Project Title:	**i-Treasures**: Intangible Treasures – Capturing the Intangible Cultural Heritage and Learning the Rare Know-How of Living Human Treasures
Contract No:	FP7-ICT-2011-9-600676
Instrument:	Large Scale Integrated Project (IP)
Thematic Priority:	ICT for access to cultural resources
Start of project:	1 February 2013
Duration:	51 months

Deliverable No: D6.2

Demonstration Report

Due date of deliverable:	31 January 2017
Actual submission date:	30 May 2017
Version:	Version 1 of D6.2
Main Authors:	Filareti Tsalakanidou (CERTH)

Project funded by the European Community under the 7th Framework Programme for Research and Technological Development.

Project ref. number	ICT-600676
Project title	i-Treasures - Intangible Treasures – Capturing the Intangible Cultural Heritage and Learning the Rare Know-How of Living Human Treasures

Deliverable title	Demonstration Report
Deliverable number	D6.2
Deliverable version	Version 1
Previous version(s)	-
Contractual date of delivery	31 January 2017
Actual date of delivery	30 May 2017
Deliverable filename	D6_2_Demonstration_Report_final.doc
Nature of deliverable	R = Report
Dissemination level	PU = Public
Number of pages	152
Workpackage	WP6
Partner responsible	CERTH
Author(s)	Filareti Tsalakanidou (CERTH), Athina Grammatikopoulou (CERTH), Dimitrios Konstantinidis (CERTH), Panagiotis Barmpoutis (CERTH), Sohaib Laraba (UMONS), Francesca Pozzi (CNR), Francesca Dagnino (CNR), Lise Buchman (CNRS), Claire Pillot-Loiseau (CNRS), Pierre Roussel (UPMC), Christina Volioti (UOM), Athanasia Stergiaki (UOM), Athanasios Manitsaris (UOM), Sotiris Manitsaris

	(ARMINES), Alina Glushkova (ARMINES)
Editor	Filareti Tsalakanidou (CERTH)
EC Project Officer	Marcel Watelet

Abstract	This deliverable presents a detailed overview of the demonstration activities organised for each ICH use case within WP6. It is the outcome of Tasks 6.2 – 6.5.
Keywords	Demonstration, demonstration scenario, Web-platform, learning path, game-like applications, users, workshop, course, concert, experts, learners, students, practitioners, user feedback, questionnaires.

Signatures

Written by	**Responsibility- Company**	**Date**
Filareti Tsalakanidou	Responsible for D6.2 (CERTH)	22/05/2017
Verified by		
Filareti Tsalakanidou	WP6 Leader (CERTH)	22/05/2017
Approved by		
Nikos Grammalidis	Coordinator (CERTH)	26/05/2017
Kosmas Dimitropoulos	Quality Manager (CERTH)	26/05/2017

Table of Contents

1. Executive Summary 7

2. Introduction 9

2.1 Demonstration planning 9

2.2 Demonstration activities & challenges 10

2.3 Interaction with other WPs 12

2.4 Report Structure 14

3. Demonstration Activities 15

3.1 Demonstration activities for the “Rare Traditional Songs” use case 16

3.1.1 Demonstration activities for Canto a Tenore 16

3.1.2 Demonstration activities for Cantu in Paghjella 31

3.1.3 Demonstration activities for Byzantine music 39

3.1.4 Demonstration activities for Human Beat Box 54

3.2 Demonstration activities for the “Rare Dance Interactions” use case 64

3.2.1 Demonstration activities for Tsamiko dance 65

3.2.2 Demonstration activities for Walloon dance 81

3.2.3 Demonstration activities for Salsa dance 89

3.2.4 Demonstration activities for Contemporary Dance/ “Tai-chi-chuan” martial art 101

3.2.5 Demonstration activities for the use of i-Treasures technologies for the creation of novel educational tools for dance teaching and learning 108

3.3 Demonstration Activities for the “Traditional craftsmanship” use case 118

3.4 Demonstration activities for the “Contemporary Music Composition” use case 126

4. Conclusions 139

List of Abbreviations

Abbreviation	Meaning
2D	Two Dimensional
3D	Three Dimensional
CMC	Contemporary Music Composition
EEG	Electroencephalography
HBB	Human Beatbox
ICH	Intangible Cultural Heritage
ICT	Information Communication Technologies
IMI	Intangible Musical Instrument
ITGD	i-Treasures Game Design tool
LMS	Learning Management System
Mocap	Motion capture
SCORM	Shareable Content Object Reference Model
TTS	Text to Song
WP	Work Package

1. Executive Summary

This deliverable presents a detailed overview of the demonstration activities organised for each Intangible Cultural Heritage (ICH) sub-use case in the context of WP6 "*System Demonstration*". It is the outcome of Tasks 6.2 – 6.5.

The scope of the demonstration was to showcase the usability of the developed technologies under different operational scenarios and at different audiences in the context of different ICH use cases. The demonstration activities were based on the demonstration plans proposed in D6.1 *"Demonstration Plan*", which were effectively revised and finalized during the last year of the project.

The demonstration activities involved a variety of users, covering a wide range of population including students of all ages, experienced ICH practitioners, ICH apprentices, and general public in different European cities and villages. The activities also covered different demonstration scenarios ranging from structured learning paths for school students to online courses for ICH beginners to applications for museum visitors to demonstration sessions during festivals. The demonstration events were organised in a variety of locations, including public schools, dance schools, pottery workshops, museums, festivals as well as open days and dedicated workshops organised by the Consortium. In total, we have organised 26 different demonstration activities in the context of the 10 sub-use cases, which involved more than 650 users of all ages and with different backgrounds.

For each demonstration activity we present in detail the demonstration scenario, the users involved, the challenges and problems we dealt with and the feedback we received from the demonstration participants.

The design and organisation of these events presented significant challenges. In several cases, we had to revise the initial plans and either replace them with new ones (e.g. in the case of contemporary dance) or modify some of their aspects. The demonstration participants included users of different ages and educational/cultural background that required a different level of support by the consortium (e.g. people with limited experience in computers required a lot of help). Moreover, the demonstration activities were based on various scenarios and took place in different venues that required different organisation/preparation. In addition, convincing people to participate was found to be far more challenging than we initially believed. Several means were adopted to reach out to potential users, the most important and effective one being through our ICH experts. Finally, although users were happy to

share how they felt about this experience in face-to-face discussions or small interviews, they were reluctant to fill in questionnaires.

Despite these challenges, overall, the demonstration of the i-Treasures technologies was successful. The users were in general satisfied by the developed technologies and thought that they constitute an innovative and promising set of tools that help and advance ICH analysis, education and research. They felt that the offered tools respect ICH tradition and can significantly contribute to its safeguarding and transmission, taking advantage of recent advances in ICT technologies to analyse ICH content in a deeper and more effective way and to boost ICH education in ways that make it more appealing and attractive to younger generations.

The experts have played a crucial role in introducing and explaining the potential of our technologies to local people, that were in many cases afraid of or negative towards the use of new technologies, and convincing them to use them: first, by highlighting the aspect of capture and analysis, which allows for the better understanding and documentation of ICH, and second, by underlining the advantages of modern tools for ICH education that are more appealing to younger people and also attract possible interest from around the world, making their culture known to and appreciated by a much wider audience, which would not be reached otherwise. If the experts incorporate new technologies in their everyday practice, then they will much more easily convince other practitioners to accept and use them as well.

2. Introduction

The objective of WP6 is the demonstration of the integrated i-Treasures system (see D5.7 "*Final version of the integrated platform*") to selected groups of users and ICH experts in the context of the four ICH use cases. The demonstration activities were carefully designed to actively involve users, either experts or learners, in the demonstration of the developed technologies based on a variety of operational/educational scenarios, while effectively targeting different types of audiences in local or global communities. The outcome of this WP (feedback received by the users and data collected by our system) provides valuable feedback for the finalization of the system's requirements (WP2 "*Requirements and Specifications Identification*") and the evaluation of the developed technologies for ICH education and research (WP7 "*Technical Assessment and Evaluation*").

2.1 Demonstration planning

At the end of year 2, a set of initial demonstration plans were elaborated for each ICH use/sub-use case, which defined the demonstration objectives and outlined the intended actions to demonstrate the usability of the i-Treasures platform and its main components under different scenarios and to different audiences in the context of the four ICH use cases. These plans were presented in deliverable D6.1 *"Demonstration Plan*" and clearly identified the following issues for each sub-use case: a) definition of the specific form of ICH, b) usual performers and potential learners to be involved in the demonstration, c) geographic location/s and venues candidate for the demonstration, d) learning path usually followed by the ICH practitioners, e) demonstration scope and initial demonstration scenario(s), f) technologies to be demonstrated, g) data to be collected.

Although, the initial demonstration plans were quite detailed and provided an effective synthesis of the demonstration scenarios, expected participants and intended outcomes, there were a lot of other aspects of the demonstration that were only briefly outlined, e.g. the schedule for the establishment and operation of the demonstrators, the demonstration venues, the i-Treasures components to be demonstrated or the methodological approach adopted for data collection. This was due to the fact that D6.1 was submitted quite early at the life of the project (at the end of the first development cycle, in year 2) when a lot of components were still under development and discussions with stakeholders for the organisation of demonstration activities were at very early stages, thus, preventing us from finalizing a lot of details.

To this end, a set of updated demonstration plans was prepared in the first half of the fourth year of the project (summer/autumn 2016) in cooperation with our ICH experts. During the elaboration of the updated demonstration plans, the sub-use case leaders in cooperation with the experts clearly outlined the schedule for the establishment and operation of the demonstrators, the demonstration scenarios to be adopted, the i-Treasures technologies to be demonstrated under each scenario, the users to be involved and the data to be collected and used for evaluation. The finalization of the demonstration plans was a process that required numerous face-to-face meetings with our experts and people responsible for the different demonstration venues, a lot of discussions about the details and logistics for the operation of the demonstrators, a lot of contacts with potentials users and stakeholders and a lot of advanced testing of the technologies to be demonstrated so as to avoid serious technical problems and failures during the demonstration. This has been a tedious and time-consuming process, which in several instances led us to completely revise some demonstration scenarios, change the initially selected venues or group of users, add new scenarios for some sub-use cases as a result of our talks and brainstorming with the experts, or abandon previous ideas.

2.2 Demonstration activities & challenges

As already discussed in D6.1, the demonstration scenarios are closely related to the pedagogical plans contained in D5.1 "*Report on Analysis of Educational Scenarios*" and D5.8 "*Final report on Analysis of Educational Scenarios*", where an effort had already been made to define possible demonstration and learning contexts, as well as target populations. The scope of the demonstrations was to showcase the innovative technologies developed within i-Treasures and promote their integration in conventional learning paths opening, thus, the way to new learning opportunities and paradigms coupling traditional approaches with cutting-edge technologies. Through these demonstrators, we also aimed at engaging younger generations and the general public, in a common effort to get familiar with, transmit and preserve valuable ICH expressions that constitute our heritage.

Based on the educational scenarios defined in D5.8, the users involved in the different demonstration scenarios cover a wide range of the population including students of all ages, experienced ICH practitioners, ICH apprentices, and general public in different European cities and villages. For some sub-cases, we targeted a very specific audience, such as secondary-school students or experienced

practitioners, while for others we targeted the general public or a community of experts.

The demonstration events were organised in a variety of locations, including cultural centres, museums, universities, public schools, dance schools, pottery workshops, science festivals as well as open days and dedicated workshops organised by the Consortium. They were organised on a local level (e.g., in villages where the specific ICH is performed in cooperation with local communities), on a "national" level (big cities in the country where the specific ICH is performed) or "international" (science or cultural festivals addressing an international community of potential users or stakeholders) level. For different sub-use cases, we targeted different audiences, adopted different scenarios and used different set-ups or components of the developed technologies in various premises.

