries because these institutes are unimaginable without computers and internet in our age.
In this article I would like to demonstrate a way of usage of this modern technology by Electronic Music Library (EML) program, which is the result of my research. The EML is able to store, retrieve and service sound documents in digital format by network. This system is also able to store a wide range of related information of sound documents, like lyrics, pictures of authors and contributors, scores, and web links too.
First I am willing show the main idea of EML. After this I represent the advantages of this system. I will demonstrate the step of development and the emerging problems, like digital formats or points of laws. Finally I would like to touch upon the possible ways of development and usage.

KEYWORDS: music library, electronic library, integrated library system, audio format, digitizing

The music and the history of people are almost the same age. Since the existence of mankind music is present in daily life of people. But storing of music was an unreachable dream for a long time. The discovery of writing brought along the birth of score. But this storing format of music was not perfect. People were able to write down notes, and play back music from scores, but they were not able to listen to the original interpretation of music. Only the 19th and 20th century brought a significant change in this area.

The dream came true, when Édouard léon Scott Martinville a typographer first realized the wave quality of sound in 1857. Charles Cros an amateur scientist discovered the way of the base of sound store and playback in 1877. At the same time Thomas Edison also came to the same conclusion. Relying upon these findings was born the first model of phonograph on 4th December of 1877. The next step was when Emil Berliner presented the license of gramophone and cheap duplication procedure of records.

The next step was, when the computers came into general use. The informatics and computer science brought along new sound document carriers like CD or DVD and created new digital sound format which are widely used.

Nowadays almost every document carrier has digital format, because this formats have number of advantages:

- less demand for space: a lot of digital documents are available on one single storage device
- file protection: with the use of digital documentation the physical status of valuable original works can be kept safe
- fast access not bound to any location: with the help of Internet technology the digital documents are quickly accessible from anywhere.

Several digitalization programs have been carried out in libraries, but very few have been materialized in Hungary, which make digitalized audio documents accessible to the public within our libraries. One major reason is that the process of digitalization of sound documents greatly differs from that of written documentation. The other reason is that the form and content of the description of audio documentation requires more effort due

to the great number of people involved and also to the nature of collected documents. Despite of the facts mentioned above, several libraries attempt to digitalize and supply customers with sound documents.

The audio or music libraries of the 20th century were opened to the public in order to support mass literacy, and work as independent music libraries or audio department of public library. Music libraries were always different from conventional libraries. The main reason is probably that they deal with not only printed material but they also handle audio files. Audio files must be handled in a different way than written documents.

In Hungary today there are several types of integrated Library Systems in circulation, however none of them, due to their very special nature, is capable of handling audio documents adequately. Most of these systems can access and provide digitalized sound documents. However, there is no efficient multimedia electronic integrated library system that is capable of storing, processing and providing digitalized audio files. Obviously, there is a need to create a specific electronic integrated library system that is capable of handling digital sound documents and satisfy the needs of traditional music libraries too. There is a need for a system that is capable of integrating most of the information in connection to the given audio documents, may that be a picture, video, sound file, web page or any form of electronic data.

Projects have been launched in other countries to create electronic or digital music libraries. However they provide only the basic information on the audio document and the digitalized file itself. These systems do not have any other information regarding the digitalized file. As far as I know no other research is in current progress in Hungary.

When I decided to create the electronic music library first I had to make a decision. The digitalized audio material can be stored with diverse methods. However at the moment there are many digital audio formats which would be perfect for this system. The question arose which form would be the most efficient for library use and naturally in the new system to be developed. I made a comparison between the most popular digital audio formats. My research showed that the Ogg format possesses the characteristics that allow the digital compression to be adequate for library use. Although this is not the most popular format, considering the quality of sound, compression and the acceptance rate this format has proven to be the better than the other compared formats. Another advantage is the possibility of the structured storage of the information connected to the document like MARC or other XML based markup records. In addition, this format is royalty free and ideal for librarian use.

Before the start of developing process I had to clear up another question. The basic criteria of the system, is that is it must not bump into any legal obstacles, therefore I have analyzed in details the opportunities the system has in connection with the copy write laws. I have come to the conclusion that since the law allows the digital servicing of works within the premises of the institutes that provide public services, there is no legal restriction that would prohibits the development of such an electronic music library system in Hungary.

When I realized that there are no other meaningful obstacles to create the system I defined my main goal:

The main goal of the creation of the Electronic Music Library is to prove that such a multimedia integrated system can be set up which is capable of handling the special documents available in the conventional music libraries so that the sound documents along with the corresponding multimedia elements and web references can be stored in digital format and accessible via Internet.

I defined the requirements set of the system. These are defined as follows.

The system has to be able to:

- store and play back the different digital audio formats
- store the special data created by the exhibition of the digital documents, and a wider span of their retrieval.
- handle the MARC format and import and export data with the help of the format
- store and play back the audiovisual forms of sound documents
- identify the original document medium
- store the literary references connected to the sound documents and also reach the corresponding web sites
- store and handle the digital sheet music, scores and lyrics connected to the given music file
- provide the stored data on the Internet or WAP with the copy write regulations taken into consideration
- store the data about the readers enrolled in the library and also track their activity conducted in the system
- contain the mechanisms needed for digitalization, sound-manipulation, and an adequate process needed to create digital formats.

In aware of these facts I surveyed the advantages of this system which are the result of the usage of Electronic music Library in contrast with the services of the conventional library system. Some of its advantages have derived from digitalization itself and the services provided in digital formats:

- During the exhibition of the documents a lot of information is defined and they can be turned into search topics with such a system. This way the system can provide a wide range of research options.

We can search title of album, title of record, language, storing number, lyrics, collaborators, classification expression, publisher, publication year, type of sound bearer, form, hyperlinks, etc.

- Regarding the preservation of the original documentation set, the original track is subjected to the possibility of physical damage only in that case when the audio bearer is being digitalized. The digitalized copy will be supplied afterwards.
- The quality of old or frequently used files can be corrected with the help of filters. This way a part of the burr and noise can be filtered out.
- The found documents are immediately accessible by the reader and can be listened to.
- The user has the opportunity to browse through the files by playing a 10-20 second intro of each file.
- There is no need for wires, a simple computer system with Internet access is enough with the device of WLAN.
- With the help of the computer system more than one user can simultaneously access the database from remote places not just in the reading room of the library but from any part of the library itself.
- The works can be independently listened to and one can interrupt the replay at any moment, it could be fast forwarded or rewound if needed.
- The system can be extended to the realm of the Internet. This way it would be independent of place and time- Only the copyright and loyalty laws create limits.
- The system can also be extended to the world of cell phones.
- Automatic statistics can be generated on the use of the system. This way, librarians can work on getting files based on the needs and interests of the users. Also music listening habits of users can be observed.
- Apart from servicing of the sound document itself more information can be provided about and in connection with the work.

I established that this system with these advantages gives a new and very usable service to the music libraries. Before I started to realize the system I had to answer two fundamental questions.

The first question: What program language the system should be written in? I chose a Java object oriented language because of its platform independence and support.

The second: Which database management program should be used to store data? For the database management program I decided on the MySQL system because it is free, reliable and easy to use.

