Usability Test of VARIATIONS and DML Prototypes

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Overview

To aid in user requirements and task analysis for the Digital Music Library (DML) project at Indiana University, a baseline usability assessment was conducted of Variations (the current resource for online musical recordings for music students and faculty) and the online musical prototype for displaying scores. Users also gave reactions to early prototypes of the DML interface in an informal discussion session. The tests took place in the Usability Lab at SLIS. All data collected from the testing and informal discussion sessions are summarized in this document.

Variations

The Variations system provides online access within the William and Gayle Cook Music Library to over 5,000 digital music recordings of standard musical repertoire identified as central to the teaching mission at the Indiana University School of Music. An average of 500 sound recordings are accessed daily through Variations. The Variations database specializes mainly in the classical repertoire, but also includes some jazz, rock and world music.

Variations recordings are only accessible from computers in the Cook Music Library at IU. There are three web access points to Variations files:

- Links from the Course Reserves page within the Music Library web site.
- Links included in IUCAT (Indiana University library catalog) item records.
- Links from professors' online syllabi.

Once a Variations URL is clicked from one of these access points, the user is provided with the Variations catalog entry of an online recording (see Figure 1). From this point the user may listen to the recording via the Variations Player Interface (see Figure 2).
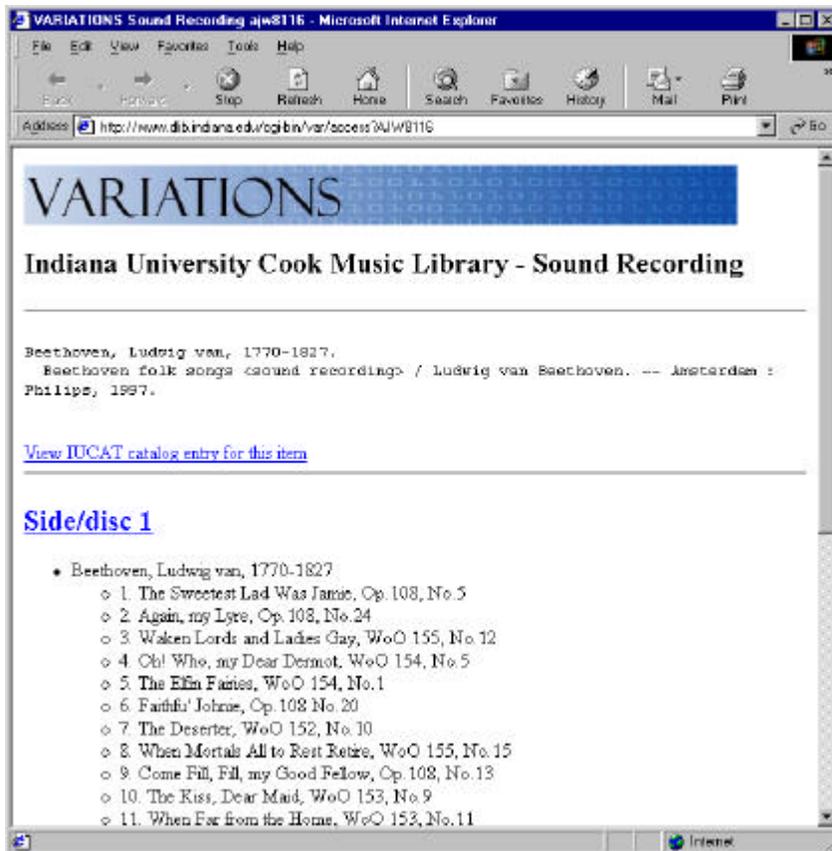
Figure 1: *Variations catalog entry of an online recording. User clicks "Side/disc 1" to bring up the Variations Player interface.*

Figure 2: *The Variations Player interface*

The Online Musical Prototype

The online musical prototype (see Figure 3) displays digital images of scores. There are about 110 online scores of operas, songs, orchestral and choral works, chamber and piano music. Each link providing access to an online score is hard coded in the Music Library home pages. The online scores include the title page and are indexed by content (such as movement). Full bibliographic information is linked to the score interface. Some scores also have links to the associated Variations online recording available for listening while viewing the score, but this is not the case for all scores with sound files existing in Variations.
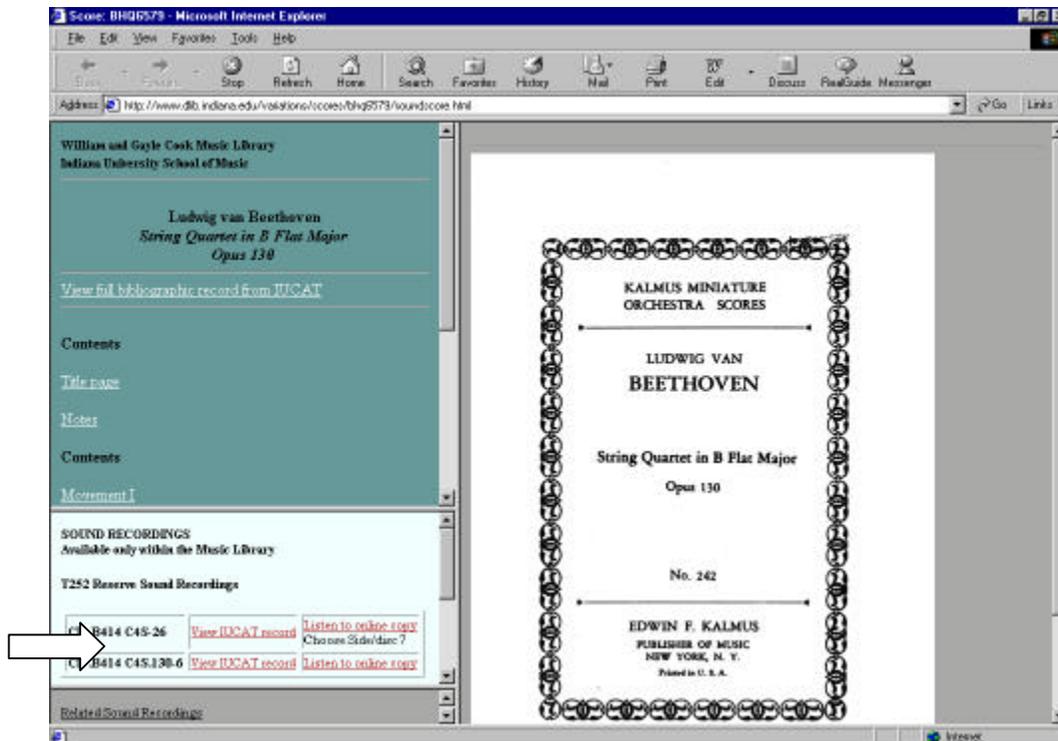