Given the fact that we tried to cover more than ten different ICH sub-use cases, it can be easily understood that designing these activities, communicating with users of different backgrounds, ethnicities and ages, and organizing the actual events presented significant challenges, including unexpected technical problems that had to be quickly and effectively resolved, users changing their minds about participating thus forcing us to revise the demonstration plans, convincing reluctant users to provide feedback about their experience by filling in questionnaires, effectively co-ordinating several demonstrations at the same time and sharing equipment, etc.

This deliverable presents the demonstrations activities organised under WP6 during the last year of the project (M37-M50) and it is the combined outcome of the work performed in TasksT6.2, T6.3, T6.4 and T6.5 by all partners.

The main technologies demonstrated include the following:

- i-Treasures Web-platform[1] (see D5.7 "*Final version of the integrated platform*"),
- i-Treasures Learning Management System[2], including educational courses for the selected ICH sub-use cases (see D5.7 "*Final version of the integrated platform*"),
- Game-like applications for ICH learning[3] (see D5.5 "*Final version of 3D visualization for sensorimotor learning*"),

[1] i-Treasures Web-platform: http://i-treasures.multimedia.uom.gr/drupalprivate/
[2] i-Treasures LMS: http://i-treasures.multimedia.uom.gr/drupalprivate/lms
[3] Game-like applications for ICH learning: http://i-treasures.multimedia.uom.gr/drupalprivate/node/36

- Text to Song synthesis module for Byzantine music and Canto a Tenore[4] (see D5.6 "*Final version of Text to Song synthesis module*"),
- Intangible Musical Instrument (IMI) (see deliverables D4.2 "*First version of mapping sound to gestures and emotions*" and D4.4 "*Final version of mapping sound to gestures and emotions*"),
- Pedagogical Planner tool[5] (see D5.4 "*First version of the Integrated Platform*")
- Generic dance game development framework (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*"),
- Semantic search functionality[6] (see D5.7 "*Final version of the Integrated Platform*"),
- Several tools for ICH capturing and Analysis (see D3.4 "*Final version of ICH capture and analysis modules*").

2.3 Interaction with other WPs

Figure 1 shows the general overview of WP6 "*System Demonstration*". WP6 receives input from WP5 (*The Integrated Platform for Research and Education*) and provides input to WP7 (*Technical Assessment and Evaluation*). As mentioned above, the demonstration plans elaborated under Task 6.1 are based on the set of educational scenarios defined for each sub-use case under Task 5.1 "*Educational scenarios*", which are presented in D5.1 "*Report on Analysis of Educational Scenarios*" and D5.8 "*Final report on Analysis of Educational Scenarios*". All the contextual constraints as well as the pedagogical aspects defined in these deliverables were taken into consideration while outlining the scope of the demonstrators, the demonstration scenarios, the participants and the venues.

The feedback provided by the users during the demonstration is used for evaluation in WP7. WP7 is responsible for the evaluation and the technical assessment of the i-Treasures system in terms of technical performance, user acceptance and cost-effectiveness. Initially, the demonstrations were not directly intended for evaluation; however, it soon became evident that in many cases they could be very useful for collecting data that could be used for the evaluation of the selected ICH use cases under task 7.3 "*Use cases evaluation*". Indeed, most of the demonstration events

[4] Text to Song module: http://i-treasures.multimedia.uom.gr/drupalprivate/it_tts
[5] Pedagogical Planner: http://i-treasures.itd.cnr.it/
[6] Semantic search functionality: http://i-treasures.multimedia.uom.gr/drupalprivate/repository_search

(except from those organised in the context of festivals for the general public, the IMI concerts and some dedicated workshops) produced significant feedback for assessing user acceptance and evaluating the usability the of the i-Treasures platform and modules. The feedback was collected in the form of questionnaires filled in by the participants. Input was also provided for the technical evaluation of the system based on the user-performance data (analytics, etc) collected by the i-Treasures platform during the demonstration. A detailed statistical analysis of the collected feedback is presented in D7.3 "*Final evaluation report*". In this report (D6.2), we present a more qualitative analysis of the user feedback, mainly focusing on our interaction and discussions with users during the demonstration activities.

WP6 is comprised of five tasks, namely: i) Task 6.1 "*Demonstrator Planning*", ii) Task 6.2 *"System Demonstration for Use Case "Rare Traditional Songs""*, iii) Task 6.3 "*System Demonstration for use case "Rare Dance Interactions*"" iv) Task 6.4 "*System Demonstration for Use Case "Traditional Craftsmanship*"", and v) Task 6.5 "*System Demonstration for Use Case "Contemporary Music Composition"*".

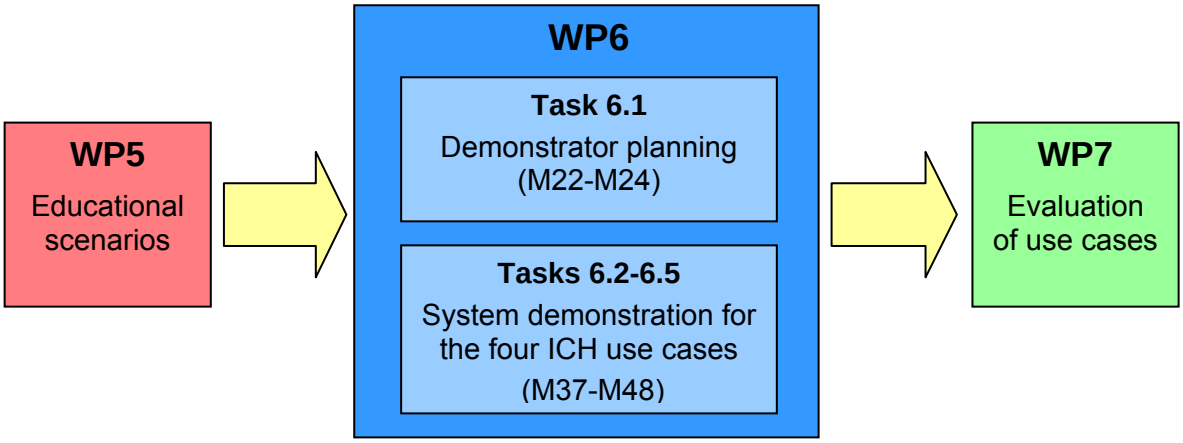


Figure 1: Overview of WP6 and interaction with other WPs.

The demonstration of the i-Treasures project started in month 37 and was supposed to end in month 48. However, due to delays presented in the finalization of the i-Treasures Web-platform and the development of the game-like applications, most demonstration activities took place later than initially planned and were completed in month 50. Given that the aim of WP6 is to present and demonstrate the usability of the main project outcomes to the relevant communities in different contexts and get feedback from them, it should be made clear that demonstrations are not part of the exploitation plan and dissemination activities (WP8).

2.4 Report Structure

The structure of this document is as follows:

- Section 1 is the executive summary.
- Section 2 is this introduction.
- Section 3 presents the demonstration activities for each of the ten sub-use cases, providing details on the demonstration scenario, participants, demonstration venue, i-Treasures technologies demonstrated, data collected and also including as short analysis of user feedback.
- Section 4 summarizes the challenges we were faced with and draws the conclusions.

3. Demonstration Activities

In this section, we present in detail the demonstration activities organised for each ICH sub-use case. Four different ICH use cases, where the human body is dominant, are studied in i-Treasures: a) rare traditional songs, b) rare dance interactions, c) traditional craftsmanship, and d) contemporary music composition.

- For the singing use case, the “Cantu in Paghjella” singing tradition of Corsica (France), the “Canto a Tenore” pastoral songs from Sardinia (Italy), and Byzantine hymns from Mount Athos (Greece) are studied; also, the Human Beat Box, a newly expanding contemporary singing style where the vocalist imitates percussive and instrument sounds (Section 3.1).
- The dance case study focuses on traditional dances from Greece (Tsamiko), Romania (Căluş) and Belgium (Walloon), as well as on contemporary dance. Later, the well-known Salsa dance was also added in this list (Section 3.2).

  The Calus dance was only partially demonstrated, since it was proven very difficult to organise a full demonstration activity in Romania, where our Calus dance expert works. Also, due to the unavailability of the contemporary dancers (with whom we have collaborated during the first years of the project) and after several attempts to schedule a demonstration for the contemporary dance use case with no success, we decided to organise a similar demonstration focusing on a different ICH expression, namely the “Tai-chi-chuan” martial art.
- For the traditional craftsmanship use case, the wheel-throwing pottery was studied (Section 3.3).
- Finally, a novel intangible musical instrument based on the performer’s natural movements/gestures and his/her affective state was developed in the context of the contemporary music composition use case (Section 3.4).

In the following subsections, we outline the demonstration activities for each sub-use case. More specifically, we present the scope of each demonstrator, the demonstration scenario(s), the participants (users/experts/stakeholders) involved in each activity, the demonstration venue, the schedule of each demonstrator, the i-Treasures technologies demonstrated, the data collected, the challenges encountered and the lessons learnt. We also briefly discuss the feedback we have received from the users via questionnaires, discussions and interviews. The analysis of user feedback presented in this deliverable is qualitative. A full quantitative and statistical analysis of the collected questionnaire data was performed under Task 7.3

"Use cases evaluation" and the results for the different sub-use cases are presented in detail in D7.3 *"Final evaluation report*".

Each sub-section of this section was written by the corresponding sub-use case leader.

3.1 Demonstration activities for the "Rare Traditional Songs" use case

CNRS is the partner responsible for the singing use case as well as for the Human Beat Box and Cantu in Paghjella sub-use cases. CNR is responsible for the Canto a Tenore sub-use case and UOM for Byzantine Music. In the following subsections, we present in detail the different activities organised for the demonstration of each sub-use case under Task 6.2 *"System Demonstration for Use Case "Rare Traditional Songs""*. The demonstration scenarios vary from structured educational paths for school students to online workshops for experts or the general public to demonstration of the developed technologies in science festivals for children and adults.

3.1.1 Demonstration activities for Canto a Tenore

Canto a Tenore represents a form of polyphonic singing performed by a group of four men who perform separate and specialized parts. Generally speaking, the tenor singing can be described as a solo singing accompanied with chords ("corfos") by a three-part vocal chord ("su tenore"). The soloist, called "sa boghe", sings a Sardinian language poem (logudorese) while the other three cantors (su bassu, sa contra, sa mesu boghe) accompany the chant with nonsense syllables (either one or two) consisting of guttural sounds characterized by a peculiar vocal tone. Since it has been developed in the oral tradition, it does not rely on rigid schemes, written scores or preset melodies. Several styles exist according to the village in which the singing is performed, which are slightly different one to the other.

The scope of the demonstration was to showcase the usability of the i-Treasures platform in Canto a Tenore education. In particular, since Canto a Tenore is usually taught and learnt in informal contexts by oral tradition and imitation, the demonstration aimed to explore the potential of the platform functionalities in supporting a formal educational path, which includes online or blended (online and face-to-face) activities.

To this end, three educational scenarios were adopted, resulting in three different demonstration activities organised by CNR in cooperation with Canto a Tenore experts from Sardinia. These are summarized in Table 1 and are presented in detail in the following subsections.