Considering all these facts I was able to start developing the Electronic Music Library system. When we deal with an electronic integrated library system it is very important to view what type of data will be stored from the given documents and in the format it will be done in. Therefore I found it important to introduce the MARC format which is the basis for every integrated system today. As the developed system deals with electronic documentation I find it important to keep in view the Dublin Core offer when creating the plan for my system.

I defined two groups of stored data: The first group contains the data of album, followings:

- Album identifier
- Title
- Author
- Publisher
- Publication date
- Copyright
- Face of cover
- Reverse of cover
- Length of time
- Type of sound bearer
- Storing number
- Collaborators
- Form
- Data of record
- MARC format
- Inventory number
- Orchestral score
- Literary linkage
- Hyperlinks
- Remarks

The second group contains the data of record of album:

- Ordinal number
- Title
- Author
- Collaborators

- Source of record (if it is a downloaded record from internet)
- Lyrics
- Digital formats
- Video
- Orchestral score
- Form
- Language
- Length of time
- Hyperlinks
- Inventory number
- Literary linkage
- Remarks

While defining the material to be stored I took into consideration the MSZ 3424-9/1988 standard on document exhibition and the earlier mentioned offer of the Dublin Core. These data fields clearly determined the structure of database schema. I placed the data meant for storage in schema and in the end I got 22 tables after normalization with difficult connections.

This schema opened the door to create the program. The completed program is still a demo version, since its main function is to prove the fact that such an idea can be materialized, therefore it does not contain all possible functions, and also, not all applications seen in the menu are active.

I build up this demo version with four modules.

- Library module: This provides the librarian with the needed tools to perform the basic work process. The parts are:
  - Digitalization: This part of program is unessential, because we found many god quality digitized program.
  - Document management: The librarians here can store the new data and modify the existing data of albums and records.
  - User management: The librarians here can manage the user data. They can take down, modify and search data from users.
  - Searching: The librarians here can search data in many different ways. Almost every data is searchable in this program.
  - Statistics: The program stores automatically the data of usage. In this way the librarians can simply create statistics automatically and follow closely the usage of system. This opens the door to develop this system by user's demands.
- User module: The main tasks of the module are the management of personal data of the user, the advanced search of the document. The parts are:
  - Personal data of the user: The user can check his main data and the data of the last usage. In this way the user can continue his listening to music.
  - Search: This is the same like the library module's search.
- Internet module: This module provides the opportunity for the user to search the database via the Internet through a browser. In this case the system must be closed and accessed safely, in other words the documents set for listening should be impossible to be saved, and unauthorized users should not have any access to the database. This application is not accessible in demo version. The main reason for this is the copyright, which is not allows the free access of database via internet.
- WAP module: the module allows the access to the database through WAP. This is not accessible in the demo version.

The program stores data and disposes many functions that other integrated systems cannot or can just partially support. Here come some characteristics of the program:

- The program allows safe access thereby access to the database is only granted through the unique reader's card number and password for those users with valid cards.
- The infrastructure in the given library can be modified freely based on its library classification system.
- Any document connectible to the album in the library can be given a stock number and the program makes it visible which stock number covers the original of digitalized work. In this way the user can reach the original and related documents of library too.
- Any number of web pages can be connected in the system to the album and recording by giving its URL and a name. These URL are displayable by browsers from the program.
- Any name recorded in connection with the creation of the given sound document can be given. Their role can be marked and a photo and a web site can also be linked to their name. These contributors are searchable.
- The digitalized copy of the cover of the album is also added. The user can identify the album and record by pictures too.

- An electronic document containing the score of the album or recording can be uploaded to the system.
- If the sound document is of a given event or concert the information on it can also be given in the database.
- The librarian can provide any literature connectible to the works.
- In case of existence of lyrics it can be also added and made available in the system. For this reason the records are searchable by part of lyrics.
- One of the most important points to mention is that the digital formats of a given sound recording can be uploaded in the system. To each record several different digitalized formats can be added.
- Video files can be attached to the given recordings.
- We can mark the language the sound documents are recorded in.
- The user can perform an advanced search in the system at the level of the album or recording. The full system allows an advanced search in all topics and all information regarding the sound documents whereas the demo version only makes a limited search available.
- The find option allows us to connect to the albums containing the given recording or the recordings of a given album.
- Apart from the basic information on the album or recording the system allows a large view of the corresponding images and also the connecting links to be opened by using a web browser.
- One of the most important functions is that the recordings or albums in the set of found elements are immediately accessible for listening with the help of play application of the system. We can simultaneously listen to the tracks and use other functions and applications provided by the system.
- Statistical measures and statements can be made with the help of the program on the operation of the system or on the activity of the users. At this stage the demo version does not allow this function.

The demo version of the Electronic Music Library opens the doors to a great number of opportunities for further development. The program is not complete as several functions work in a restricted way only. The most important step in further development is making the existing search agent more precise, efficient and it expand its opportunities. Some of the possibilities are the following:

- Backtracking based on the sheet music: Here in the saved scores there would be a well recognizable theme or part of the notes. The only thing needed to make this form of search possible is the digitalized version of the sheet music. This way is complicated, because first we have to digitize the sheet music and after that it recognizes the parts of notes with image process. The reason would be a MIDI form. Then we have two ways to find the music. The first, to compare this MIDI form to the stored scores. If we find matches we can serve the audio documents immediately. The second try is to identify the wanted document by sound. This leads us to the next point.
- Backtracking based on a tune: a given musical work can be found in the database based on its melody. The melody imported to the database can be in different forms, namely human voice, MIDI or any other digital recording. This melody has to compare to audio documents. It is very complicated. The music has tricky harmony, and we have to simplify this harmony only one strain to compare to the given melody. This demands a very good sound recognition process. This problem is handled by artificial intelligence.

The current version of the program is prepared to handle the OGG format, but it is already capable of storing other formats. The system is still to be developed to handle the most possible digital formats of the documents provided it observes the laws of loyalty.

An important developmental aim is to make the system compatible with all integrated library systems, in order to work simultaneously with existing programs.

There are many areas of development regarding the Internet and WAP, but before that the copy right and loyalty regulations have to be made clear.

The current demo version of the Electronic Music Library can already be put into use and further development can also be started. While creating this system I worked closely with the persons of the Department for Library Information Technology of the Debrecen University and the University and National Library University of Debrecen. Also at these establishments I worked together with the librarians who are responsible for the exhibition of music documentation. These librarians have declared that they are willing to introduce this new system in their libraries.

The greatest opportunity within the Electronic Music Library is not the large number of possibilities of further development, but that it could serve as the base of similar electronic library systems responsible for serving multimedia information, e.g. films, photos, etc. Therefore the next step of development will be the Electronic Multimedia Library which could handle all type of media together in one system.