Figure 3: Online musical score prototype display of Beethoven's String Quartet in B Flat Major, Opus 130.

DML Prototypes

Several early DML prototypes have been created in order to facilitate brainstorming within the team as well as to provide a sounding board for users to react to possible features that will be included in the DML. The prototypes shown to the users include:

- A non-functional web-based item record interface (see Figure 9)
- A functional audio player and linked score application (see Figure 10)

Users

Nine users were recruited for this test phase, three from each of the following user groups,:

1. Music theory students,
2. Music studio students,
3. Users not affiliated with the School of Music.

The music theory user group and the music studio user group consisted of undergraduate music majors at Indiana University who had approximately 2 years of experience using Variations. Upon scheduling of the test time, the music student users were asked to identify themselves with either the theory or the studio user group. It was a matter of personal identification that users chose which user group they participated in.

The non-music user group consisted of users who were not affiliated with the School of Music and had no Variations experience. Non-music users would use Variations for personal listening pleasure or for personal research of musical works.

All users were individually observed in the SLIS Usability Lab (see Appendix 1 for full demographic details)

Procedure

Users came to the usability lab at their scheduled time and were briefed on the purpose of the tools to be tested and the tasks involved. Users were instructed to speak aloud as they worked through the tasks and that they had as much time as desired to complete the tasks (see Appendix 2 for test plan including the script). Users were provided with their choice of browser.

Each user attempted two or three tasks, depending on the user group to which he/she belonged (see Figure 4 for task list and Appendix 2 for the test plan and procedure). These tasks were developed by the testers and approved by music faculty and librarians on the DML team as typical activities of each user group. Tasks for each user group were structured with that user group in mind. While certain tasks were similar across groups (such as finding and listening to a piece), no tasks were exactly alike. Tasks for Non-music users were general in nature (such as "find a work of jazz to listen to") since these students did not have the background of the music majors.

Users provided a verbal protocol of their thoughts while completing the tasks. This technique provides investigators with information about what the user is attending to and thinking. The test sessions were video-recorded for subsequent analysis. After the sessions, users filled out an adapted QUIS questionnaire about their experience (for more on QUIS, see section Data Collection).

After completing the Variations tasks, users were briefed on the aims of the DML project and shown the prototype interfaces for the DML (see Figures 9 and 10). With an evaluator sitting by their side for this portion of the test, users were asked for impressions of the interface and their perceptions of the interfaces' usefulness for their purposes. They were encouraged to comment on what they liked and disliked about the interfaces and the functionality offered. Users were also asked to recommend design solutions to any problems they saw or to think of scenarios of use that may not be well supported by the interfaces. Each session lasted about an hour. Upon completion, users were thanked for their efforts and arrangements to pay them their $10 stipend were completed.

User Type I — Music Theory Student
Task 1: I am taking a music theory course and, according to my professor's syllabus, I will need to mark the phrasing, motifs, and sections on a paper copy of the score of Beethoven's Piano Sonata Op. 13, movement II to hand in as an assignment. My task is to find an online score of this piece and print it out.

Task 2: My professor has assigned me several pieces that I need to identify on an aural exam. The recordings on reserve are all checked out, but my professor mentioned that they are also available online. My task is to find and listen to an online recording of the third movement of Boccherini's Symphony Op. 12 No. 1 in D.

Task 3: I am taking the T152 theory class, and according to the syllabus, I need to listen to "The Banshee" by Henry Cowell. My task is to locate and listen to this recording from the Music Library's Course Reserves web site.

User Type II — Music Studio Student
Task 1: I have a printed score of Beethoven's Symphony No. 5 and my studio instructor has asked me to listen to a recording of it on Variations and make notes in my score about style and phrasing. My task is to find and listen to this piece on Variations and to explore the interface features such as stopping, pausing, and skipping around different tracks.

Task 2: I am in a conducting studio and need to familiarize myself with Beethoven's Third Symphony, op. 55, in Eb major, in order to conduct it. My task is to look up the Variations recording of this as well as view the associated score online.

User Type III — Non-Music User
Task 1: I want to listen to the duet *"Au fond du temple saint"* but I can't remember who wrote it. My task is to locate and listen to an online recording of this piece.