Table 1: Overview of demonstration activities for Canto a Tenore

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Structured educational path for secondary school students	Upper secondary school "A Volta", Sardinia, Italy	18 May - 6 June 2016	• 10 secondary school students • 1 Canto a Tenore expert (Prof. Sebastiano Pilosu) • CNR researchers	• Canto a Tenore course in LMS • Text-to-Song for Sardinian music	• PCs • Microphones
Virtual workshop for music experts	Online	15 November-23 December 2016	• Experts in Canto a Tenore (project's experts + a selected group of 10 music experts) • CNR researchers	• Web platform • Canto a Tenore course in LMS • Text-to-Song for Sardinian music	• PCs • Microphones
Online course on the basics of the Canto a Tenore	Online	20 March-19 April 2017	• 39 Italian apprentices, students, amateurs in Canto a Tenore • 3 Canto a Tenore Expert(s) • CNR researchers	• Canto a Tenore course in LMS	• PCs • Microphones

3.1.1.1.1 Scenario 1: Structured educational path for secondary school students in Nuoro, Sardinia

The first scenario involved a structured educational path for secondary school students in a Sardinian village. This scenario aimed to demonstrate the use of the i-Treasures platform with a population of students in the context of mainstream education (in particular, upper secondary school students). The target users in this case are not novices in Cantu a Tenore, but they have never followed structured educational paths before. This learner's profile is quite common in Sardinian villages; as a matter of fact, children living in some parts of the island have often the opportunity to listen to Tenore singers during social events and to learn something in informal contexts, so that they develop some knowledge in the field, which is, however, not organised or structured. The scenario aims to provide them with a structured learning path.

Participants & venue

This first scenario was realized at the upper secondary school "A. Volta"[7] in Nuoro, Sardinia (Italy) between May 18th and June 6th, 2016. The demonstration took place as an extra-curricular activity and involved different actors:

- Students: 10 students, age 14-19 years old (all of them boys), with different levels of competences participating spontaneously.
    - Some were apprentices in their villages, i.e., had learned to sing Canto a Tenore through oral tradition in their own villages. These students had medium-high listening competences also of the singing styles of other villages.
    - Others had never sung, but they had listened to Canto a Tenore songs in a number of social occasions and situations.
- An expert singer, who was also the teacher of the course, i.e. Prof. Sebastiano Pilosu (one of the i-Treasures experts for the Canto a Tenore).
- i-Treasures partners: the sub-use case leader CNR trained the expert/teacher on the platform functionalities and was available for technical support during the first day of the demonstration/course via Skype, in order to introduce the platform to the learners.

Demonstration outline

This scenario aimed to help learners to systematize and consolidate their theoretical knowledge about the Canto a Tenore. Moreover, the plan was conceived for increasing their listening and singing competences. Students could follow the path according to their level of competences (some activities were optional for students who already had the specific competence). Therefore, the learning activities were structured as follows:

- *Introduction*
- *Basics of Canto a Tenore*
- *The four voices*
- *The forms of the Canto*
- *The local styles (modas)*
- *Conclusions.*

[7] "A. Volta" secondary school, Nuoro, Sardinia: http://www.iisvoltanuoro.it/

The focus of the demonstration was primarily the i-Treasures Learning Management System (LMS) with all its basic functionalities and, more specifically, the available course for Canto a Tenore (LMS course: *Canto a Tenore (ITA)*[8]). Moreover, students also navigated the i-Treasures Web-platform during the "*Introduction*" section. The teacher was one of the experts previously involved in the i-Treasures activities, so he was already very familiar with both the Web-platform and the LMS course.

According to the learning path, after the "*Introduction*", students were delivered the "*Basics of Canto a Tenore*" module, a theoretical module, which gave them the opportunity to systematize and consolidate their theoretical knowledge about Canto a Tenore through material already available on the LMS (links to external resources, lecture notes, etc.) or - as an alternative - through an enquiry-based activity, where they had to look for relevant materials about this cultural expression. Besides, during the familiarization, students had also the chance to explore the Sardinian Text-to-Song (TTS) module[9].

In the following three modules ("*The four voices*", "*The forms of the Canto*", "*The local styles (modas)*"), students could improve their listening abilities by means of made-on-purpose audio and video resources stored in the LMS. The acquired competences were also tested with quizzes that students had to take individually. Some students carried out the study and quiz phases also at home.

Along the whole path, the above mentioned activities were also alternated with real singing activities, during which students could practice the Canto with the help of their teacher (see Figure 2).

[8] LMS course for Canto a Tenore: http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/CANTUATENOREASCUOLAPERSTUDENTIDILIVELLOI (Italian version), http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/COURSE1GKOURV (English version)

[9] i-Treasures Text-to-Song module: http://i-treasures.multimedia.uom.gr/drupalprivate/it_tts

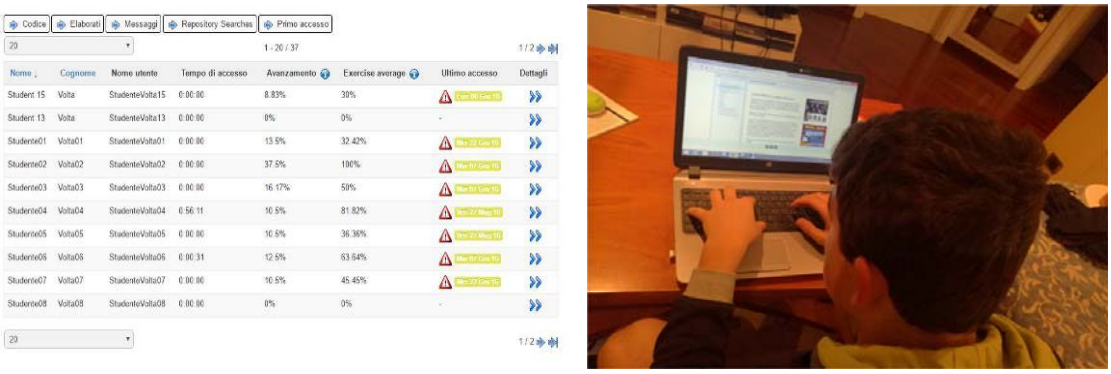


Figure 2: Secondary school students of the Instituto "Volta" (Nuoro, Sardinia) singing with an expert during the face–to-face activities of the course (top); The students' logs and one student studying the course materials at home (bottom).

Data collected

At the end of the activities, a questionnaire[10] was filled by the learners to assess their experience of our technologies. Furthermore, the teacher kept a qualitative session log, where he reported main problems of the educational process or aspects he considered important. Finally, the i-Treasures Web-platform tracked the students' progress and results of their quizzes (LMS analytics).

Challenges, problems encountered and lessons learnt

According to the teacher's report, the main problems encountered during this demonstration activity were logistical and technical. In particular, as far as logistics are concerned, it was not easy for the teacher to manage the whole experience within the time constraints of the school. This is because – in order to carry out the activities – he had to bring his students to the computer lab of the school, which was not always available.

Moreover, the teacher complained about the lack of support from his colleagues: while the activities proposed, in principle, lend themselves to an interdisciplinary approach, teachers of the other subjects got hardly engaged and our teacher ended up managing the course alone. Unfortunately, this problem (i.e. the difficulty to propose interdisciplinary paths) is quite typical in secondary education in Italy, due to the parceling in many different subject matters.

As far as the technical problems were concerned, the teacher reported connection issues due to the fact that the WiFi connection at school was not working properly at all times. This caused several problems during navigation and exploration of the

[10] Questionnaire for Canto a Tenore: http://i-treasures.multimedia.uom.gr/evaluation/cantoatenore.doc

Web-platform, which were disruptive for learners and time-consuming. To solve the aforementioned problems, some of the students ended up finishing parts of the learning activities at home, as part of their homework, which was not originally planned.

Overall, the lessons learnt can be summarized as it follows:

- When proposing a learning path on an ICH expression, especially if this targets novices, it is very important to ensure a multi-disciplinary approach, as the cultural, societal and historical aspects behind one ICH are crucial, in order to understand it. This implies that – if the learning path is proposed in schools – a number of teachers should get involved from the very beginning, even in the design phases.
- Time is also an important component: at least a couple of hours for each session should be guaranteed to cover a meaningful piece of knowledge, while the total duration of the path will obviously depend on how deep the contents are addressed. In any case, we estimate that 20 hours in total for our course was a reasonable duration.
- Technical infrastructure plays also an important role, so one should previously check that the equipment is configured properly to allow a smooth navigation and exploitation of the e-learning platform and its functionalities.
- Some of the individual activities were de facto carried out by spontaneous groups of students. This was due to the setting of the scenario: given that students were seated close to each other in the lab, and that there was only one teacher to provide support, most of the time they tended to aggregate even for carrying out those activities that were originally supposed to be individual. This – far from being a negative point – turned out to be positive (see below, *User feedback*), so for the future, we suggest to orient most of the activities in schools to collaborative learning approaches.
- An alternation of singing tasks (supported by an expert) and more theoretical sessions is desirable, even if the learning path is just an introduction to an ICH, as this approach gives the real flavour of the cultural expression and is particularly welcomed by students.

User feedback

Overall, the experience required some effort by the teacher, but it was quite positive, both for the students and for the teacher himself.

The students appreciated the platform and were happy to use new technologies during their school time (which in Italy is not common, at least not in all schools). At the same time, we noticed that the alternation of singing activities with more theoretical tasks, was also very much appreciated. This confirms the original working hypothesis that practicing is always very important and that a direct contact with one expert is a crucial element of the learning process, because it allows a direct experience of the cultural expression.

Given that Canto a Tenore is traditionally not “taught”, it is not possible to compare a traditional formal learning path with the one proposed by the project. What we could observe, though, was the overall engagement of the students in doing the proposed activities and the overall satisfaction by the teacher regarding the achieved learning objectives. To be noted that there was no formal assessment of the proposed activities, as the tests proposed were mainly intended as a formative assessment tool for students to orient their next steps in the learning path, rather than for summative evaluation purposes.

Moreover, students appreciated a lot the collaborative activities proposed and tended to transform into collaboration also those activities that had been originally conceived as individual ones (see above).

One important side-effect of this experience concerns the revision of the LMS course materials that the teacher was able to do, since during its use by the students some issues emerged, concepts that needed to be clarified, etc.

3.1.1.1.2 Scenario 2: Virtual workshop for Canto a Tenore experts

This scenario regarded the demonstration of the i-Treasures Web-platform as a whole and involved a group of selected experts in music and singing.

In particular, the idea here was to collect feedback about the i-Treasures platform, the LMS, the Canto a Tenore course (same as in previous scenario), and the proposed educational materials, from a group of people with a certain expertise in the field of music and also (for some of them) of the Canto a Tenore, in view of further repurposing to other people in the future.

Participants & venue

Ten music experts from Italy participated in this online workshop, but only 8 of them filled in a questionnaire. As far as their profile is concerned, 5 of them were Canto a Tenore experts, while the rest were musicians with no specific expertise in this kind

of traditional singing. These people were recruited under suggestion of the i-Treasures experts of Canto a Tenore, with the aim to collect their opinion about the potential of the i-Treasures platform and LMS course for apprentices in Canto a Tenore, and - more in general - for student singers.

The involved experts were all males, most of them aged between 46 and 60 and only one was over 60. As to their cultural background, most of them had a master degree; just one had a lower-secondary school degree. The group of experts included music teachers, singers, and ethno-musicologists. Their level of expertise in Canto a Tenore was diversified as only 5 of them had a good knowledge while others did not have much experience. The majority had an average or good familiarity with computers and only one of them was not familiar with ICT technologies.

The workshop lasted about 6 weeks and took place online between mid-November (the introductory session was held on November 15th, 2016) and the end of December 2016.

Apart from the participants, the sub-use case leader (CNR) was directly engaged in this demonstration, both in the initial synchronous session (see below), and as moderators in the other activities along the whole educational path.

Our three Canto a Tenore experts (Mr Bastiano Pilosu, Mr Marco Lutzu, and Mr Paolo Bravi) were active during the phase of participants' recruitment and, then, provided direct support with face-to-face sessions to some of the participants (see below for details).