REFERENCES

1997. évi CXL. törvény a kulturális javak védelméről és a muzeális intézményekről, a nyilvános könyvtári ellátásról és a közművelődésről 56 § (5) (1997), from http://www.1000ev.hu/index.php?a=3&param=9559

1999. évi LXXVI. törvény a szerzői jogról, from http://www.artisjus.hu/opencms/export/download/aszerzoijogrol/szerzoi_jogi_torveny.pdf

Az ARTISJUS Magyar Szerzői Jogvédő Iroda közleménye I 09 zeneművek nyilvánosság számára egyedi lehívásra („on demand") hozzáférhetővé tétele fejében fizetendő szerzői jogdíjakról, valamint a felhasználás engedélyezésének egyéb feltételeiről. *Hivatalos értesítő. XII. évf. 2009/8. sz.*, p. 2475-2484, from http://www.kozlonyok.hu/kozlonyok/Kozlonyok/12/PDF/2009/8.pdf

Audio Formats, from http://www.geocities.com/seanbyrneprogrammer/Audio_Formats.html

Bakonyi, G., Kokas, K. (2006) *Integrált könyvtári rendszerek. Bevezetés a könyvtári informatika alapjaiba.* Szeged: JATEpress

Dublin Core from http://dublincore.org/

Ficsor, M. Z. (1999) Szerzői jogi gondolatok a könyvtárról. *Tudományos és műszaki tájékoztatás*, *46*, 11-12, 434.

Fraunhofer intézet, from http://www.fraunhofer.de/fhg/EN/index.jsp

Greguss, F. (1986) *Élhetetlen feltalálók, halhatatlan találmányok.* Budapest: Móra Ferenc könyvkiadó

Horváth, P. (2003) A digitális (elektronikus) könyvtár. *Könyvtárosok kézikönyve. 4. Határterületek.* (p. 176–193.) Budapest: Osiris,

Iszaly G. B. (2009) Elektronikus Zeneműtár, Debrecen: Debreceni Egyetem. TTK.

Iszály, G. B. (2005) EZ a jövő! Az Elektronikus Zeneműtár megvalósíthatósága *Networkshop 2005.* from https://nws.niif.hu/ncd2009/docs/ehu/112.pdf

Iszály, G. B. (2006) A WAP alkalmazásának lehetőségei a könyvtárakban *Tudományos és műszaki tájékoztatás 53,7-8*, 354-359, from http://tmt.omikk.bme.hu/show_news.html?id=4468&issue_id=474

Indiana University Digital Music Library Project. from http://dml.indiana.edu/

Java from http://java.sun.com

Jens, A. *Comparison of Digital Audio Formats!* from http://www.cdburner.ca/digital-audio-formats-article/digital-audio-comparison.htm

Lagoze, C., Payette, S. (1998)An infrastructure for open-architecture digital libraries. *Computer Science Technical Reports*, TR98-1690, June form http://ecommons.library.cornell.edu/bitstream/1813/7344/1/98-1690.pdf

The Library of Congress Digital Audio-Visual Preservation Prototyping Project. from http://www.loc.gov/rr/mopic/avprot/

Lossy audio formats comparison from http://www.bobulous.org.uk/misc/lossy_audio_2006.html

Magyar Szabvány MSZ ISO 15836, Információ és dokumentáció. A Dublin Core metaadat elemkészlete. (2004. szeptember) Budapest: MSZH from http://www.mszt.hu/dokumentumok/134715.pdf1

Magyar Szabvány 3424/9-1988 Bibliográfiai leírás. Hangdokumentumok (1989) Budapest: MSZH,

Microsoft, Windows Media Audio Codecs from http://www.microsoft.com/windows/windowsmedia/forpros/codecs/audio.aspx

mp3licensing.com from http://www.mp3licensing.com/

MySQL http://www.mysql.com/

The New Zealand Digital Library from http://www.nzdl.org/

Nippon Telegraph and Telephone Corporation from http://www.ntt.co.jp/index_e.html

Tóth P. B. (2001) A szerzői jog könyvtárakra vonatkozó rendelkezései *Tudományos és Műszaki Tájékoztatás*, 48, 2, 64-70 from http://tmt.omikk.bme.hu/show_news.html?id=1266&issue_id=23

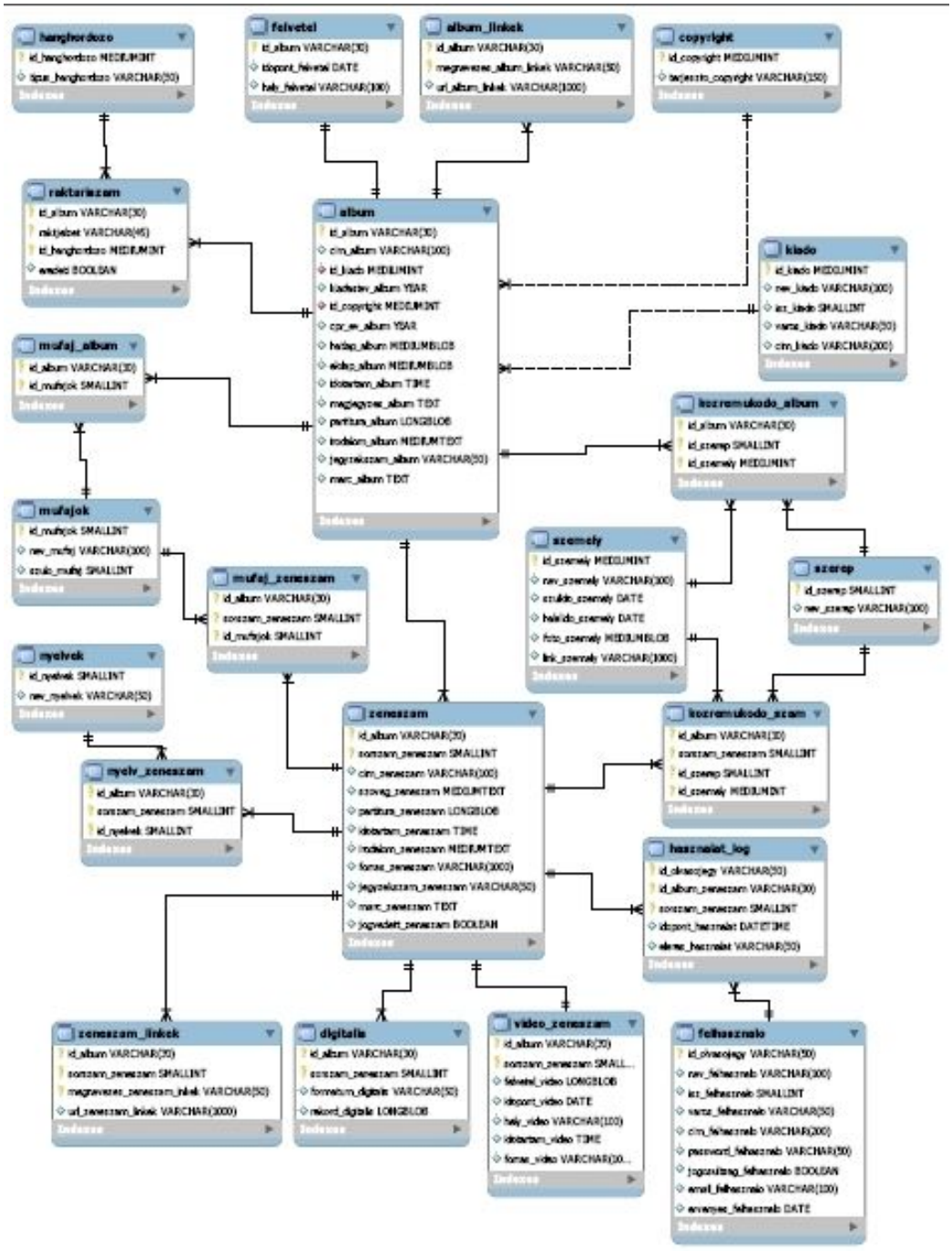
Tritonus: Open Source Java Sound from http://tritonus.org/