Task 2: I like jazz and want to listen to some while I do my homework. My task is to find some jazz to listen to.

Figure 4: List of tasks by user group

Data Collection

Effectiveness was scored by noting user success or failure in completing tasks. An adapted version of the Questionnaire for User Interface Satisfaction (QUIS: Chin, J.P., Diehl, V.A., Norman, K.L., 1988) provided quantitative measures of satisfaction with Variations (see Appendix 3 for full questionnaire). Items on the original version of QUIS deemed not useful (e.g., "System Capabilities: System tends to be Noisy/Quiet") were excluded from this version in order to prevent user confusion.

Time spent on each task was also collected. However, it should be noted that participants were allowed to take their time with each task, and therefore were not consciously making an effort to be efficient. Furthermore, the act of providing a verbal protocol is known to slow down normal task processing and may increase time on task. As a result, time scores should not be interpreted as true efficiency measures.

Qualitative data collection was based on verbal protocol and free form comments written on the questionnaire.

Findings

The flow of interaction with Variations and the associated web pages exists as three definable stages from the beginning of the search until the end goal of listening to a recording on the Variations Player (see Figure 5).
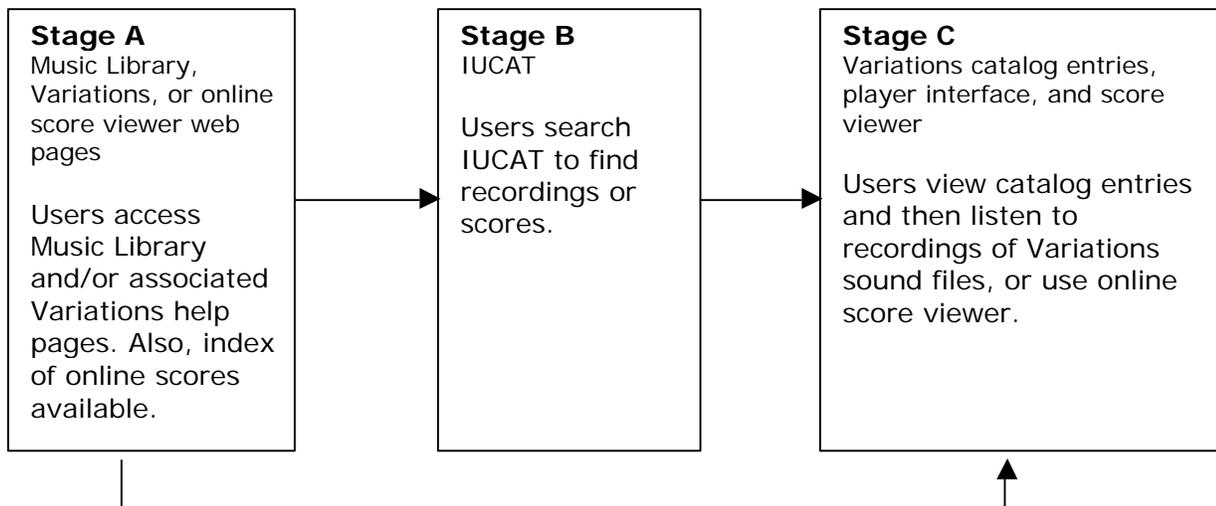
| **Stage A** Music Library, Variations, or online score viewer web pages

Users access Music Library and/or associated Variations help pages. Also, index of online scores available. | → | **Stage B** IUCAT

Users search IUCAT to find recordings or scores. | → | **Stage C** Variations catalog entries, player interface, and score viewer

Users view catalog entries and then listen to recordings of Variations sound files, or use online score viewer. |

Figure 5: Interaction flow with Variations and associated web pages.

Stage A includes the associated Variations web pages where users can access:
- Background information on Variations
- Tutorials on using Variations and IUCAT (Indiana University library catalog)
- Variations catalog entries and IUCAT
- The entries existing for the online musical score prototype
- Course Reserves
- Professors' online course syllabi

It is from this first stage that users can move on to Stage B or C:

Stage B is where users search IUCAT in order to find recordings or scores. IUCAT is separate from Variations and the Music Library and is a search engine used University-wide to retrieve library item records.

Stage C is where users finally view Variations catalog entries of recordings and have the option to listen to the sound file using the Variations Player Interface. (Occasionally users must wait while the sound file is retrieved from tape. This time is noted where necessary, but not included in Stage C times or overall task times.) Stage C also includes the online score viewer.

The following charts (Figure 6) show the proportion of time each user group spent in each stage of the interface:
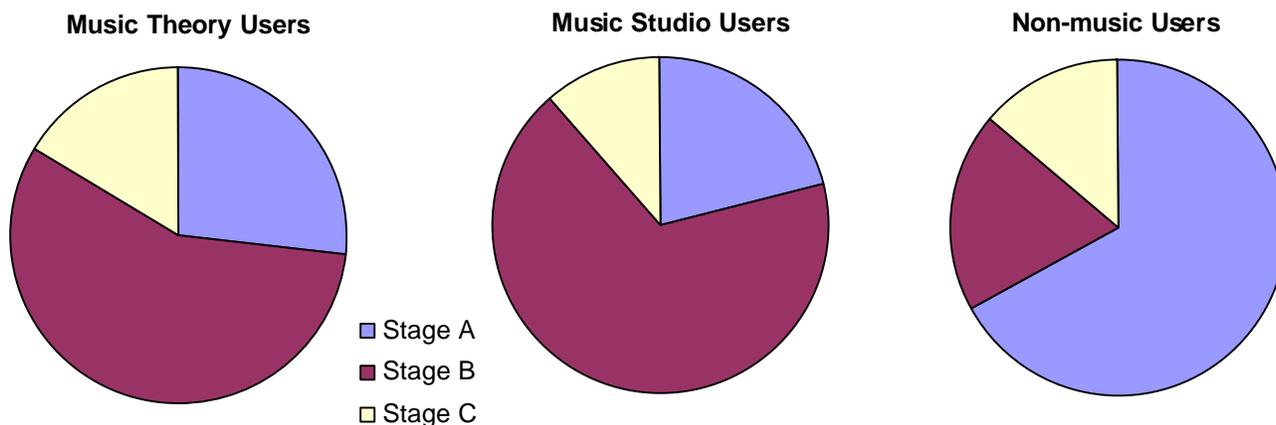
Music Theory Users **Music Studio Users** **Non-music Users**