Demonstration outline

The online workshop included two parts. First, an initial synchronous session was held via Skype, during which CNR researchers illustrated the platform, its modules and functionalities to the participants. Then, the participant music experts explored the various modules of the platform by themselves, asynchronously.

The proposed learning path consisted of the following modules:

- *Introduction and familiarization with the i-Treasures platform*
- *Theoretical aspects of Canto a Tenore*
- *The four voices*
- *The forms of the Canto*
- *The local styles (modas)*

- *Canto a Tenore and new technologies*
- *Conclusions.*

Differently from the first scenario, in the second scenario, the focus of the demonstration was the whole i-Treasures platform and also the LMS with all its basic functionalities as well as the Text-to-Song module.

According to the learning path, during the "*Introduction*", participants got familiarized with the Web-platform, as they attended a synchronous presentation and, then, were triggered to navigate and explore freely the Web-platform environment (Figure 3).

In the theoretical module "*Theoretical aspects of Canto a Tenore*", participants were provided with a SCORM (Shareable Content Object Reference Model) containing the basics of the Canto.

In the subsequent three learning modules, participants were exposed to several audio and video resources stored in the LMS that allowed them to learn the basics of this singing tradition. They also had to go through several tests, which were also compounded with audios and videos.

In the "*Canto a Tenore and new technologies*" module, the main activity was centered around the Text-to-Song functionality. This specific learning module (which - as such - was not present in the first scenario) was included to give more emphasis to the TTS and with the precise aim to get in-depth feedback from the participants about this functionality.

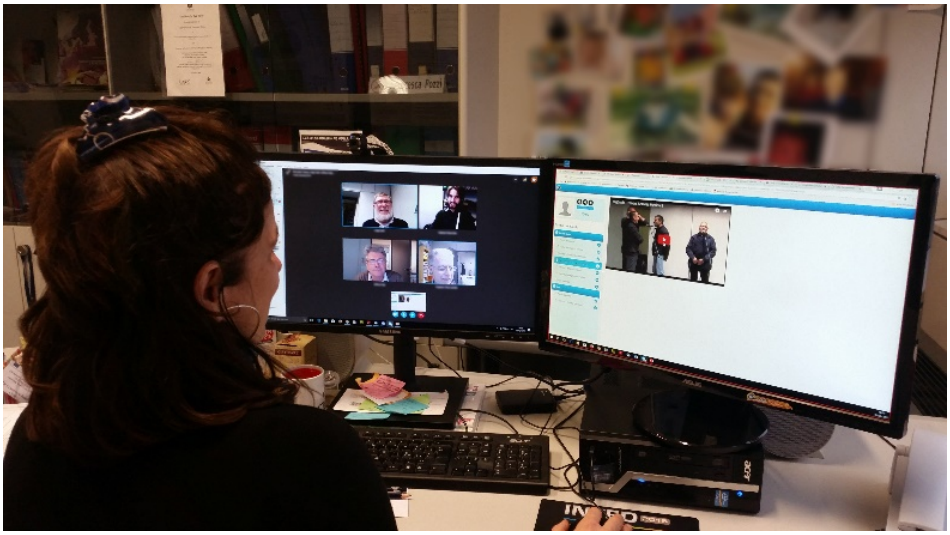
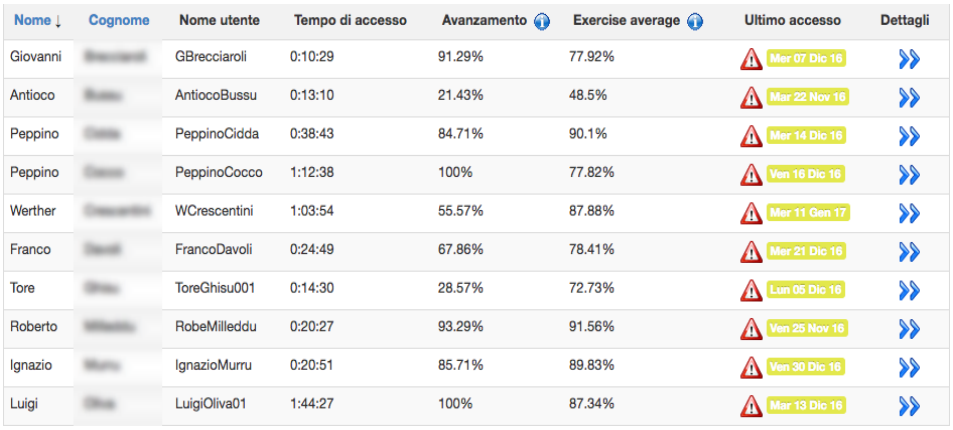


Figure 3: CNR researcher Dr Francesca Pozzi presenting the i-Treasures Web-platform and its main functionalities to a group of music experts via Skype.



Nome	Cognome	Nome utente	Tempo di accesso	Avanzamento	Exercise average	Ultimo accesso	Dettagli
Giovanni	[illegible]	GBrecciaroli	0:10:29	91.29%	77.92%	Mer 07 Dic 16	
Antioco	[illegible]	AntiocoBussu	0:13:10	21.43%	48.5%	Mar 22 Nov 16	
Peppino	[illegible]	PeppinoCidda	0:38:43	84.71%	90.1%	Mer 14 Dic 16	
Peppino	[illegible]	PeppinoCocco	1:12:38	100%	77.82%	Ven 16 Dic 16	
Werther	[illegible]	WCrescentini	1:03:54	55.57%	87.88%	Mer 11 Gen 17	
Franco	[illegible]	FrancoDavoli	0:24:49	67.86%	78.41%	Mer 21 Dic 16	
Tore	[illegible]	ToreGhisu001	0:14:30	28.57%	72.73%	Lun 05 Dic 16	
Roberto	[illegible]	RobeMilleddu	0:20:27	93.29%	91.56%	Ven 25 Nov 16	
Ignazio	[illegible]	IgnazioMurru	0:20:51	85.71%	89.83%	Ven 30 Dic 16	
Luigi	[illegible]	LuigiOliva01	1:44:27	100%	87.34%	Mar 13 Dic 16	

Figure 4: The users' logs.

Data collected

At the end of the activities, a questionnaire (same as in previous scenario) was filled by the participants to assess their experience in using the Web-platform. Furthermore, the Web-platform tracked their progress and results of their tests in the form of LMS analytics.

Challenges, problems encountered and lessons learnt

In this case, the demonstration was affected by the fact that not all the participants involved had the same level of familiarity with the proposed technologies. In particular, in a couple of cases, close support was required, with one of our experts providing face-to-face help, because two participants had great difficulties in accessing the platform and using the learning resources. This should be taken into due consideration for future projects, as in many contexts the level of digital literacy may vary a lot.

In any case, this activity allowed collecting a lot of feedback, especially regarding the available learning materials so that our experts could further revise and improve them, especially in view of the third demonstration scenario.

User feedback

A statistical analysis of the collected questionnaires was performed under Task 7.3 "*Use cases evaluation*" and the results are presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis.

The overall demonstration experience was good, even if some criticalities emerged for a couple of participants with the use of the platform because they were not very familiar with computers (see above).

To be noted that in this specific case, the scenario was not so much aimed at making the participants reaching a set of learning objectives, but rather to collect their opinions regarding the suitability of the platform and the proposed learning materials in view of repurposing the same platform and course to other people in the future. Overall, their feedback was quite positive, as they judged that the course was able to provide a meaningful introduction to this cultural expression and they evaluated the use of technology useful to foster awareness of the ICH at hand. Of course, the two experts who suffered from inexperience with the use of technology, were more severe about the necessity to make these instruments user friendly, but even in these two cases, they acknowledged the potential of using technology to attract more people towards the ICH and to engage (especially) young generations.

Some useful feedback came regarding the Text-to-Song functionality, where some of the experts observed some criticalities as far as the syllable division is concerned: this is because the Sardinian language is very complex and has got (often implicit) rules of its own, different from those of the Italian language. Thanks to their inputs, it is possible to improve the TTS functionality.

3.1.1.1.3 Scenario 3: Open online Canto a Tenore course for the general public

The third scenario grounds on the first one, but it targets a wider potential population. The idea here is to offer a permanent online course for free, for anyone who is interested in learning the basics of this artistic expression[11] (**Error! Reference source not found.**). To be noted, that to the best of our knowledge, this is the **first course** on the Canto a Tenore singing tradition and – as such – this is an important legacy of the project.

As already mentioned, the course is permanent and will remain open as a legacy even after the project conclusion with all the materials and learning resources; nonetheless, during the four weeks of this demonstration (March 20th –April 19th, 2017) the course was tutored and synchronous activities were carried out. In order to recruit participants for the demonstration, the course was advertised – among the others - in local Sardinian associations (e.g. Terra Mea) and among students at the Cagliari Conservatory, among experts in rare singing (so that they can propose the

[11] Open online course for Canto a Tenore: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/OPENONLINECOURSEFORCANTOATENOREI

course to their students) and among various groups of amateurs. Furthermore, many music teachers in various Italian schools were contacted.

Figure 5: Open online Canto a Tenore course for the general public.

Online fruition was supported with tutorials and guidelines for learners about the course, its structure and how to use the various LMS functionalities. Moreover, differently from what happened in the other two scenarios, this course was also enriched with three forums, in order to allow communication and collaboration during the course. In particular, one forum was dedicated to discussions about the contents of the course; in this forum our Canto a Tenore expert(s) could answer learners' questions and learners could interact and collaborate to carry out the proposed activities. A second forum was dedicated to technical issues, where personnel from CNR provided technical support. A third forum was more general and concerned the whole course and was again moderated by CNR. This was where learners could ask questions or rise issues related to the course itself.

At the end of the learning path, participants having attended >75% of the proposed activities could get a certificate of attendance.

Participants & venue

This third scenario involved 39 participants, all Italians, apprentices, amateurs or students. During the four weeks of the demonstration, 40% of the participants completed or almost completed the online course, which will remain available for those that still have to finish it or for whoever would like to attend the course in the future. 60% of the participants were men. Some of the participants were Canto a Tenore singers or apprentices, others were singers of other singing styles or music

teachers; a small group was interested in Canto a Tenore as a cultural expression. Most of them (60%) were from Sardinia.

Apart from the participants, our three experts (Sebatsiano Pilosu, Marco Lutzu and Paolo Bravi) were again actively engaged, both in the recruitment phase as well as during the whole demonstration period, as they were appointed to answer questions in the Forum about the contents of the course.

CNR personnel was also directly involved in this scenario, both during participant recruitment, as well as forum moderation, support and tutoring.

Demonstration outline

This scenario aimed at helping learners getting familiar with the basics of the Canto a Tenore. Moreover, the educational path was conceived for increasing their listening competences. As a consequence, the learning activities were structured as follows:

- *Introduction*
- *Basics*
- *The four voices*
- *The forms of the Canto*
- *The local styles (modas)*
- *Conclusions.*

In this last scenario, the focus of the demonstration was primarily the LMS with all its basic functionalities. In this case, the Text-to-song module was not included, given the concerns raised by the expert participants in the second demonstration scenario (see above).

According to the learning path, after the *Introduction*, where learners were delivered a pre-test to check their initial knowledge about the Canto, learners were delivered the *Basics*, a theoretical module, which gave them the opportunity to get a preliminary picture of the theoretical knowledge underpinning the Canto a Tenore through a SCORM.

In the following three modules, learners could improve their listening abilities by means of made-on-purpose audio and video resources stored in the LMS. The acquired competences were also tested with quizzes that learners had to take individually.

In the conclusive module, learners were exposed to a post-test, so as to evaluate whether their knowledge and skills have improved.