TwinVQ from http://www.reference.com/browse/wiki/TwinVQ

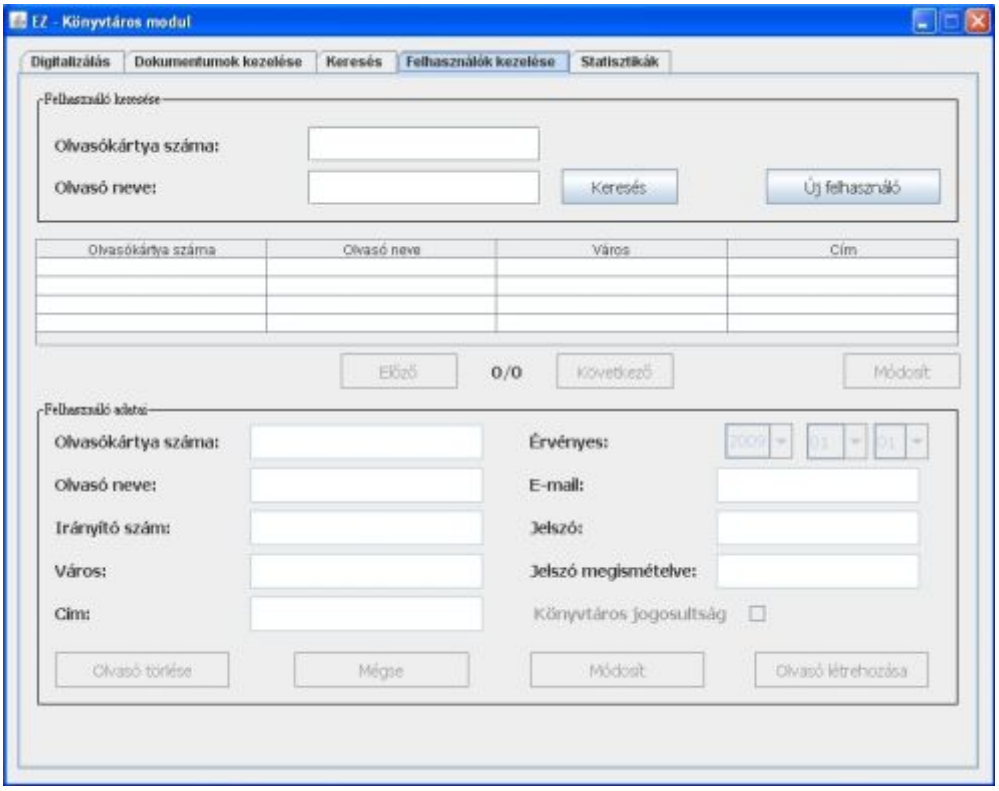
Vorbis.com from http://www.vorbis.com/

Yamaha Global Home from http://www.yamaha.com