■ Stage A
■ Stage B
□ Stage C

Figure 6: *The proportion of time each user group spent in each stage of the interface.*

Both the music theory and music studio user groups spent most of their time in the searching stage (B) of the interface (57% and 68%, respectively), while the non-music users in contrast spent 67% of total time in Stage A, the informational and help pages. Since the non-music users were also novice users, they spent a considerable amount of time with the tutorials and help pages for the system, whereas the experienced users began a task by immediately going to IUCAT and starting a search.

Generally, time spent on tasks was similar between theory and studio users, however the non-music users spent more time per task (see Figure 7).

Music Theory	
Task	Average Time
1	4:16*
2	3:38
3	1:44

*1 of 3 users gave up

Music Studio	
Task	Average Time
1	2:01
2	3:51

Non-Music	
Task	Average Time
1	14:23**
2	5:42

**2 of 3 users gave up

Figure 7: *Average time per task per user group.*

Upon analysis of the data captured on video, it is clear that this time difference is due to difficulty in navigation through Stage A and difficulty in searching in Stage B (details below). Time spent in Stage C (at the Variations catalog entries)is fairly equivalent for all user groups (see Appendix 4 for detailed timing data).

The following issues each user group had with every stage of the system are drawn from observing user behavior, verbal protocols, and comments written on the questionnaire.

Experiences with Stage A (Help and information pages, Course Reserves):
Music theory users
- All three users had no problems completing the task that required them to find a piece to play from the Music Library's Course Reserves page. Users remarked that the alphabetical listing of courses and composers' last names made it easy for them to find the piece. The frequency with which these users perform this task in real life might also contribute to the users' ease of completing this task.
- User 1 unsuccessfully tried searching for an online score in IUCAT, not knowing that the desired score could be found in Stage A (this user did not complete the task). This user did not consult help material even after experiencing difficulties.

Music studio users
- Two users found online scores via Stage A. Aside from this, these users did not use any Stage A material.

Non-music users
- All three novice users began each task by reading the help pages.
- One user wanted links from the help pages to open new windows so he could consult the help pages as he continued with the task (instead of clicking on a link and having the help page replaced by a new page, such as IUCAT).
- All three users experienced navigational difficulties, moving back and forth repeatedly between Stage A and Stage B. Two users were confused by multiple locations of Variations related material and would go in circles through the same pages.
- All three users remarked that the information on the help pages was not organized clearly.
- One user wanted more examples of how to search for materials in IUCAT

Experiences with Stage B (IUCAT):
Music theory users
- All three users disliked having to use IUCAT to find materials. They wanted a listing like Course Reserves to see exactly what materials are available online through Variations or the score viewer.
- One user experienced difficulty when trying to use IUCAT's advanced search feature. She was not sure which format designation online scores would fall under.
- One user tried truncating a search term (used "symphon?" to search for both "symphony" and "symphonies") but this did not work.
- One user performed six searches before giving up on task 1.
- One user had difficulty telling if scores were available online from the IUCAT records.
- One user briefly consulted IUCAT's help, but quickly realized it would not help her find online scores.

Music studio users
- User 2 used "www" instead of "http" to find URLs in records.
- One user expressed confusion over which keywords to include in his search to find online scores.
- Two users disliked having to use IUCAT to find materials. They wanted a listing like Course Reserves to see exactly what materials are available online through Variations or the score viewer.

Non-music users
- This user group had the most difficulties searching for materials due to their inexperience:

- One user tried two exact title searches and one title search to try to find an aria that was not actually a title of a recording (user gave up this task).
- Even after spending over seven minutes reading the help pages, one user did not note the trick of adding "http" to keyword searches to find Variations URLs (gave up task).
- One user did not know the requirement to add the word "and" between keyword phrases.
- Out of desperation, one user tried adding quotation marks around the title to search.
- One user tried using keyword search terms, but clicked the "title" search button.

Experiences with Stage C (Variations interface and online score viewer):
Music theory users
- One user noted that she never used the track button because she didn't know what it did (button did not make any sense to her).
- One user complained that the call number of the physical CD is not displayed in the record available from the Variations index page.
- One user wanted to hold down the fast forward button on the Variations player to move around the recording.
- One user complained about the delay experienced after moving the slider bar.
- Two users wanted a more precise method than the slider bar of moving around a track.
- One user complained about a high-pitched drone in the background of the music recordings that annoys him and other students, especially when listening to softer music.

