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### Project Info

**Acronym:** IMUTUS  
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### Note

Requests to subscribe to or unsubscribe from this Newsletter should be directed to [elav@exodus.gr](mailto:elav@exodus.gr) specifying "IMUTUS Newsletter" at the subject line.

All issues of the Newsletter will also be downloadable through the project website:

<http://www.exodus.gr/imutus>.

## Editorial

Dear reader,

Welcome to the fourth issue of the IMUTUS electronic Newsletter.

In this issue you can find a summary of the validation report, presenting results obtained from field-tests and validation activities. Additionally, you have the chance to read what the students and teachers had to say about IMUTUS! It was truly exciting to see students really enjoying practicing with IMUTUS and the teachers' initial hesitation turning into real interest in the IMUTUS approach. But, above all, it was very rewarding to observe IMUTUS helping the students to improve while practicing. **Once again, the IMUTUS Consortium would like to thank warmly all the involved students, teachers and schools for their help.**

This issue also includes a short presentation of the educational content in IMUTUS and a presentation of the functionalities of its Distance Learning Platform, the place where students can find new content, teachers author it, and everyone can communicate with each other.

On January 28th, the final review meeting of the project took place in Stockholm, Sweden, hosted by KTH. The review meeting has provided an opportunity to the IMUTUS partners to present their results to the review team and discuss all aspects of the project. The results clearly indicated a successful project and a music tuition prototype with great potential.

Even though IMUTUS has officially ended at the end of February, the IMUTUS consortium continues to actively disseminate and promote the project results. A presentation of several planned activities is provided in the last article of this issue. One of the most important activities planned is the release of the prototype of the IMUTUS practicing environment. This will be publicly announced with a special issue of our Newsletter. Clearly, the research carried out by the partners in music tuition and music technology extends well beyond the limits of the project, and therefore our invitation for contact on these issues remains open.

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## Validating IMUTUS – Methodology and results

### Reference

A more complete description of the validation results will soon be available at the IMUTUS website: [www.exodus.gr/imutus](http://www.exodus.gr/imutus)

The IMUTUS project has addressed many research topics in the development of an interactive music tuition multimedia system for training students of traditional instruments with no MIDI support. Computer engineering has been devoted for the integration of various key technologies resulting in the final version of the IMUTUS prototype. However, the validation efforts have been directed to assess the benefits of IMUTUS as a tool for tuition, questions that can not be taken for granted despite careful computer engineering. The topics for validation refer to the following.

- a) Educational needs: The content, the aim, the students' perspective on the tuition system and the teachers' knowledge and experience.
- b) Computer experience: The estimate of knowledge to handle the computer as a tool.
- c) Affect and attitude: The students' and the teachers' impressions of IMUTUS examined after each week of the validation period.
- d) Musical improvement: The efficiency of the system in teaching students to play the recorder.
- e) Usability: The mixture of Relevance, Efficiency, Attitude and Learnability of IMUTUS.

### Methodology

The validation was a field trial that collected qualitative and quantitative data as they appeared in students' (12) and teachers' (3) self-reports, as well as performance measures from the practicing sessions stored in the computer log files. The students, between 9 and 14 years old, used the tuition system in their homes (ecological validity), during a period of a couple of weeks (longitudinal), 3-4 times a week, about 30 – 45 min per session but in well-defined tasks and with possibility for technical support from the research leaders (control). There were two groups of students arranged in matched pairs, one experimental group using IMUTUS, and a control group doing the same kind and amount of practice, but without access to the software. The control group used a minidisk player to record their performances (quasi-experiment). The musical material consisted of the same melodies that the teacher would select for the student during normal teaching and students in each pair used the same melodies.

### Questionnaires

The questionnaires were designed to assess the overall usability of the system. They contained a mix of fixed response alternatives and open-ended questions. Questionnaires aimed for students were in simple style that avoided abstract and ambiguous terminology and questions.

There were three different kinds of questionnaires. The first was used to estimate (longitudinal) usability, affect and attitude changes among students during the three-week period. This questionnaire was answered at the end of each validation week. The second and third questionnaires aimed at final validation at the end of the period, with reflections on IMUTUS as well as previous computer experience. The students and the teachers' answers were possible to compare in a systematic way.