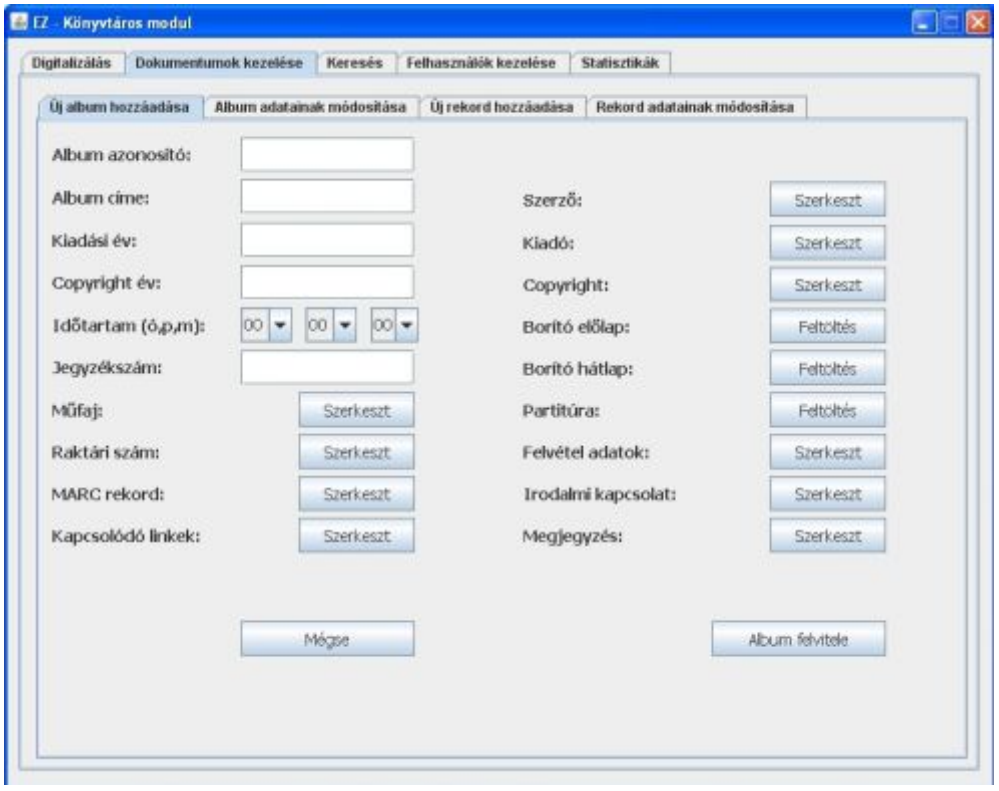
ATTACHMENTS



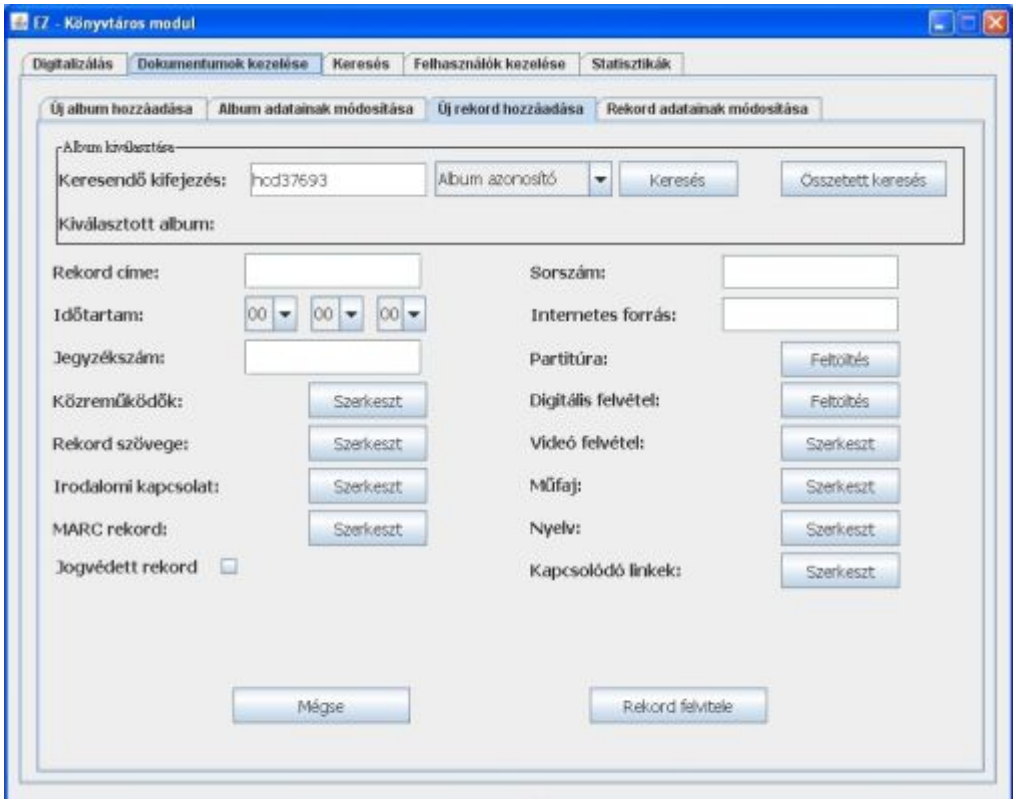
1. Picture: Database schema



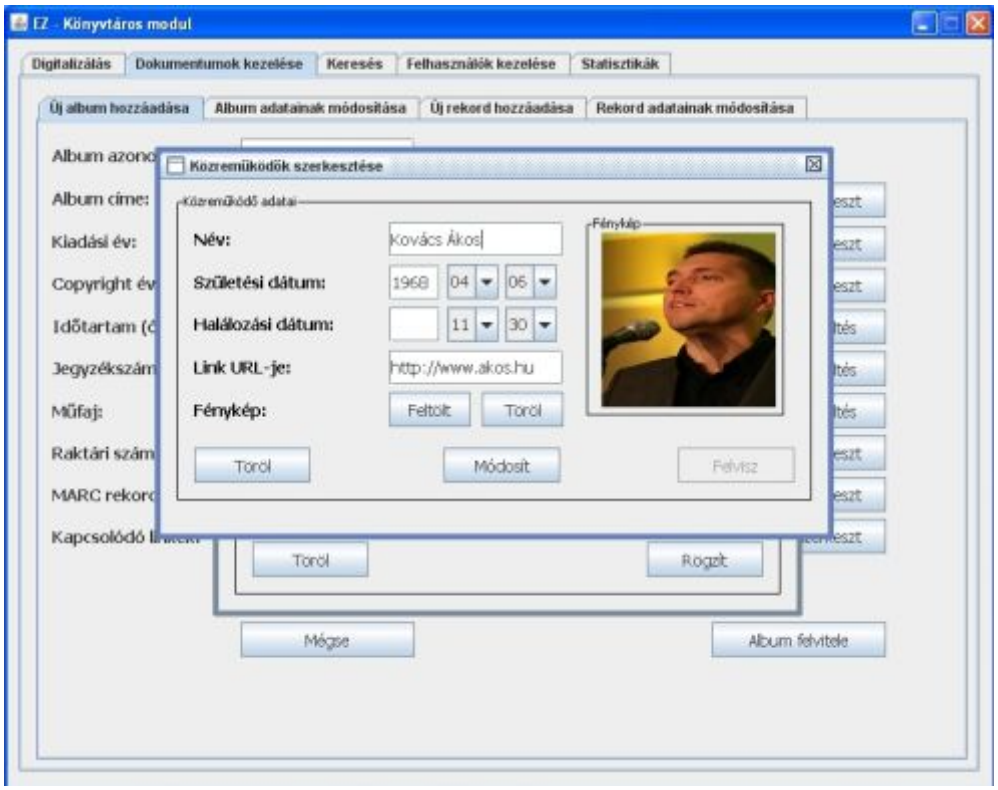
2. Picture: Library module – User management