Music studio users
- One user requested a method to precisely move about music recordings.
- One user remarked that Variations should have a way to repeat a selected number of measures as that would be helpful for analysis. This could come in the form of creating two bookmarks, and then having that section repeated, or by selecting an area of the score for repetition. The music could play in a loop until the student stopped it.
- One user complained that the audio was choppy when the slider bar is moved.
- One user wanted a graphics equalizer available in Variations so he could change the levels in order to hear different instruments better.
- One user did not like the layout of the score viewer. He thought the frames were awkward and made it difficult to view an entire page.

Non-music users
- One user said the grayed out buttons on the Variations interface made them look like they were not available for use (inactive state).
- One user wanted the track list attached to the player interface.
- One user found the slider bar difficult to operate.
- Two users remarked that the they could not discern the functionality of the track button.

Questionnaire for User Interface Satisfaction (QUIS):
After going through the tasks, users were given a questionnaire to fill out (see Appendix 3 for complete questionnaire). The questionnaire consisted of eleven questions asking users to rate features of the system on a scale of one to five, with one being a negative response and five being positive. Figure 8 shows the average satisfaction rating given by each user (full detailed results are presented in Appendix 5):
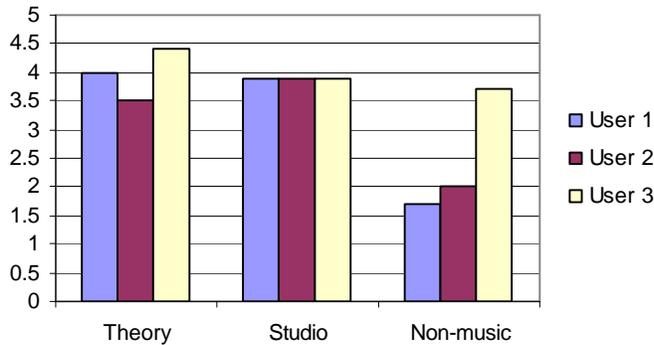
Figure 8: *Average satisfaction rating of each* user

Novice non-music users reported lower levels of subjective satisfaction. The two non-music users who were not able to complete their first task were especially unsatisfied with the system. One gave very low ratings ("1" or "2") to every aspect except readability of characters on the screen and knowing her location within the system at any given moment. The other user gave 1s or 2s to every aspect except readability and system speed.

The following three aspects of the system elicited the most negative reactions from the majority of users, with no user giving them a "5" and the average of all scores resulting under a "3":

- Overall rating of the system as dull (mean score of 2.9 on scale of dull/stimulating).
- Organization of information was rated as confusing (mean score of 2.8 on scale of confusing/clear).
- Task performance considered not straightforward (mean score of 2.9 on a scale of in never/always straightforward).

Reactions to Prototypes:
After testing Variations and the online score viewer, users were shown two early prototypes of possible DML schemes, a semi-functional visual basic application and a non-functional web page (see Figures 9 and 10).

Figure 9: *Prototype - Non-functional web-based interface*
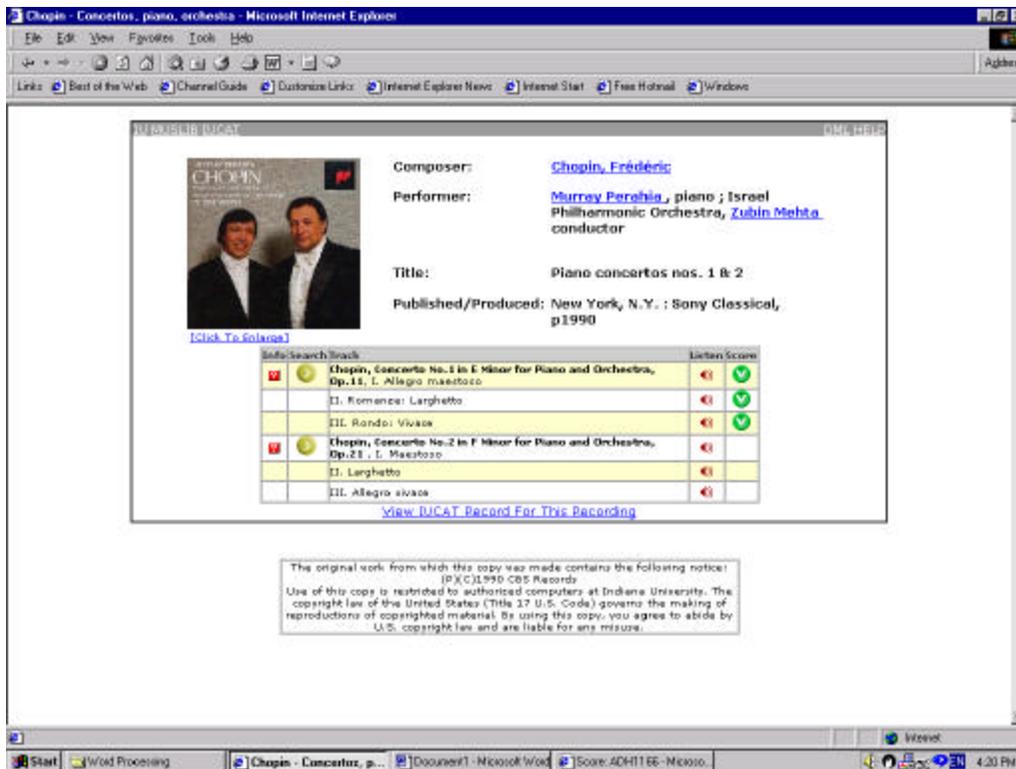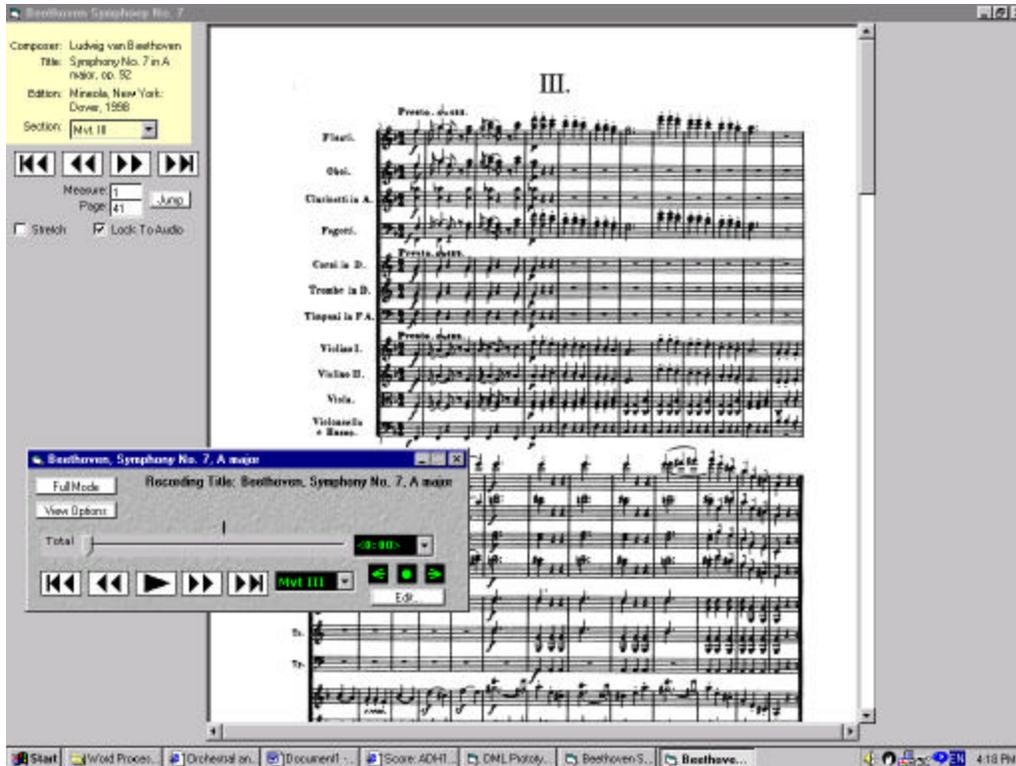