### Results

#### *Computer experience*

The students are experienced computer users. Everyone (but one) plays computer games and all are on the internet, everyday. They have access to computer at home but also use computer at their friends and relatives.

None of the teachers had used a computer program in their teaching before. They use the computer at home and at work several times a week, but none considered oneself as well-experienced. All three teachers estimated their interest for computers as "pretty small", but they were somewhat positive for computers in education.

#### *Affect and attitude*

The teachers answered the open-ended question "When you heard about IMUTUS for the first time, what was your impression?"

Explain in your own words the first thought you had." They reported that they were sceptical to the very idea of having computer software as a tutor for music. Their exact comments were:

*"Is it possible to learn music from a computer?"*

*"I don't think that a computer can replace a teacher, but I am curious"*

*"I was sceptical because of my inexperience, and a bit worried that the computer should replace me as a teacher."*

#### **Reported amusement and perceived usability**

After the validation period the three teachers answered the question "How do you believe that your students experienced the work with the computer software?" Their responses were:

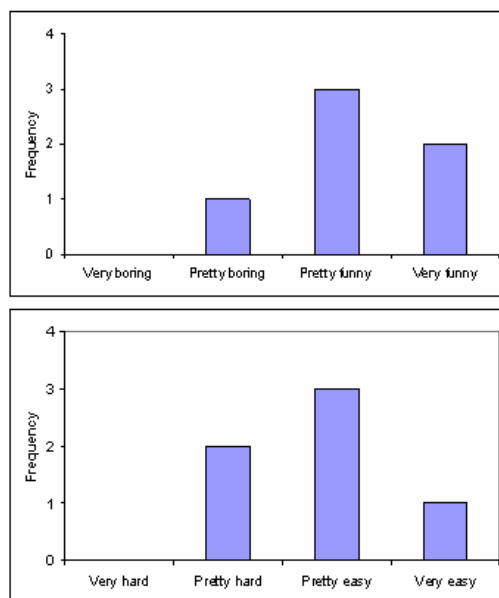
*"Very funny, pretty easy, the program is free from demands, amusing"*

*"Very funny, pretty easy, when they can see through the software structure to gain award."*

*"Pretty funny, pretty easy, but the 10-year old students perceived it as very funny".*

**Figure 1**

Frequency of students self reported amusement (upper panel) and perceived usability (lower panel). "How do you experience the work with the computer software? (after week 1)"



To be able to compare the teachers' first impressions with their attitude after the validation period the following question were answered "Explain in your own words your experience of IMUTUS now three weeks later and how that feeling corresponds with your first expectations".

*"I am positively overwhelmed that students found IMUTUS so funny. It exceeded my expectations."*

*"I was sceptical but now my I am curios. I think the software is under way."*

*"My sceptical thoughts disappeared, but I realize that the program needs to be developed."*

#### **Musical improvements**

The students self reported beliefs about their musical improvements showed that about one third believe themselves to be "much better", about one third "somewhat better", and one third "as good as before" in even distribution across the three weeks validation period. They also believed that their teachers had the same opinion about their improvement. The teachers' judgment of the students' musical progress were positive. "Based on your experience as musical teacher do you think that your students which used IMUTUS improved by the computer software compared to the control students?" Two teachers answered yes after the 1st, 2nd, 3rd week and 'in total' (Response alternatives: no – doubtful – yes.) The third teacher did not meet the students after the end of the validation.

The teachers' free comments (open-ended) were also positive:

*"The improvement was stable across the three weeks and there is a persistent effect in the students' musical skill, even now a month later"*

*"The students have been much more secure in expressing themselves on the recorder"*

*"There were individual differences in how students improved by the software".*

However, the most objective measure would be to examine the performance data stored in the computer. The results show that the experimental group decreased error density in Fingering across the validation period much more than the control group. Similar effect was apparent in Intonation, Tempo and Attacks, but not so for melodic, where the experimental group show a floor effect with low error level in all three periods.