A synchronous session was carried out at the end of the course (April 19th) in order to give the participants the opportunity to ask questions and collect their impressions (Figure 6). One expert, Mr Sebastiano Pilosu, participated in the session and discussed with the learners.

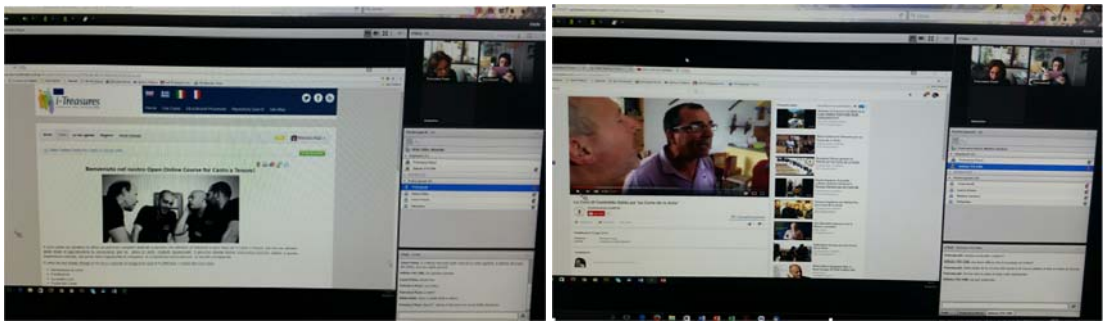
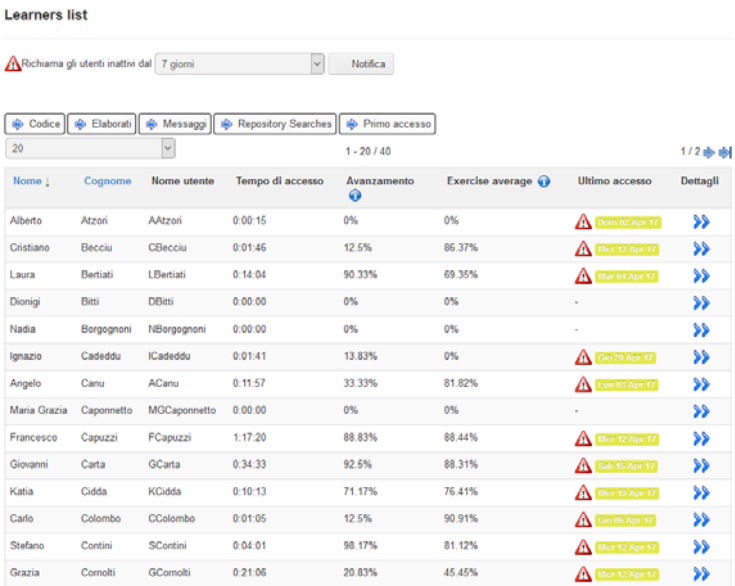


Figure 6: Two moments of the synchronous session for the open online Canto a Tenore course for the general public.

Data collected

Similarly to the other two demonstration scenarios, at the end of the activities, a questionnaire was filled by the participants to assess their experience in using the i-Treasures Web-platform. Furthermore, the Web-platform tracked their progress and results of their tests in the form of LMS analytics (**Error! Reference source not found.**). Moreover, the course included a synchronous section during which the participants expressed their opinions on the course.



Learners list

Richiama gli utenti inattivi dal 7 giorni Notifica

Codice | Elaborati | Messaggi | Repository Searches | Primo accesso

20 1 - 20 / 40 1 / 2

Nome	Cognome	Nome utente	Tempo di accesso	Avanzamento	Exercise average	Ultimo accesso	Dettagli
Alberto	Atzori	AAtzori	0:00:15	0%	0%	Dom 02 Apr '17	
Cristiano	Becciu	CBecciu	0:01:46	12.5%	86.37%	Mer 12 Apr '17	
Laura	Bertiati	LBertiati	0:14:04	90.33%	69.35%	Mer 04 Apr '17	
Dionigi	Bitti	DBitti	0:00:00	0%	0%	-	
Nadia	Borgognoni	NBorgognoni	0:00:00	0%	0%	-	
Ignazio	Cadeddu	ICadeddu	0:01:41	13.83%	0%	Gio 20 Apr '17	
Angelo	Canu	ACanu	0:11:57	33.33%	81.82%	Lun 03 Apr '17	
Maria Grazia	Caponnetto	MGCaponnetto	0:00:00	0%	0%	-	
Francesco	Capuzzi	FCapuzzi	1:17:20	88.83%	88.44%	Mer 12 Apr '17	
Giovanni	Carta	GCarta	0:34:33	92.5%	88.31%	Sab 15 Apr '17	
Katia	Cidda	KCidda	0:10:13	71.17%	76.41%	Mer 19 Apr '17	
Carlo	Colombo	CColombo	0:01:05	12.5%	90.91%	Gio 06 Apr '17	
Stefano	Contini	SContini	0:04:01	98.17%	81.12%	Mer 12 Apr '17	
Grazia	Cornolti	GCornolti	0:21:06	20.83%	45.45%	Mer 12 Apr '17	

Figure 7: Users' logs for the open online Canto a Tenore course for the general public.

Challenges, problems encountered and lessons learnt

As it happened in the previous demonstrations, the demonstrated i-Treasures technologies presented a challenge for some of the participants. The interface of the platform was considered not always intuitive and some participants had a problem navigating through the LMS pages. For the future, we plan to add in the course guide a section about the most frequent interface problems met by the learners.

Even in this case, we were allowed to collect a lot of feedback regarding the learning materials (see the following subsection) and the proposed assessment activities; thanks to this opportunity, we collected suggestions for further improving the course.

User feedback

A full statistical analysis of the collected questionnaires was performed under Task 7.3 "*Use cases evaluation*" and the results are presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis.

Participants, in general, appreciated the course and the materials provided.

During the synchronous session, one expert singer evaluated the course as follows: "*The course is interesting and innovative, the information is well organised and the platform allows to make available materials in different formats, so that the learner can have access to theoretical information and listen to singers' performances at the same time*" (M.S. expert singer).

As for the contents, they were considered adequate to the course objectives, complete and well organised; the opinions about clarity was less unanimous, but in any case quite positive.

The most part of the resources (SCORM and PowerPoint presentations, audio and video resources, etc.) were considered useful and easy to use by almost all the participants, even though, according to their opinions, they could be further enriched.

The positive aspect of the course, highlighted by some participants having a previous knowledge of Canto a Tenore, is its ability to guide the learner in a structured discovery of this cultural expression and to provide him/her with information that is not usually transmitted to the enthusiasts and amateurs. This represents, for sure, an added value of the course and in general of the methodology proposed (see D5.8) for ICH education, on which we have based all the courses on the i-Treasures LMS.

Despite the already cited difficulties, the support of technology was positively accepted by participants as an essential means to spread the knowledge beyond the regional boundaries.

3.1.2 Demonstration activities for Cantu in Paghjella

The Corsican Cantu in Paghjella is often described as one of the most ancient indigenous polyphonies of the Mare Nostrum islands. The Cantu in Paghjella, based on oral transmission, has been accompanying generations of peasants in their everyday life in Corsica. It is a tradition and an oral expression, a social practice, a ritual and festive event. It designates a polyphonic male chant interpreted a capella by three voices (a seconda, u bassu and a terza) in both secular and liturgical types. If there are more singers, the bassu voice may be sung by more than one singer. According to the repertoire, diverse languages such as Corsican, Crusca Lingua (Toscan Corsican), Sardinian, Latin and Greek are used.

The scope of the demonstration was to showcase the usability of the i-Treasures platform for the preservation of Cantu in Paghjella polyphonic singing. We suggest a set of tools, which could be displayed in museums/exhibitions/music festivals/singing schools/any other space aiming at giving a brief introduction to Paghjella by learning some basic singing technique elements and a short melody/text (versu), representative of this singing style. This can contribute to introduce and disseminate the knowledge of this rare human treasure, to raise people's interest and curiosity and to encourage them to learn and practice.

Two demonstration scenarios have been adopted as described below (Table 2). The first corresponds to the educational plan already described in D5.1 "*Report on analysis of educational scenarios*" and is targeted at the visitors of a Corsican Cultural Heritage museum, while the other involves an online course offered to adults interested in Corsican culture and Cantu in Paghjella.

Table 2: Overview of demonstration activities for Cantu in Paghjella

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Workshop in museum to raise visitors' interest in Cantu a	Museum of Corsica, Corte, Corsica	23 Septemb er 2016	• 40 Corsican-inhabitants who were familiar with the Corsican language or any language in the Paghjella repertoire	• Web platform • Cantu in Paghjella course in LMS • Tool for vocal tract signal capturing,	• PCs • Microp hones • Hyper-helmet with embed

Paghjella			• 10 Cantu in Paghjella experts • 6 university teachers • 5 CNRS & UPMC researchers	visualization and analysis	ded sensor s
Online course on the basics of the Cantu in Paghjella	CNRS-LPP, Paris	17 February 2017	• 6 university students interested in Cantu in Paghjella • 1 Cantu in Paghjella expert • 4 CNRS & UPMC researchers	• Web platform • Cantu in Paghjella course in LMS	• PCs • Microp hones • Headp hones

3.1.2.1.1 Scenario 1: Workshop in the Museum of Corsica

The aim of the first scenario was to demonstrate the LMS course for Cantu in Paghjella to Corsican speakers, university students and Cantu in Paghjella experts and test their interest and reactions. The idea was to use this course as an educational tool installed in a museum, aiming at the dissemination of the Corsican culture and, most specifically, the Cantu in Paghjella singing style towards people interested in Corsican culture, but not necessarily well aware of this unique singing style.

This scenario aimed to a) demonstrate the use of the i-Treasures platform with a population aware of the necessity of safeguarding this ICH, b) highlight the interest of the European Union towards this rare immaterial knowledge to people familiar with Corsican culture, c) showcase the possibilities offered by modern technology for the preservation of this singing tradition, focusing on the LMS but also presenting innovative tools and sensors for vocal tract signal capturing, visualization and analysis. The scenario was a good opportunity to introduce the audience to a structured educational path for learning the basics of Cantu in Paghjella.

Participants & venue

The first scenario involved the demonstration of an educational and cultural application installed at the Museum of Corsica, during a dedicated workshop held at the museum premises. The museum, located in the city of Corte, is devoted to the Corsican cultural heritage and presents an anthropological history of Corsica, introducing visitors to the traditional Corsica of yesteryear and charting its development through to the modern day. The museum's permanent collections are

divided into two areas. The first provides an insight into the traditional lifestyle of herdsmen and farmers and the evolution of customs and beliefs. It exposes, introduces and explores the myths and mythical figures of an essentially oral society, its language, its insular culture and its craftsmanship (production, methods and uses). Visitors can follow the daily routine of a herdsman, their conventions and their customs. The second area introduces the "modern" aspect of Corsica, including its attempts at becoming industrialized and the promotion of certain wine-producing businesses, which have stood the test of time, as well as its spiritual aspect, in which religion plays a very significant role. The museum also hosts conferences, school activities and general public visits, all focusing on the Corsican culture. Furthermore, the city of Corte is the only city in the island that has a university, so this was by all means the best place to hold this demonstration event.

The demonstration involved a day-long workshop on "*ICT technologies for Cantu in Paghjella singing and education*" that took place on September 23, 2016 in the museum. Official invitations were sent to local and regional authorities in charge of cultural affairs, while information was also sent to high-school teachers, local singing associations and local population involved with the museum activities. The workshop included the following actors:

- General public: 40 participants coming from all over Corsica with a special interest in Cantu in Paghjella.
- Scientific community: 6 university professors with a special interest in Corsican culture and pedagogy.
- Experts: 10 professional experts in Cantu in Paghjella, who participated in well known singing groups.
- Ethnologist: Our expert, Dr Catherine Herrgott was supervising the organisation of the workshop.
- i-Treasures partners: 5 researchers from CNRS and UPMC attended the workshop. They trained the experts/teachers/audience on the use of the Web-platform and the LMS and were available for technical support.