Figure 10: *Prototype – Visual basic audio player and linked score application*

Music theory students comments:

Web-based interface prototype:
- Two users expressed confusion about the functionality of the "search" and "info" buttons.
- Two users liked the cross-referenced searching and the ability to view liner notes.
- One user remarked that the clear listing of CD contents was helpful.

Visual Basic Audio Player prototype:
- One user felt the page turning was not intuitive.
- One person was confused about what the Jump to Page function did, and once she figured it out, she didn't see the value of it.
- Three users preferred to write on actual score.
- Appreciation for finer control in moving around track.
- Problems juggling between audio player and score interface.
- Appreciation for bookmarks (2) - expressed desire to click on score to make a bookmark as well as typing in measure number to create bookmark.
- Should not have to scroll around on score in order to see it all.
- Recording should not stutter when page turns.
- Larger, higher-quality video player.
- Linked audio and score is an improvement.
- Controls for video should be as robust as the controls for audio interface (jump, specifying scene or act, list of sections to choose from)

Music studio students comments:

Web-based interface prototype:
- Two users liked cross-referenced searching.
- One positively remarked on the ability to view liner notes.
- Two users expressed confusion about the functionality of the "search" and "info" buttons.

Visual Basic Audio Player prototype:
- Two preferred to write on a paper score.
- One wanted to be able to make tempo changes.
- One user thought that when a measure is "jumped to", it should be highlighted or in some fashion brought to the user's attention where it is on the page.
- Two user wanted to be able to put in measure numbers to create bookmarks.
- One user wanted to be able to bookmark by measure number, time or page.
- Two users wanted to be able to click on score to start audio.
- Two users felt one shouldn't have to scroll to see score. Scroll bar is difficult to grab.
- One user expressed that the image quality of scanned scores could be improved.
- Two user thought the audio and score controls should be unified.
- All liked being able to jump around by measure.
- All liked the bookmark feature.

Non-music users comments:

Web-based interface prototype:
- All users expressed confusion about the functionality of the "search" and "info" buttons.
- Two users remarked that the interface was easy to explore, but they could not immediately discern the functionality of every button.

Visual Basic Audio Player prototype:
- One user disliked horizontal scrolling.
- One user expressed confusion over having two sets of audio controls.
- One user could not find the volume control and remarked on the lack of one.
- One user wanted bookmarks to be displayed in the score as well as on the audio timeline.

Other Suggestions:

Music theory students suggested:
- A local search for recordings and scores would be beneficial.
- There should be more customization for searching scores; example: search for Opus number
- There should be a way to locate music without a particular piece in mind but a general idea ("cool") guided by composer, time period, difficulty rating (grade) and records should cross-referenced by composer.
- IU productions (operas) should be available for viewing in the DML.
- Searching: student wants to search by instrumentation such as "flute quartet" and by date of composition.
- There should be a way to browse through music that is available via online recordings and scores similar to an index by composer.
- Content in DML should have its own search facility, but the data should also be available in IUCAT.