#### **Usability**

The students reported that they sometimes get stuck when using the software and that they need to get help many times. However, it

should be noted that this was their first time using the software and that the research leaders were there to provide instructions and help when needed.

not in week 2 and 3. To run the software and open menus were never a problem to them.

**Figure 2**

Frequencies for students self reported usability on specific tasks they find to be "hard" for week 1, 2 and 3.

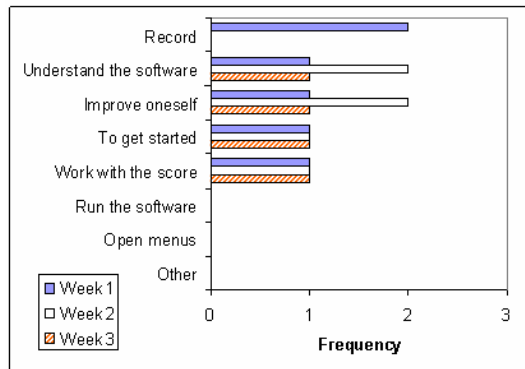


Figure 2 shows the students self reported usability on specific tasks. The Figure shows the frequencies for "Hard" and reveals that the recording procedure was hard the first week but

### Conclusion

This validation of IMUTUS is a typical small N field investigation in which a few students and their teachers affects and attitudes in combination with performance data stored in the computer across a limited timed period of three weeks were studied. The converging evidences of Affect and attitude shows that IMUTUS is fun and believable. Students' musical skills were also improved as is evident from a) performance evaluation data and b) reflected in judgements by the teachers and in self-estimations by the students. With regard to Usability it could be concluded that IMUTUS is relatively easy to use.

## Validating IMUTUS – Teacher and student impressions

The end of November till mid December was a validation period for the project. Students from 3 music schools in Sweden have been using IMUTUS at home and in the classrooms for 3 weeks. These schools were Nacka musikskola, Solna kulturskola, and Stockholms kulturskola, all residing in Stockholm. Moreover, 8 students at the Ghiberti Junior High School and others in Music School of Fiesole have been using IMUTUS for practising in groups at schools in 3 sessions and a teacher group has evaluated separate components. Finally, 3 students and 2 teachers have been involved in the fine-tuning and adjustment of a set of functional parameters of the IMUTUS practising environment.

The IMUTUS Consortium would like to warmly thank all the involved students, teachers and schools for their invaluable help. Working with them and testing IMUTUS in action has been an enjoyable, fruitful and rewarding experience!

### Student impressions

The students' own comments on the IMUTUS software were as follows:

*"I think that the instructions sometimes are bad. But they are good because you can improve your performance."*

*"This is good because I have learned a lot more."*

*"It has been fun. I have had to think a little on my own without a teacher breathing down my neck, I get a little nervous from that. There has not either been any particular inflection to the comments so I can interpret them by myself a little. (12 year old student)"*

### Teacher impressions

The teachers' own comments on IMUTUS software were as follows:

*"The stars (grading) are amusing, but the feedback is bad sometimes."*

*"IMUTUS is explicit and easy to follow."*

*"The fingering animation is not so appropriate."*

*"The concentration on few items is good for younger students but it is a limitation for the teenager. As a teacher you can always adapt your feedback to the case at hand."*



## IMUTUS Distance Learning Platform

The Distance Learning Platform (DLP) is the point where students are able to view and download content, teachers author new content and view student reports, and all users communicate with each other.

### Basic functionalities

The basic functionalities provided by the Distance Learning Platform include:

#### Students

- User registration and profile management
- Browse, Search and Download tuition material.
- Communicate with students or teachers.
- View the results of the tests they have conducted or view reports regarding their progress.
- View Announcements
- Send emails

#### Teachers

- Browse, Search and Download tuition material.
- Author tuition material.
- Monitor the progress of students – View reports
- Communicate with students or teachers
- View / Post Announcements
- Send emails

#### Administrator

- User registration and profile management
- Issue reports
- Manage supporting information