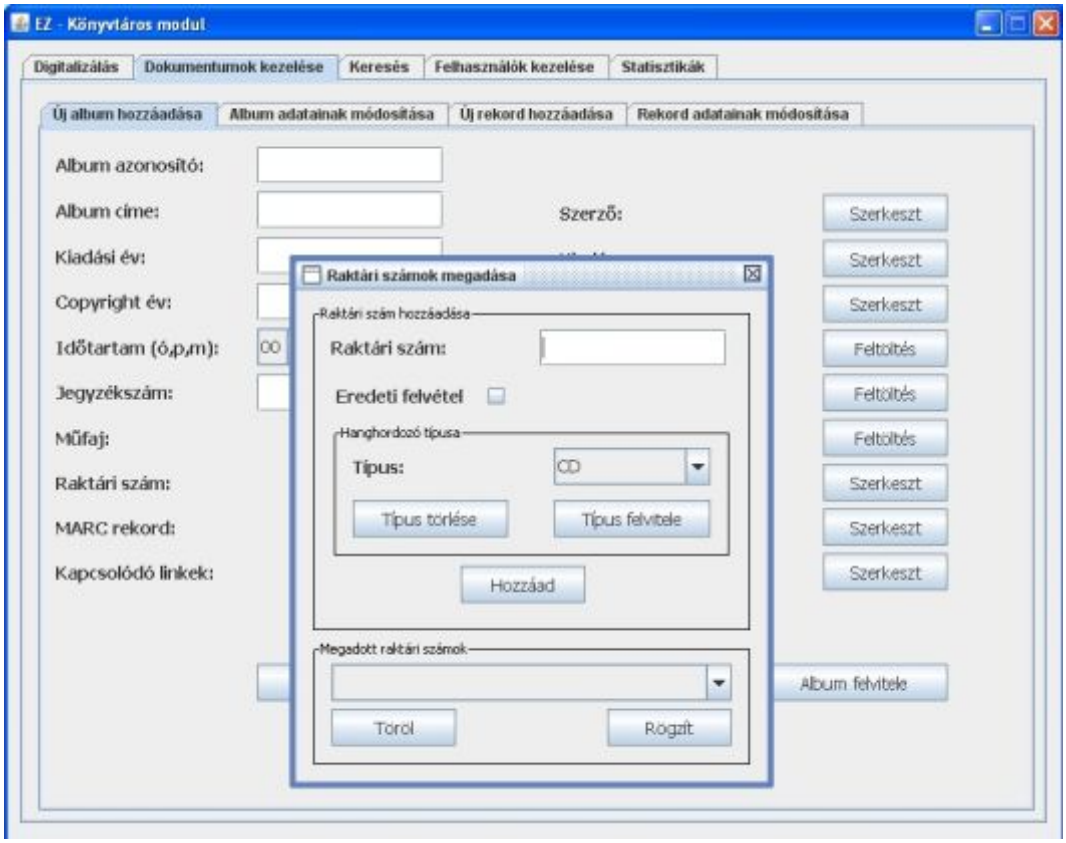
3. Picture: New album panel



4. Picture: New record panel



5. Picture: Collaborator data



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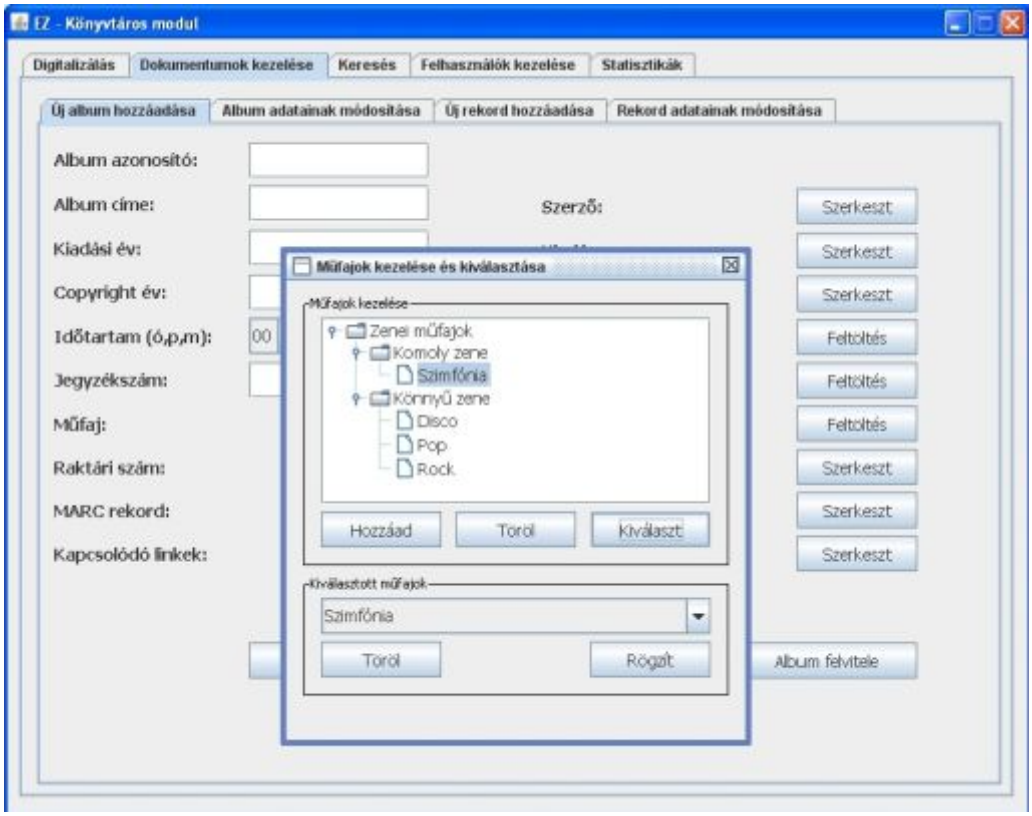
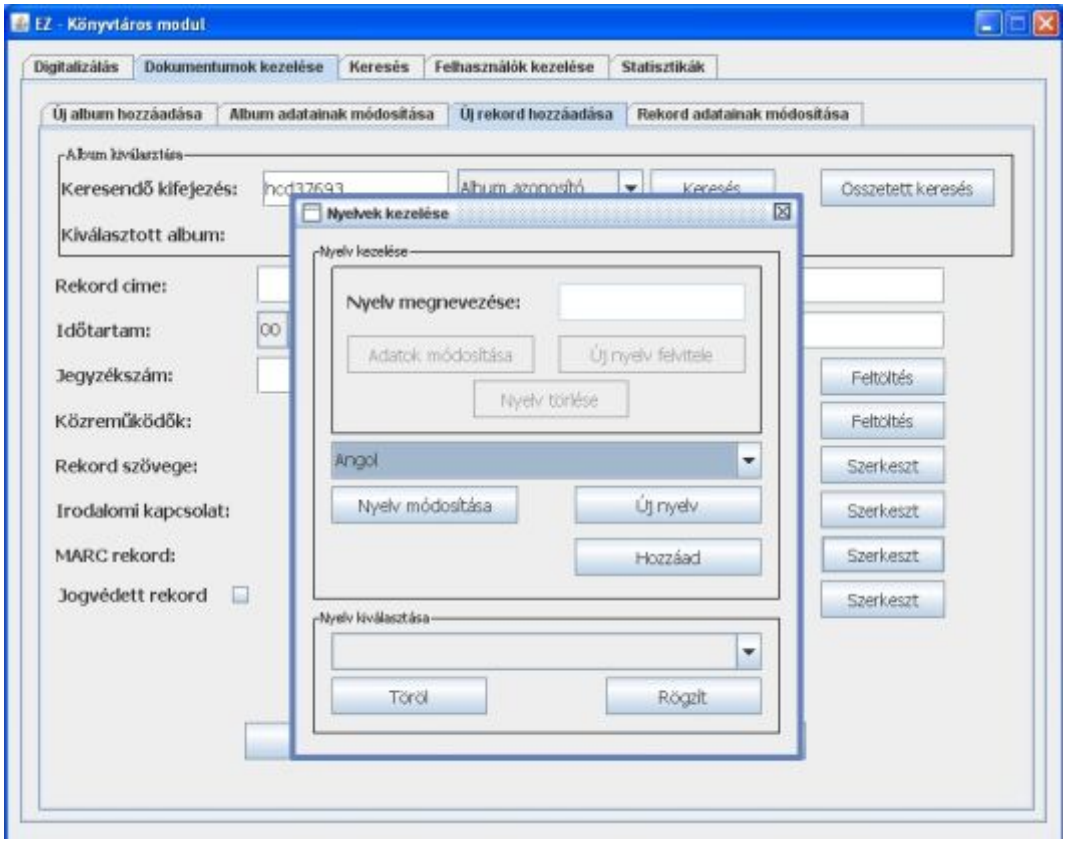