Demonstration outline

The objective of the demonstration was to present a structured educational path for discovering the Cantu in Paghjella tradition to people who have some knowledge about this singing technique in a non-formal way, usually by listening to Cantu in Paghjella songs during local folklore festivals or social events. The structured

educational path is delivered through an online course in the i-Treasures Web-platform[12].

The demonstration was organised as a day-long workshop. The agenda of the Workshop is shown in Figure 8. As can be seen it comprises of two parts. The first was a theoretical part that focused on the i-Treasures objectives and results, the notion of ICH and the role of UNESCO in safeguarding, and the history and specificities of the Cantu in Paghjella singing tradition. The second part focused on the demonstration of the technologies developed within i-Treasures for the safeguarding of Cantu in Paghjella. During the last part, the audience had the opportunity to test these technologies on their own.

i-Treasures Workshop on "ICT technologies for Cantu in Paghjella singing and education"		
10:00-10:30	Introduction to i-Treasures project	Dr Lise Crevier-Buchman & Dr Martine Adda-Decker (CNRS)
10:30-11:15	What is ICH in UNESCO and in Corsica?	Dr Catherine Herrgott, Anthropologist (CNRS)
11:45-12:15	Ethics in safeguarding	Ms Marie-Barbara le Gonidec, Ethnomusicologist (French Ministry of Culture)
12:15-12:45	Specificity of Cantu in Paghjella and its capture	Dr Claire Pillot-Loiseau (CNRS)
13:00-14:00	Lunch break	
14:00-15:00	Multi-sensor acquisition and analysis for traditional singing: HyperHelmet & i-Threc software	Mr Gregoire Bachman(CNRS) & Ms Clemence Leboulanger (UPMC)
15:00-15:30	Presentation of the pedagogical plan and the LMS course for Cantu in Paghjella	Mr Gregoire Bachman(CNRS) & Ms Clemence Leboulanger (UPMC)
15:30-17:30	Hands on: Your turn! *The LMS course was tested by the audience.*	CNRS and UPMC researchers

Figure 8: Agenda of i-Treasures demonstration workshop on "*ICT technologies for Cantu in Paghjella singing and education*" organised in the Museum of Corsica in Corte.

[12] LMS course for Cantu in Paghjella: http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/CANTUINPAGHJELLA (FR) (online course in French)

More specifically, the second part began with the demonstration of the i-THRec software coupled with the hyper-helmet for vocal tract capture and the sensors attached to it (see D3.3 "*Final report on ICH Capture and Analysis*", Section 3.4).

Next, the LMS course was presented to the Workshop participants, who were then invited to navigate through the learning path of this course, assisted by CNRS and UPMC researchers, who offered technical support and answered questions from the audience. There were 6 computers available by the museum. In addition, the participants had been invited/encouraged to bring their own laptops at the event. Two participants were sitting in front of each PC (Figure 9).

Depending on the interest shown by the audience and the participants'' familiarity with computers, the different parts of the learning path of this course were investigated in various depths:

- "*The origins and history of the Corsican songs*" module, which focused on the historical background of this ICH expression, was completed by most of the participants.
- "*Themes and context of Corsican singing*" was completed by a large number of people. Although still easily accessible, this second module was completed by people that were familiar with computers.
- "*The vocal techniques*" module was completed only by those with some singing experience, because this module, as shown by its title, is more technical. The users could test the acquired competences with quizzes that they could carry out also at home.

Live singing activities were organised during breaks, where students and the general public could sing with groups of Cantu in Paghjella experts (Figure 9). Moreover, the participants were able to try on the hyper-helmet and use the i-THRec software for vocal tract signal capturing and visualisation.

Figure 9: Demonstration event for Cantu in Paghjella at the museum of Corte: a) Introductory lecture on ICH by the museum director and the local Cantu in Paghjella expert (top-left), b) Students and attendees singing with a group of experts (top-right), c) CNRS and UPMC researchers preparing the hyper-helmet and laptops for the afternoon demo session (bottom-left), and d) Hands on session with some participants in front of their computers, navigating through the LMS and studying the course material (bottom-right).

Data collected

No questionnaires were collected during this workshop, despite our efforts. The majority of the attendees (general public and local experts) did not feel like spending time filling questionnaires and were more interested in oral exchange. Feedback from the participants was collected through discussions and mini-interviews.

Challenges, problems encountered and lessons learnt

The main challenge in this demonstration activity stemmed from the fact that most of the participants were not familiar with ICT technologies and, thus, had some problems interacting with the LMS. Only few participants (university teachers and part of the audience) were familiar with online courses and were able to navigate the LMS comfortably on their own. Most attendees did not feel comfortable with PCs or screens or wearing the hyper-helmet while singing and they needed some help to navigate through the activities of the learning path, which was to be expected since the audience comprised mainly of local inhabitants of Corsica that had limited computer literacy.

Moreover, most of them were used to listening to Corsican music live in local folk festivals so their interest picked when they discovered the available videos and other audio-visual material. That is why the hands-on session during which people experienced the LMS lasted until 19:00h instead of 17:30h, showing the participants' interest for it.

The main lesson learnt from this experience is that it is important to have an initial training session for those not familiar with computers and new technologies, so that

they are smoothly introduced to these technologies and learn how to use them. This greatly facilitates and advances the learning experience and allows people to focus on the educational activities/materials without obstacles.

User feedback

The participants were very interested in the idea of a computer-based course for Cantu in Paghjella, which could be followed online by anyone. Moreover, as pointed out by the museum representatives, this course can certainly be a major asset for the museum and museum visitors that come with a desire to discover more about the place they visit and its traditions. A basic familiarity with computers is of course required, which, however, should not be a problem for young people. The interest on this aspect of ICH education was strong enough to keep the participants engaged, despite the fact that some of them needed assistance to navigate the LMS contents.

The attendees found the course material novel and interesting. Some of the experts, coming from different parts of the island, thought that the course should be expanded to cover regional specificities of the language, the accent and the music across the whole island of Corsica. Moreover, they expressed the opinion that it would be very helpful to further explore the socio-cultural aspects of this singing tradition. They have made some interesting suggestions about the kind of materials or activities that could be added to this course to make it more complete.

In general, the introduction to our technologies was considered to be a positive experience. The use of new technologies to record, document, analyse and, especially, transmit this cultural heritage to more people not only on a local, but also on a national and international level was found to be very promising for the safeguarding of this tradition and its potential for tourist attraction. Although not very familiar with such technologies themselves, local inhabitants recognised that this approach is very useful, especially when reaching out to the younger generation and people abroad, and allows covering this cultural heritage in a much more spherical way, beyond the singing aspect.

The dimension of our research focused on the capture and analysis of the singing performances with different sensors was also something that really interested the Cantu in Paghjella singers, especially since it did not only focus on the produced sound/voice but also on other aspects of the vocal tract operation like tongue movement, breathing, nasality vibrations etc.

3.1.2.1.2 Scenario 2: Online Cantu in Paghjella course

The second scenario involved an online course for people interested in traditional music, and more specifically in Cantu in Paghjella, that are also familiar with computers. It aimed at testing the interest of learners who would follow the course online, either on an individual initiative at home or in the context of a visit to a museum or a cultural association or a touristic place.

Participants & venue

The participants were 6 university students, 20-25 years old, interested in Cantu in Paghjella, and 5 CNRS researchers, 30-60 years old, familiar with acoustics and phonetics. The demonstration took place at the Laboratory of Phonetics and Phonology in CNRS (LPP/CNRS), Paris on February 17, 2017.

Demonstration outline

The objective of the demonstration was to showcase the i-Treasures Web-platform and the LMS in an audience that would potentially use the LMS course (same as in previous scenario) without the obstacles encountered by the audience of the workshop in Corte: people interested in but not familiar with Cantu in Paghjella, who are familiar with computers and online courses.

After a general presentation about the i-Treasures technologies and an introduction to the proposed learning path, the users were invited to complete the course on their own. CNRS and UPMC researchers were available for questions and technical help. At the end, the participants filled in questionnaires[13] to evaluate their experience.

Data collected

Seven questionnaires were collected from the participants, which evaluate the different components of the i-Treasures system, focusing on the Cantu in Paghjella use case.

Challenges, problems encountered and lessons learnt

Some participants required some time to get used to the LMS environment and had some difficulty navigating the learning path, at least initially. However, once started, these preliminary difficulties were overcome and they proceeded without problems.

It is important to note that it was shown once again that familiarity with computers and some initial training with the proposed tools is a key to the success of such

[13] Questionnaire for Cantu in Paghjella: http://i-treasures.multimedia.uom.gr/evaluation/paghjella.docx

educational tools. Otherwise, they can cause the user anxiety and frustration and might discourage some of the users from completing the proposed activities.

User feedback

A statistical analysis of the collected questionnaires was performed under Task 7.3 "*Use cases evaluation*" and the results are presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis.

Most of the users were impressed by the quality of the course and the large amount of the available documentation and audio-visual material. The learning material was found to be very satisfactory, providing adequate examples on the specificities of the polyphonic singing. The proposed learning path was considered innovative and it was agreed that it does help learners to get adequately introduced to this kind of ICH.

One of the most positive things about the proposed structured educational path, as pointed out by the users, was the fact that it provided a variety of activities and educational materials, which made the learning process much more interesting. The learners appreciated the fact that it included both theoretical activities that introduced them to the historical background and the basics of this tradition but also practice activities that aimed at fostering singing competences. They also found very helpful the assessment of their knowledge through tests available in the LMS.

They learners thought that the course succeeded in teaching them the basics of this singing technique; especially, the available audio-visual material, which allowed them to listen to the different Cantu voices separately and as a polyphony and also visualized the different gestures and the behaviour of the singing group.

The overall assessment was that such a course would be of great interest to people interested in traditional singing or Corsican culture, since it provides a very good basis for further exploration of/ engagement with this ICH expression. The users thought that the i-Treasures tools can be easily adopted by organisations/ schools/ institutions to help them promote and safeguard Cantu in Paghjella or other forms of ICH, especially among younger people, and were ready to recommend these tools to other people.

3.1.3 Demonstration activities for Byzantine music

Byzantine music is the music of the Byzantine Empire composed to Greek texts as ceremonial, festival, or church music. Although, it has not been listed by UNESCO as

an endangered ICH, there is a real risk that certain interpretation styles of Byzantine hymns could die out if no action is taken towards its safeguarding.

The scope of the demonstration was to showcase the usability of the i-Treasures platform in Byzantine Music education. Like many other traditional cultural expressions, Byzantine Music is usually taught and learnt in informal contexts by oral transmission and imitation, so, the demonstration aims to explore the potential of the platform functionalities in supporting a formal educational path with different learning activities.

To this end, three educational scenarios were adopted, resulting in three different demonstration activities organised by UOM in cooperation with Byzantine music experts from Thessaloniki. They correspond to the educational plan already described in D5.1 *"Report on analysis of educational scenarios*" and are targeted at primary school students as well as Byzantine music learners (see Table 3).

Table 3: Overview of demonstration activities for Byzantine music.