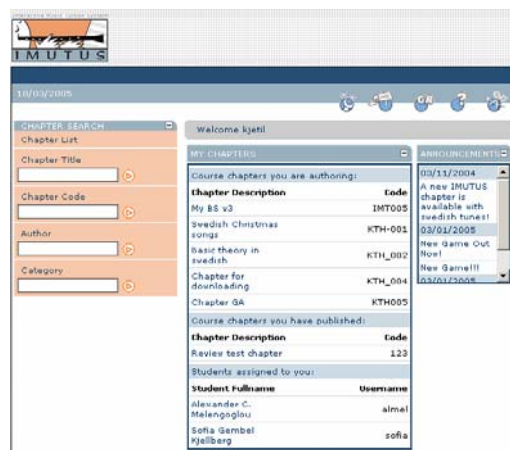
### Content Authoring

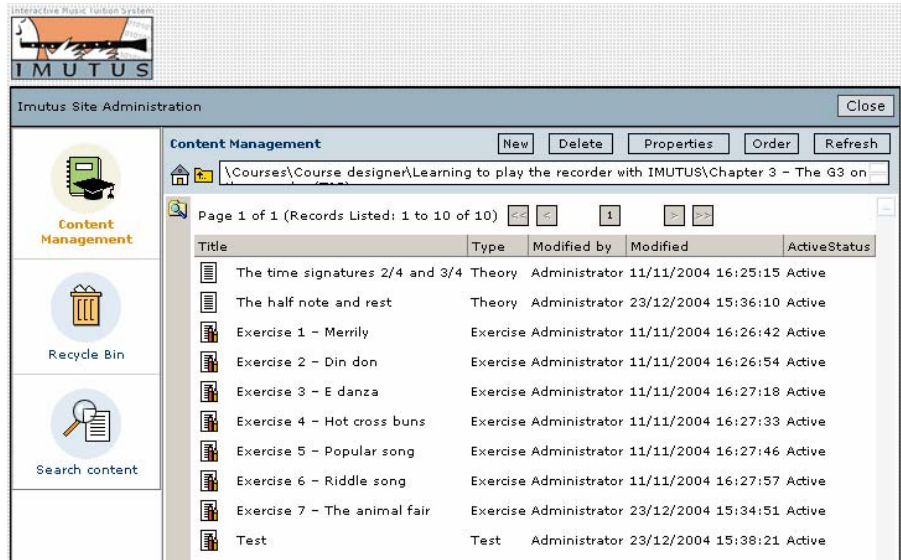
The Content Authoring Module is available at the DLP and is used by teachers in order to author new educational units (Theory, Exercise, Game Units and Tests) and make them available to students through downloading from the Distance Learning Platform.

Using IMUTUS tools and other external content authoring tools, the teacher creates locally all the material that will be included into the educational unit. The various files (.wav, .midi, score images, documents, video, 3D etc.) that will be attached to the unit are stored locally at the user's system. When all the content is ready, the teacher logs into the DLP.

At the DLP the teacher has the ability to browse through the available content and author new educational units to new or existing chapters of a course. This is achieved through wizards especially designed for each type of educational unit. In the wizard forms the teacher fills in all the required information regarding the specific unit and attaches the various files that apply to that unit. The procedure finishes by publishing the new unit, i.e. making it available to the students.

Figure 3  
The Teachers portal on the DLP





**Figure 4**  
Content Authoring on the DLP

## Content in IMUTUS

Content in IMUTUS is structured hierarchically and resembles the structure of a book. Teachers are able to create any part of the content, adding to the existing educational material based on the specific needs of their students.

### Content items

IMUTUS content comprises of the following items:

**Course.** A course is the top level for grouping educational information. It is analogous to a book, or a University course.



**Figure 5**  
Course information and content list

**Chapter.** The course is logically partitioned into chapters, similar to the chapters of a book. IMUTUS chapters are considered as groups of interrelated educational units focusing on a specific part of the overall course. Chapters are

intended to establish, strengthen, and extend the application of a number of musical concepts. They are the minimum piece of educational content a user may download and they contain educational units, or folders that better organise educational units.

The student progress is measured on a chapter basis. This means that each chapter has prerequisites and is characterized by values regarding the musical skill they train the student on. Each chapter includes a final test, which has the goal to test whether the Student has mastered the knowledge presented in the chapter. If the Student passes the test threshold then the chapter is considered completed.