7. Picture: Form panel



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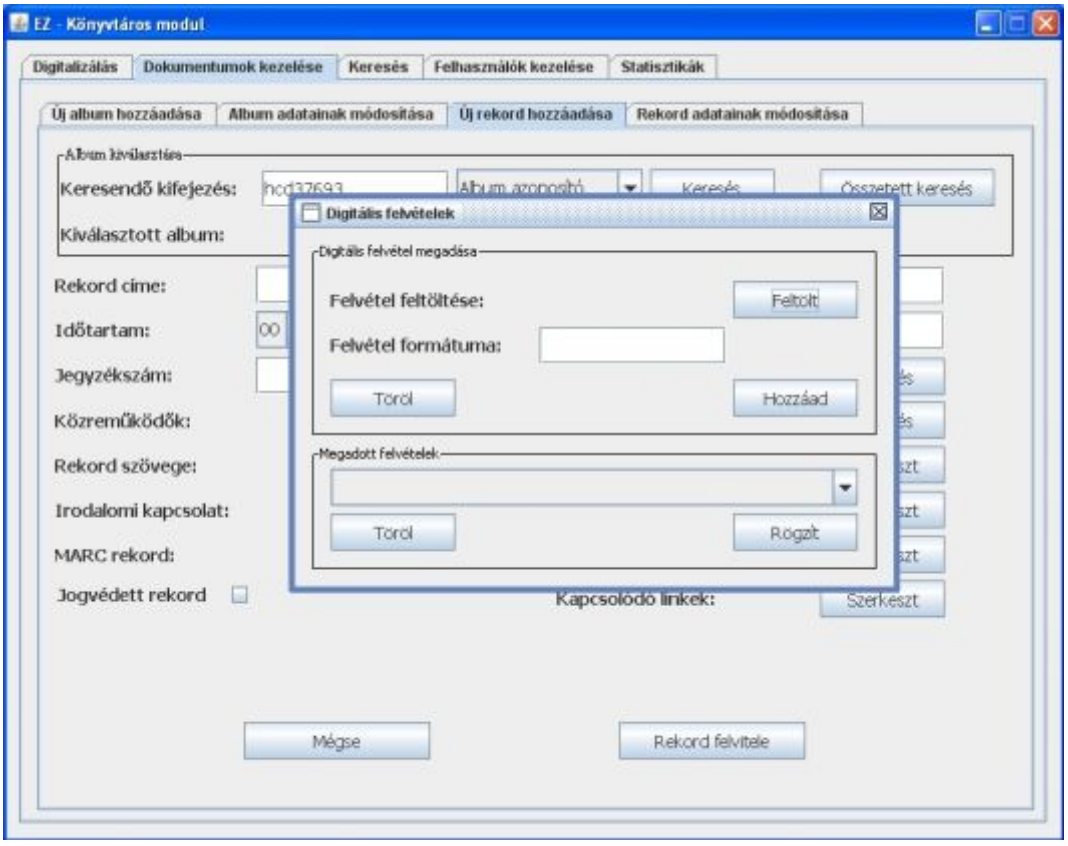
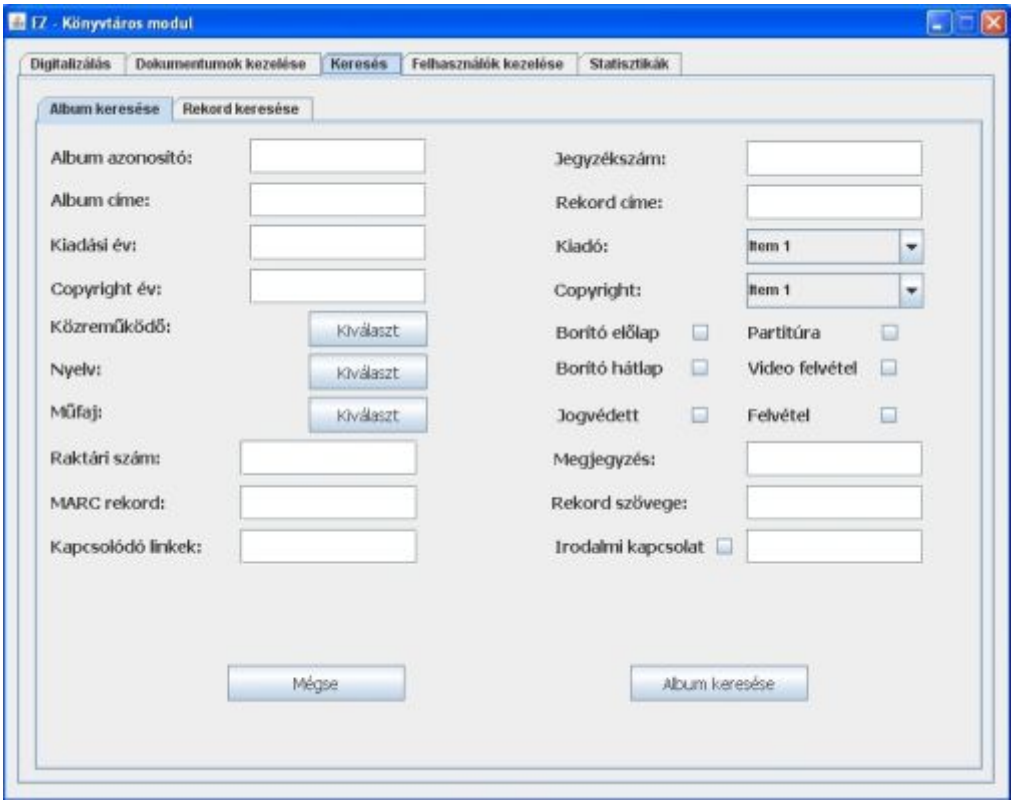
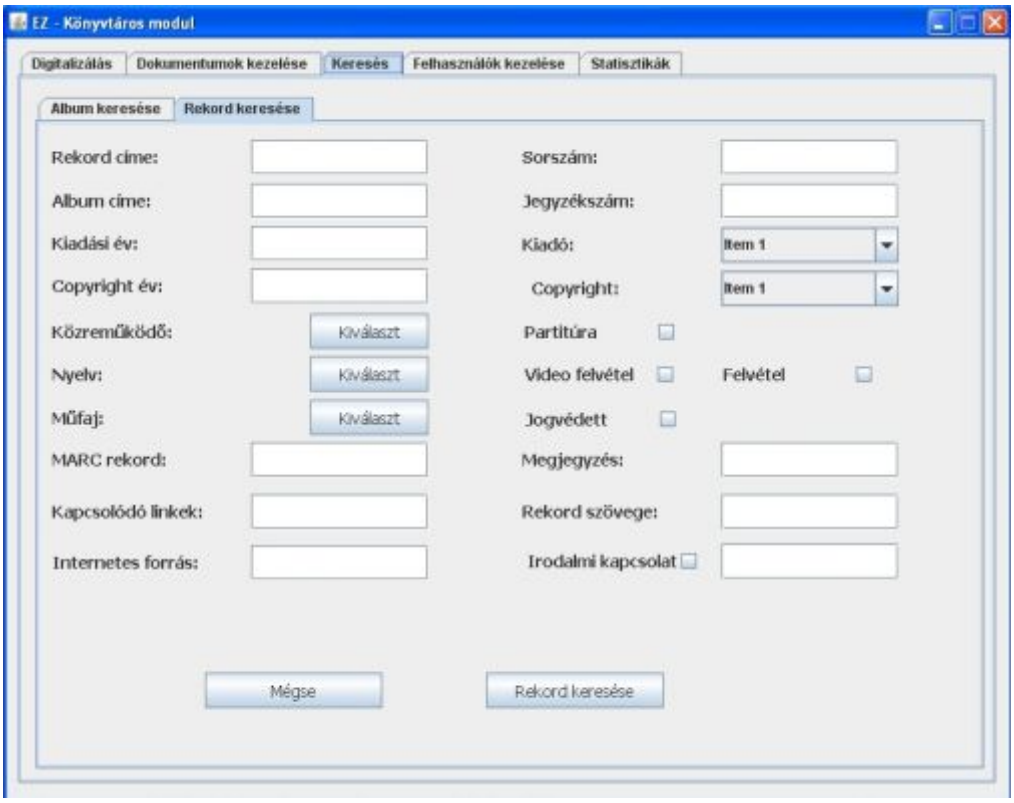