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Structured educational path for primary school students	Primary Experimental School of the Aristotle University of Thessaloniki	December 2016-January 2017	• 20 primary school students • 1 Byzantine music expert/ music teacher (Athanasia Stergiaki)	• Web platform • Byzantine music course in LMS • Text-to-Song for Byzantine music • Game-like application for Byzantine music	• PCs • Microphones
Educational tools for Byzantine music chanters	Church of Saint Nikolaos in Larisa	February 2017	• 5 Byzantine music chanters • 1 Byzantine music expert (Athanasia Stergiaki)	• Web platform • Byzantine music course in LMS • Game-like application for Byzantine music	• PCs • Microphones
Structured educational path for university students	University of Macedonia	March 2017	• 5 university students, with music knowledge • 1 Byzantine music expert (Athanasia Stergiaki) • UOM researchers	• Web platform • Byzantine music course in LMS • Text-to-Song for Byzantine music • Game-like application for Byzantine music	• PCs • Microphones

3.1.3.1.1 Scenario 1: Structured educational path for primary school students

The first scenario involves a structured educational path for primary school students. Byzantine music is considered to be a difficult subject for young learners, since it is very different from Western music. For example, the music notation in Byzantine music is not specific. Byzantine notation contains several qualitative symbols that describe how a particular note or group of notes should be chanted. Western notation, on the other hand, has only a few qualitative symbols. Western notation describes a melody in terms of absolute pitches, whereas Byzantine notation describes a melody as relative pitches within a particular predefined scale.

The novel educational tools developed within i-Treasures for this kind of ICH aim at motivating and facilitating young students to learn more about Byzantine music. The scope of this scenario was to explore how the students of a primary school perceive ICH learning using new technologies and how effective, enjoyable or motivational such an approach can be for this target population.

Participants & venue

This demonstration activity took place at the Experimental School of the Aristotle University of Thessaloniki[14] and involved primary school students in the 5th and 6th grade. It was organised in the context of their "Music" class and took place in the computer lab of the school. The demonstration took place in December 2016 and January 2017. It involved the following actors:

- Students: a group of 20 primary school students (10 girls and 10 boys) of the Experimental School of the Aristotle University of Thessaloniki, 10-12 years old. The students had different levels of knowledge about music theory and practice. The activity was compulsory for all the students attending the class (which is taught once a week).
- Experts: Ms Athanasia Stergiaki, music teacher in the school and expert in Byzantine music. Ms Stergiaki presented the platform and its main components to the students, coordinated the delivery of the LMS course and provided technical support in problems related to the use of the LMS.

Demonstration outline

[14] Experimental School of the Aristotle University of Thessaloniki: http://dim-peir-thess.thess.sch.gr/

The objective of this demonstration was to study how young learners experience the use of the i-Treasures Web-platform in Byzantine music education. The demonstration followed the structure of the corresponding LMS course in the i-Treasures Web-platform (LMS course: *Introduction to Byzantine music (Gr)*[15]) and also introduced the TTS module for Byzantine music (see D5.6 "*Final version of Text to Song synthesis module*") and the game-like application for Byzantine music (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*").

During the first day of the demonstration, the teacher briefly presented the project, its objectives and its main outcomes to the students using available audio-visual material. The presentation focused on the introduction of the i-Treasures project, the i-Treasures Web-platform and, specifically, the Byzantine music use case, as well as the structure of the learning path to be followed by the students. The students received usernames and passwords and, after the main presentation, they logged in to navigate and explore the platform on their own.

In the following days, the students followed the learning path and completed the different activities with the help of their teacher. This lasted eight teaching hours, in different school days. In every lesson, one or two modules of the learning path were first presented to the students by the teacher at the central video projector of the classroom. Next, each student had to complete the module's activities individually (Figure 10). During this time, the teacher was walking around the classroom, answering questions or helping students with some activity, if that was necessary. After completing the learning activities of the day, the teacher was giving the students homework. Moreover, the students were asked to repeat the day's activities or new ones at home by logging into the system again.

The outline of the course/lessons is summarized below:

- In the first lesson, the teacher showed to the students the main menus of the i-Treasures Web-platform and explained to them how to login and subscribe in the Byzantine music course. She also presented the learning path of the course and corresponding activities to be followed. This corresponds to the first module of the learning path ("*Introduction-Familiarization with the platform*"). After this introductory part, the students moved on to the second module ("*Traditional Byzantine music history*"), which helped them acquire basic knowledge about the history of Byzantine music.

[15] LMS course for Byzantine music: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/INTRODUCTIONTOBYZANTINEMUSIC (GR)

- In the second lesson, the students followed the activities of the third module (*Byzantine Music Scale*), which allowed them to make a first acquaintance with Byzantine chanting and come in touch with the richness of this tradition. The acquired knowledge was tested through an online quiz. The contents of the next two modules ("*Characters of Quantity*" and "*Characters of time*") were also briefly presented to the class and the corresponding activities (along with the available quizzes for assessing the acquired knowledge) were completed by the students at home.
- In the third lesson, the teacher introduced the Text to Song module for Byzantine singing and demonstrated how it works. Following this introduction, the children experimented with the TTS module on their own and started synthesizing short Byzantine hymns by using paradigms available on the Web-platform or by trying their own lyrics and neumes. They found this activity very entertaining and were very eager to experiment with this tool. This was the last lesson before the Christmas holiday. The children were asked to go through all the activities of the learning path again and complete unfinished modules during this time.
- During the last lesson, the teacher demonstrated to the students the game-like application (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*") and the students had the ability to practice what they had learned. Unfortunately, there were some problems with the game-like application, which could not run in all the school's computers (because they had installed old versions of Windows), so we had to use a few laptops, which students used sequentially to try the game. Not all the students were able to practice and test the game in the school area.

Data collected

At the end of this demonstration activity, we collected 16 e-questionnaires[16] from the participants (students), which evaluate the different components of the i-Treasures system, summarize their experience and provide valuable information about the system's user acceptance.

[16] Questionnaire for Byzantine music: http://i-treasures.multimedia.uom.gr/evaluation/byz_en.doc

Figure 10: Primary school students in Thessaloniki following the learning path of the Byzantine music course in the i-Treasures LMS. The children also used the corresponding game-like application for Byzantine music practice.

Challenges, problems encountered and lessons learnt

Differently to other demonstration scenarios and use cases, the students participating in this demonstration activity were very young (10-12 years old) and, thus, required a lot of help from their teacher and her constant supervision and intervention, since they were not familiar with the terminology that was used in the platform. Their teacher gave them clear instructions and many of them also worked alone at home on their own computers.

As will be discussed below, students were fascinated by this kind of e-lessons and their enthusiasm was evident throughout the demonstration process. The proposed learning path, which effectively combines different kind of activities and learning tools/materials, increased their curiosity and kept their interest high, making the educational process a lot more enjoyable and effective. Moreover, it gave the teacher the opportunity to use different kinds of teaching methods depending on the nature and content of each lesson/learning activity, i.e. a) teacher addressing the whole class (all of the students), b) team-work involving 4-5 persons working with each other and being assisted by the teacher, c) students following an activity individually in the lab or at home.

Whether we follow traditional teaching approaches where all learning activities take place entirely within the classroom or innovative approaches like the ones proposed

within i-Treasures that involve all kinds of different activities (face-to-face and online, group work or self-study), it is clear that the more organised and well-structured the lessons of the conceived educational path are (whether they are followed in the classroom or at home), the more successful the course will be. To make sure that we could effectively follow the activities of the proposed educational path and since young children were involved in this demonstration, it was important for the teacher to train the students on the basics of the LMS and complete the initial activities within the classroom for the first time, before they could use the LMS by themselves in the lab or at home for self-study. The time required for training depends on the student. Some students learn easier than others or have a more solid background in using similar technologies. About a couple of hours can be considered an effective amount of time to receive some basic training that will allow the young learners to start following the learning path on their own. The forums can always be used for exchanges between the students and the teacher, but students of this age were not very keen in using them because, on the one hand, they were not familiar with such communication tools and, on the other hand, they preferred face-to-face contact with the teacher to answer their questions or help them.

The main problem we have encountered during the demonstration was the one with the game-like application, which unfortunately did not allow all students to practice the game. Some were just spectators.

User feedback

A full statistical analysis of the collected questionnaires was performed under Task 7.3 "*Use cases evaluation*" and the results are presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis, also taking into account our discussions and interactions during the demonstration.

In general, the students enjoyed learning the basics of Byzantine music using the tools offered by the i-Treasures platform. Their reaction about the LMS course was very positive and they were very excited about the game-like application. They repeatedly wished that more courses could be taught in a similar way, i.e. by exploiting the opportunities offered by new technologies.

After an initial training, the students were able to easily navigate the Web-platform and the LMS by themselves. The LMS interface was found to be attractive and the LMS content was considered to be clear, satisfying and informative. The course was designed to include a combination of different types of learning activities aiming to satisfy the different learning objectives (theoretical and historical background,

visualization of byzantine notation, ear training, guided practice, etc.) and this variety helped the young learners to remain interested and focused, while at the same time making the learning path easier to follow and more enjoyable.

With regards to the TTS module for Byzantine music, although, the students were not familiar with the idea of synthetic voices, they thought that it was a useful tool for learning more about this ICH. However, many of them had some difficulties in learning how to use it, mainly because it involved using Byzantine notation that they were not very familiar with (and this is why most of them thought that it was easier to use the TTS for Canto a Tenore). In some cases, they said that the synthesized voice sounded rather robotic and thought that it could be improved.

On the other, they found the game very interesting, they liked its interface, and they thought that it helped them improve their Byzantine music singing. Most of them found comfortable to practice/sing the hymn with musical rhythm gestures and watch the expert's video at the same time[17], which was something that had troubled us during the design of the game. As an improvement, the children said they would like to have the possibility to practice some very popular hymns that they were familiar with since a very young age. In addition, they would prefer that the virtual tutor explained to them their mistakes and provided visual or audio feedback instead of just an evaluation score and a message about how good their singing was.

The children thought that our technologies can significantly contribute to the safeguarding of ICH and would recommend them to friends and family. The enthusiasm of the children for the use of new technologies as part of the education process is not a surprise, especially nowadays. It is common knowledge that younger people learn better and easier through new technologies, since they already use them everyday in different aspects of their lives. Offering different stimuli and tools, increases their interest and motivation, while helping their memory. The use of quizzes in the LMS and sensorimotor learning in the game helped the students learn from their mistakes and improve their performance and ear training. By using such a variety of tools and stimuli, the teacher can complete the entire curriculum in a fast, effective and enjoyable way.

According to the teacher, if students were asked to design an educational path for this kind of ICH, they would certainly include more game-like applications and

[17] In Byzantine music, we count the tempo of the song by the movement of the hand. We have three music gestures corresponding to Down- Right- Up position of the hand. This helps the musician understand the place of each note in the hymn.

activities based on videos or quizzes because such activities were the ones that had helped them more, based on what they said during discussions they had in the classroom. For example, memorization of the Byzantine music terminology was more effective because of the game-like application. According to the teacher, students were able to remember a lot of Byzantine notation names and melodies after using this tool, even after a long time.

The teacher of this class, who has been working as a music teacher in elementary schools for a long time, has pointed out the difficulties encountered by music teachers when they try to teach Byzantine music in elementary or secondary school students. Most of them avoid teaching this chapter because they do not know how to approach it. The children believe that it is a difficult genre of music (and it is, without doubt, more difficult compared to Western music usually taught in schools) and do not pay a lot of attention or they are discouraged and give up easily. According to the teacher, the tools offered by i-Treasures greatly facilitated the teaching of Byzantine music and helped the children to learn and memorize melodies and Byzantine music notation much easier than expected. The teacher, who also helped us to design the game activities and interface and create the LMS course, expressed her delight for having the opportunity to use these tools used in her classroom and experience first hand the enthusiasm and the progress of her students. She pointed out that it was very satisfying to see young children being so interested and motivated to learn more about Byzantine music, since this could mean that this invaluable cultural expression can be revitalized using the appropriate tools.