Music studio students suggested:
- Want the ability to multi-task – listen to music or watch video and search for something else.
- Searching for motifs would be nice, but faculty may complain because students may use it to cheat on assignments.
- Graphics equalizer would be very helpful.

Non-music users suggested:
- There should be an ability to search by genre (especially important for popular music).
- Clicking in a score somewhere to start audio playing in that spot is useful.
- Search/find/listen should be streamlined in the DML.
- Searching for scores and recordings should be separate from IUCAT and tailored to the topic.
- Keywords from search should be obvious in search results.
- Instructions on how to use recording player and score viewing should be more succinct. Any outside links should be new windows.
- DML shouldn't cover popular music – people will use the Internet for that.

References
QUIS Questionnaire:
Chin, J.P., Diehl, V.A., Norman, K.L. (1988) Development of an Instrument Measuring User Satisfaction of the Human-Computer Interface. ACM CHI'88 Proceedings,213-218. ©1988 ACM.

APPENDIX 1: DEMOGRAPHIC DATA

Student Subjects

	1	2	3
Age	20	19	20
Year	soph	soph	soph
Major	performance	performance	music-BSOF
Instrument	flute	violin	horn
Sex	F	M	M
Prior Variations use	yes	yes	yes
Computer ability*	3	5	4

Studio Subjects

	1	2	3
Age	19	19	19
Year	soph	soph	soph
Major	performance	performance	music/math-BSOF
Instrument	violin	trombone	piano
Sex	F	M	M
Prior Variations use	yes	yes	yes
Computer ability*	2	2	4

Non-Music Subjects

	1	2	3
Age	29	24	27
Year	none	grad	grad
Major	none	info sci	info sci
Instrument	none	none	none
Sex	F	F	M
Prior Variations use	no	no	no
Computer ability*	4	5	5

*rated on a scale of 1 to 5 (novice to expert)

APPENDIX 2: TEST PLAN AND PROCEDURE

Test Goals

This test has two purposes:
- To provide a baseline usability assessment of Variations and the online score prototype, which are forerunners to the DML project;
- To learn which aspects of Variations and the online score prototype work well and which are problematic in order to apply this knowledge to the development of the DML ("lessons learned");

Participants

Three participants for each user type (nine participants total) are required for this study. One of the participants from both the User Type I group and the User Type II group should be familiar with Variations.

There are three main user types involved in the task scenarios:

User Type I
Music undergraduates who need to access online recordings for their course work. These students have a firm understanding of musical terms and notation and are most likely somewhat familiar with the composers and musical works they would like to view or hear. They may or may not have experience working with computers. They are most likely accessing Variations from the Music Library.

Users who are selected to participate in this study and are representing Type I should have the following characteristics:

1. Familiarity with music notation.
2. Familiarity with music literature.
3. Experience in a music theory classroom setting.

User Type II
Studio students who are using Variations in response to an instructor's request or for personal music study related to their performance requirements. These students have a firm understanding of musical terms and notation and are most likely familiar with the composers and musical works they would like to view or hear. They may or may not have experience working with computers. They are most likely accessing Variations from the Music Library.

Users who are selected to participate in this study and are representing Type II should have the following characteristics:

1. Familiarity with music notation.
2. Familiarity with music literature.
3. Experience with lessons and studio music study.

User Type III
Library patron who wants to listen to music outside the context of any class (e.g. will not access files through Course Reserves or professors' syllabi). These students do not have to be music experts and they could be listening purely for enjoyment.

Users who are selected to participate in this study and are representing Type III should have the following characteristics:

1. An interest in music.

Tasks

User Type I
Task 1: I am taking a music theory course and, according to my professor's syllabus, I will need to mark the phrasing, motifs, and sections on a paper copy of the score of Beethoven's Piano Sonata Op. 13, movement II to hand in as an assignment. My task is to find an online score of this piece and print it out.   (yes, please print the score)

Task 2: My professor has assigned me several pieces that I need to identify on an aural exam. The recordings on reserve are all checked out, but my professor mentioned that they are also available online. My task is to find and listen to an online recording of the third movement of Boccherini's Symphony Op. 12 No. 1 in D.

Task 3: I am taking the T152 theory class, and according to the syllabus, I need to listen to "The Banshee" by Henry Cowell. My task is to locate and listen to this recording from the Music Library's Course Reserves web site.

User Type II
Task 1: I have a printed score of Beethoven's Symphony No. 5 and my studio instructor has asked me to listen to a recording of it on Variations and make notes in my score about style and phrasing.

Task 2: I am in a conducting studio and need to familiarize myself with Beethoven's Third Symphony, op. 55, in Eb major, in order to conduct it. My task is to look up the Variations recording of this as well as view the associated score online.

User Type III
Task 1: I want to listen to the tenor duet "*Au fond du temple saint*" but I can't remember who wrote it. My task is to locate and listen to an online recording of this piece.

Task 2: I like jazz and want to listen to some while I do my homework. My task is to find some jazz to listen to.

Data Measures

An assessment of the usability of Variations and the online score prototype is based on users' performance on the set of tasks outlined above and a post-test survey:
- *Effectiveness* determined by whether or not the students can complete each task.
- *Efficiency* determined by comparing the number of steps students take for each task to the minimal number of steps needed. If a student does not complete a task, efficiency will be determined by the path of the user up to the point of abandonment.
- *Satisfaction* determined by administering a survey to users after they run through the tasks. This survey will be based on the Questionnaire for User Interface Satisfaction

(QUIS) that uses a 5-point Likert scale to solicit and record users' feelings on different aspects of the interface.