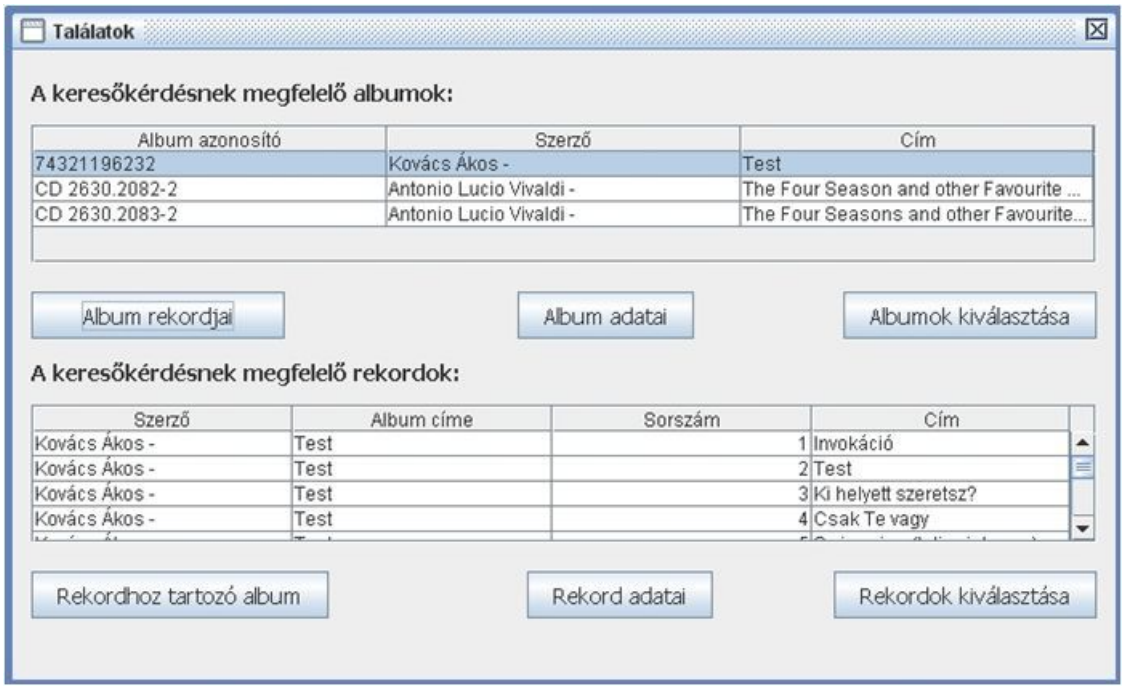
9. Picture: Digital record panel



10. Picture: Searching albums

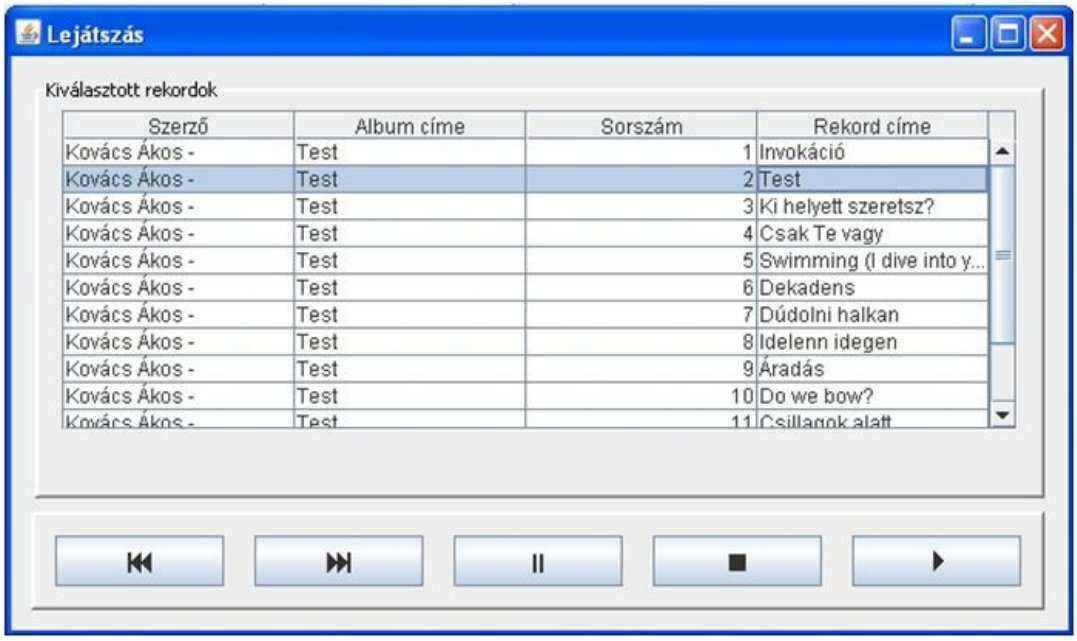


11. Picture: Searching records

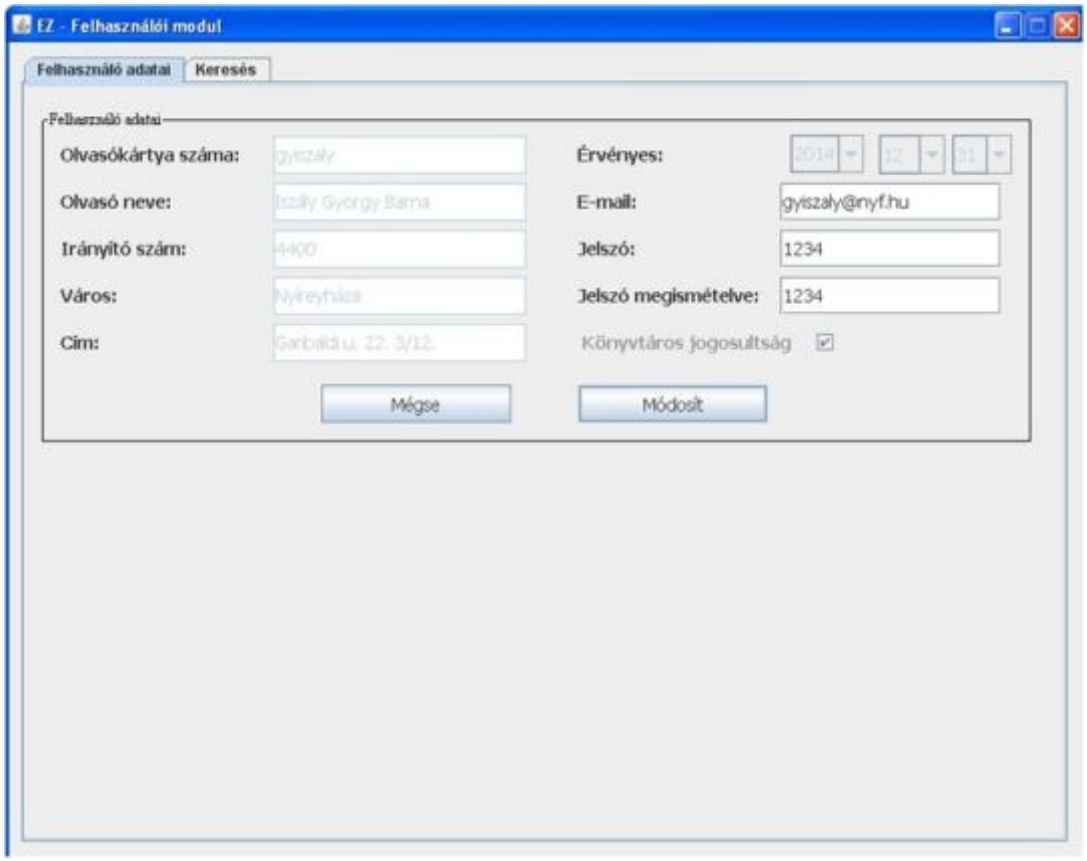


12. Picture: Result of searching

13. Picture: Data of album



14. Picture: Player



15. Picture: User module