**Folder.** A chapter may include one or more folders, which in turn contain other folders and units. Folders are used in order to better organise the educational material within a chapter.

**Educational Units.** Educational units are sets of various resources used in combination for a specific and focused educational purpose. An educational unit may belong to one of the following categories:



- Theory Units. They address theoretical issues and may be accompanied by multimedia that facilitate the students' learning experience.
- Exercise Units. They address the student's need for practice on musical pieces. They comprise of a musical piece upon which the student should practise and be evaluated. They may be accompanied by multimedia regarding the specific musical piece.
- Games. Games are simpler than exercises and are used to complement the student's musical training in a pleasant way.
- Tests. Tests are groups of exercises and games. Each chapter has a test that is used in order to examine whether the student has reached a specific level and can proceed to the next chapter.

### Chapter structure

Each chapter is structured with common rules. It starts with a theory unit, introducing a new item. Theory units explain to the student the new content using images, text documents, animation and audio. This first part is particularly dedicated to the instrumental technique.


Then the student is required to practice on several exercise units, and be evaluated by IMUTUS. The exercise units are summarizing all the difficulties and the content related to the lesson. At the end of each performance the student gets an evaluation regarding each aspect of the execution (timing, score reading, instrument control, etc.), as well as tips for correcting the performance the next time.

A chapter may be complemented with games and ends with a test.

Figure 6  
A Theory Unit


**The time signatures 2/4 and 3/4**

In the time signature the number below indicates the note representing the basic beat, and in 3/4 the basic beat is the quarter note like in 4/4.




In 2/4 time signature in one measure you will find only two quarters, one for each beat. In both times (like in 4/4) the main accent is always in the first beat.

An example of 2/4:



Listen to the 2/4 example!

An example of 3/4:




## IMUTUS Final review meeting

### The IMUTUS Consortium

Members present at the Final Review Meeting in Stockholm, January 2005



On January 28th, the final review meeting of the project took place in Stockholm, Sweden, hosted by KTH. The review has provided an opportunity to the IMUTUS partners to present their results to the review team and discuss all aspects of the project. The results clearly indicated a successful project with a music tuition prototype with great potential.

We owe a special thanks to IMUTUS' commission project officer, Mr. Ian Pigott for his steady and determined support and, of course, to Dr. Sean O Miadhachain and Dr. Xavier Serra from the review panel, who have been following IMUTUS ever since its inception, providing always concrete recommendations, which significantly affected the course of IMUTUS.

The review meeting started with a live demonstration by young Sofia, a student from Sweden who also participated at the validation trials. Sofia demonstrated IMUTUS by performing several musical pieces. For each song she received IMUTUS automatic evaluation and then repeated her performance based on IMUTUS tips.

Additional demos illustrated other aspects of the IMUTUS practicing environment and the distance learning platform. Technical and administrative presentations followed and the review process closed with an open discussion with the review panel and the announcements of the review results and recommendations. The panel advised the consortium on several topics, and focused especially on the dissemination and exploitation of the project's results, considering IMUTUS a system with a great potential for music education and practising.

The project's official end was on February 28th, 2005.



## Future activities

Although the IMUTUS project has officially finished, the Consortium continues its efforts in disseminating information about the IMUTUS system, improving the system, and investigating exploitation potentials. To this end, the following activities are foreseen:

- A new brochure is available for downloading at the project's website, and will be distributed in several venues and events.
- A booklet will soon be available.
- Soon the IMUTUS prototype will be available for downloading at the project's website. A special issue of the Newsletter will accompany it.
- A proposal for presentation has been submitted to the **ICMC2005**: International Computer Music Conference, Barcelona, September 5-9, 2005 (<http://www.icmc2005.org>)
- The **IST-TV** project is preparing a video on IMUTUS. It will appear under the [www.youris.com](http://www.youris.com) site, possibly at the end of April.
- An article on IMUTUS has been prepared and published by IST Results (<http://istresults.cordis.lu/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/74925>)
- An article on IMUTUS will appear under the Greek CORDIS website hosted by the Greek National Documentation Center (<http://www.cordis.lu/greece/spotlights.htm>)





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