Lessons learned from Variations and the online score prototype to apply to the development of the DML will be captured by pinpointing areas during testing that are frequently problematic or well liked by users. This data to be collected by asking users to verbally enunciate what they are doing and why they are doing it while they attempt to complete tasks in the form of a verbal protocol. This way, areas of substantial confusion or likeability should become apparent.

Procedure

Preparation:
The Music Library home page should be pulled up on the browser and be minimized.
Questionnaire should be face down on the table that the user is working at.
Once the user is seated at the computer, begin.

Script:
Hello and thank you for being a participant in this study of the School of Music's online recording system Variations and the online score viewer prototype.

These tools are used for listening to music online and viewing digital musical scores. Instructors, students, and library patrons at Indiana University use these tools to complete music theory and literature assignments, study music pieces for private lessons, and to listen to music online while they are studying for other classes.

We have 2 or 3 tasks for you to go through that utilize Variations and the online score prototype. These tasks will require you to navigate through web pages to listen to music files and view scores.

You are not the one that is being tested today. We are here to test the tools, not you.

Here is the list of your tasks (place task sheet face down on desk). Once I leave the room you may turn the page over and begin your tasks. Both Netscape and Microsoft Internet Explorer are launched on your machine. You can use whichever browser you are most comfortable with.

You will start at the Music Library home page at the beginning of each task. To get back to the Music Library Home page when you are beginning a new task, just click the Home button at the top of your browser.

You have as much time as you want to complete the tasks so go through the tasks at a pace that is comfortable for you.

Please read each task aloud and speak aloud as you go about completing the task. Tell us what you are thinking as you figure out what it is you need to do to accomplish the task. Also, feel free to comment on any aspect of the interface that you like or dislike at any point. If you feel that you are unable to accomplish a task, please let us know by saying "I am unable to complete this task and I want to move on to the next task" and then do so.

Once you have completed the tasks, let us know that you are finished. You may then turn over the questionnaire to complete it.

Again, you are not being the one tested and you have no time pressure. Remember to read each task aloud and speak aloud as you go through the tasks. Do you have any questions?

You may begin when you are ready.

(leave the room)

APPENDIX 3: QUESTIONNAIRE FOR USER INTERFACE SATISFACTION (QUIS) (adapted)

Please circle one number in the continuum for each question that best represents your experience. Feel free to write down any comments you may have.

Overall reaction to the web sites and multimedia tools:

terrible   wonderful
      1   2   3   4   5

difficult   easy
      1   2   3   4   5

frustrating   satisfying
      1   2   3   4   5

dull   stimulating
      1   2   3   4   5

slow   fast
      1   2   3   4   5

Screen

Characters on web sites and multimedia tools are
hard to read   easy to read
      1   2   3   4   5

Organization of information on the web sites & multimedia tools
confusing   very clear
      1   2   3   4   5

Sequence of web pages
confusing   very clear
      1   2   3   4   5

Navigation

Learning to navigate the web sites and multimedia tools
difficult   easy
      1   2   3   4   5

Tasks can be performed in a straight-forward manner
never   always
      1   2   3   4   5

My location within the web sites & tools at any given moment
never apparent   always apparent
      1   2   3   4   5

APPENDIX 4: ALL TIMES FOR TASKS AND STAGES

User	Task	Total Time	Stage A	Stage B	Stage C	Retrieval time
Music Theory 1	1	**8:22**	0:22	8:00	**0:00**	
	2	**6:00**	0:55	4:20	0:45	3:12
	3	**2:58**	2:28		0:30	
Music Theory 2	1	**2:47**	1:50		0:57	
	2	**1:33**	0:25	0:40	0:28	
	3	**1:10**	0:27		0:43	
Music Theory 3	1	**1:41**	0:14	0:51	0:36	
	2	**3:22**	0:22	2:35	0:25	
	3	**1:05**	0:45		0:20	
Music Studio 1	1	**1:09**	0:27	0:35	0:07	1:38
	2	**6:29**	1:13	4:34	0:42	
Music Studio 2	1	**2:16**	0:54	1:09	0:13	
	2	**2:21**	0:17	1:38	0:26	
Music Studio 3	1	**2:39**	0:32	1:52	0:15	
	2	**2:43**	0:20	2:05	0:18	
Non-Music 1	1	**22:42**	16:33	6:09	**0:00**	
	2	**3:28**	1:43	1:23	0:22	2:40
Non-Music 2	1	**15:44**	8:01	7:43	**0:00**	
	2	**6:10**	1:45	4:13	0:12	4:08
Non-Music 3	1	**4:44**	3:07	1:19	0:18	1:45
	2	**7:30**	1:05	5:35	0:50	

APPENDIX 5: DETAILED QUIS AVERAGES

Overall Reactions: Averages

Legend:
- terrible/wonderful
- difficult/easy
- frustrating/satisfying
- dull/stimulating
- slow/fast

Categories: Student, Studio, Non-Music, ALL

Navigation: Averages

Legend:
- learning to navigate difficult/easy
- tasks can be performed in a straight-forward manner never/always
- my location within system never apparent/always

Categories: Student, Studio, Non-Music, ALL

Screen: Averages

Legend:
- hard to read/easy
- organization of information confusing/very clear
- sequence of web pages confusing/very clear

Categories: Student, Studio, Non-Music, ALL