Of course, several improvements can be made to the proposed tools. The LMS seemed to work well for both the children and the teacher. Some training is required at the beginning so that they can learn the basics, but after this initial training it is easy for the children to navigate the LMS and for the teacher to create new lessons or learning activities and monitor the progress of the class. The TTS could also be improved so that the synthesized singing voice sounds even more natural and some mistakes, encountered when rare words or syllables are used, can be fixed. This can be done by recording a larger corpus including more samples of more Greek syllables. In the game-like application, it would be very helpful to be able to receive some feedback in case of a low performance evaluation score, which will clarify what kind of error was made. Another improvement could be to scan the voice range of the learner in order to find automatically the appropriate music tone for him/her (in the current version of the game, the learners must do this on their own with the help of the teacher).

3.1.3.1.2 Scenario 2: Educational tools for Byzantine music chanters

The scope of this demonstration scenario was to test the usability of the i-Treasures platform in Byzantine Music education aiming at amateur music chanters. The demonstration covered the theoretical part that has been implemented as a course available in the LMS and also included a practice session based on the use of the game-like application.

Participants & venue

The demonstration took place in the church of the New Saint Nicholas, in Larissa, Greece, in February 2017 (Figure 11). The participants included chanters and our Byzantine music expert:

- Chanters: a group of 5 people (4 male and 1 female, 28-45 years old), all of them amateur Byzantine music singers. They had medium knowledge of Byzantine music theory and practice. They had learned the basics of this ICH in a conservatory and were practicing on their own. They had limited experience with the use of computers.
- Experts: Ms Athanasia Stergiaki, music teacher and Byzantine music expert.

Figure 11: A demonstration activity targeted at amateur Byzantine music singers was organised at the Church of Saint Nikolas of Vounenis.

Demonstration outline

The objective of this demonstration activity was to study the use of the i-Treasures Web-platform in Byzantine music education for adults that have some experience in this kind of ICH. The demonstration followed the structure of the corresponding LMS course in the i-Treasures Web-platform (LMS course: *Introduction to Byzantine music (Gr)*):

- *Introduction-Familiarization with the platform,*

- *Traditional Byzantine music history,*
- *Byzantine Music Scale, d) Characters of Quantity,*
- *Characters of time,*
- *Characters of Quality,*
- *Basic theoretical knowledge in Byzantine music reading - Practice and training (Chanting).*

The teacher demonstrated the platform to the chanters, presented all the available tools and menus, helped them subscribe to the Byzantine music course and showed them how to navigate through the course material. After this presentation, the chanters logged in the Web-platform and started exploring it on their own, the teacher offering her assistance whenever required.

Next, the users were asked to enter the LMS environment and complete the learning path of the available Byzantine music course. All the activities were accompanied by explanations, which allowed the chanters to access them autonomously. Of course, the teacher was available to answer their questions and help them with any technical issues. Since most of the learners were already familiar with the basics of Byzantine music, they were able to complete very quickly the theoretical modules and test their knowledge through the available quizzes. Finally, the teacher demonstrated the how the game-like application for Byzantine music works and the learners were able to use it for practice.

Data collected

At the end of this demonstration activity, we collected 5 e-questionnaires (same as in the previous scenario) from the participants (chanters), which evaluate the different components of the i-Treasures system and summarize their experience.

Challenges, problems encountered and lessons learnt

The main problem/challenge encountered in this demonstration activity was the fact that most of the participants could not initially imagine using an e-course or software applications for learning the basics or practicing this kind of ICH. All of them had learned the basics of Byzantine music chanting at churches or conservatories by listening to experienced chanters/teachers, essentially following the traditional educational approach for this kind of ICH. This made them quite negative towards technology-based learning and critical of its potential and effectiveness, at least in the beginning. However, after the presentation of our expert/teacher and a short

training session that allowed them to use the LMS and the game on their own, their opinion changed and their comments and behaviour became quite positive and receptive.

During this activity, we also experienced some technical problems but these were quickly solved without affecting the demonstration. The most challenging part was the demonstration of the 3D game-like application, since we used laptops and the available 4G internet connection in the Church was causing delays in the response of the game (provision of evaluation score). Again, the fact that the students were not very familiar with computers required extra effort on behalf of the teacher, but after an initial familiarization phase with the Web-platform, no significant problems were observed.

User feedback

In this section, we briefly present the users' opinion about their experience based on the discussions we had with them and the questionnaires they have filled. A full statistical analysis of these questionnaires was performed under Task 7.3 and the results are presented in detail in D7.3.

In general, and after some initial negative reactions to the idea of using computers and new technologies for Byzantine music education, the chanters were positive about the proposed approach to Byzantine music education and agreed that it allows people to get familiar with the basics of this singing tradition in an effective and meaningful way. They found the proposed learning path to be satisfactory and liked the fact that it combined different kinds of activities, making the learning process more interesting. They found the interface of both the LMS and the game-like application quite satisfying and user-friendly.

All of them thought that using the game-like application as a learning tool was a very interesting and innovative approach and agreed that it made practicing enjoyable, especially for younger people. Moreover, they thought that it is a very useful tool for learners who want to practice and improve their performance on their own whenever and wherever they want without requiring the presence of a music teacher. We should note here that at the beginning, they experienced some problems with the feedback provided by the game and the expert had to explain in more detail how the user's performance is evaluated and how the evaluation score is calculated. The users thought that the evaluation algorithm could be further improved to indicate the mistakes made by the learner so as to help him/her really improve his/her performance.

Finally, they believed that the tools developed for this kind of ICH can increase the interest of younger generations that are not so familiar with Byzantine culture and could also promote this culture all over the world, attracting new learners. They also thought that after some improvements and additions, they would use these tools to teach others or to create their own new educational material.

3.1.3.1.3 Scenario 3: Structured educational path for university students studying music

The scope of this demonstration scenario was to demonstrate the usability of the i-Treasures platform in Byzantine Music education for adults with established musical education but no background in Byzantine music.

The scenario provides a structured educational path for university students with basic music and computer knowledge. The learning path of the corresponding LMS course allows students to systematize and consolidate their theoretical knowledge about Byzantine music. Moreover, singing competences are fostered by means of made-on-purpose video resources but also by using the TTS module for automatic synthesis of singing voices and, finally, by engaging with the available game-like application for practicing Byzantine chanting.

Participants & venue

This demonstration activity took place at the Multimedia, Security & Networking Laboratory in the Department of Applied Informatics at the University of Macedonia in Thessaloniki in March 2017 and targeted students of different departments of the university that have basic knowledge of music theory and practice. It involved the following actors:

- Learners: a group of 6 MSc and PhD students (3 female and 3 male, 36-40 years old). Three of them have a diploma in Western music studies but all are beginners in Byzantine music. They are all familiar with computers.
- Experts: Ms Athanasia Stergiaki, music teacher and expert in Byzantine music. She presented the platform and its main components to the students and coordinated the activity.
- i-Treasures partners: the sub-use case leader UOM provided technical support related to the use of the Web-platform.

Demonstration outline

The demonstration followed the learning path of the corresponding LMS course in the i-Treasures Web-platform (LMS course: *Introduction to Byzantine music (Gr)*), which is comprised of seven distinct modules: a) *Introduction-Familiarization with the platform*, b) *Traditional Byzantine music history*, c) *Byzantine Music Scale*, d) *Characters of Quantity*, e) *Characters of time, f) Characters of Quality, g) Basic theoretical knowledge in Byzantine music reading - Practice and training (Chanting)*. Moreover, there are two extra activities based on h) the TTS module for singing voice synthesis, and i) the game-like application. The course is delivered in a "blended" format, i.e. it is made up of modules in which activities are envisaged to be carried out either in the class room or remotely (self-study).

During the first day of the demonstration, the teacher briefly presented the project, its objectives and its main outcomes to the students. The presentation focused on the introduction of i-Treasures project, the i-Treasures Web-platform and the Byzantine music use case, as well as on the structure of the educational path and corresponding activities to be followed by the students. The students received usernames and passwords and after the main presentation, they logged in to navigate and explore the platform on their own.

The focus of the demonstration was the LMS with all its basic functionalities, the Text-to-Song module and the game-like application for Byzantine music. Moreover, students also navigated the i-Treasures platform during the "*Introduction*" section.

According to the learning path, after the "*Introduction*", students studied the "*Traditional Byzantine music history*" module, a theoretical module, which gave them the opportunity to learn more about the historical background and context of Byzantine music through material already available on the LMS (links to external resources, lecture notes, etc.)

In the following three modules ("*Byzantine Music Scale*", "*Characters of Quantity*", "*Characters of Time*", and "*Characters of Quality*"), the students had the opportunity to systematize and consolidate their theoretical knowledge about Byzantine music, i.e. recognise the notes of Byzantine music and understand the meaning of music scale in Byzantine music. The acquired competences were also tested with quizzes that students had to take individually.

In the next module, the students improved their reading, listening and singing competences. Through made-on purpose video and audio materials, they learnt to recognise all kinds of music symbols in a Byzantine music piece, to hear how the

hymn is supposed to be chanted based on the music notation and also chant a whole music piece on their own.

The next activity was based on the TTS module and aimed at improving their listening abilities but also further test their understanding of music notation and scale.

The final activity of the learning path involved the use of the game-like application for practicing. The students could practice singing different hymns by completing the several exercises of the game (see Figure 12). These activities were also mixed with real singing practice sessions, where the students were assisted by the teacher.

Figure 12: Students following the learning path of the Byzantine music course in the i-Treasures LMS, which also includes an activity with the corresponding game-like application.

Data collected

At the end of this demonstration activity, we collected 6 e-questionnaires (same as iin the previous scenario) from the participants, which evaluate the different components of the i-Treasures system and summarize their experience.

Challenges, problems encountered and lessons learnt

No significant problems were encountered during this demonstration activity, since the students were familiar with computers and also with music theory and practice. They could easily navigate the system and were familiar with the terminology used. They completed the theoretical part easily and also were comfortable with using the TTS and the game.

User feedback

In this section, we briefly present the users' opinion about their experience in the demonstration based on our interaction during the demonstration and the collected questionnaires. A statistical analysis of these questionnaires is presented in detail in D7.3. Here, we make a short qualitative analysis of user feedback.

The learners found the whole experience really positive. They said that the proposed learning path allowed them to learn the basics of this ICH in an effective and enjoyable way, offering different activities that kept their interest high. They all found the LMS easy to use/navigate and the structure, activities and resources of the learning path very satisfactory. They liked the idea behind the TTS technology and argued that it provided a tool that it was different from what they've experienced before and it was, thus, very interesting.

They also liked the idea of a game-like application for fostering singing competences. All of the learners agreed that comparison of their performance with an expert's performance is a good way to evaluate their chanting competency and thought that it was comfortable to practice the hymn with musical rhythm gestures and watch the expert's video at the same time. Concerning the feedback provided by the game, they found it satisfactory in general, but argued that its presentation could be improved by including some additional explanation instead of just providing an evaluation score, especially if this score is below the threshold above which their singing is considered to be acceptable. Providing a low score without a specific explanation may discourage or frustrate some learners, especially if the teacher is not there to explain what they did wrong. On the other hand, if the learner knows exactly what his or her mistake was, a low score will simply serve as an indication of that mistake. Our aim is to improve the feedback provided by the game in order to comply with the users' suggestions. This, of course, will require further research in close cooperation with our expert.

The users also believe that the tools developed within the project respect and promote the Byzantine music culture. Finally, as musicians, they feel that the use of new technologies for analysing and transmitting singing ICH will attract more learners and make more people, especially younger people, interesting in rare cultural expressions like Byzantine music.

3.1.4 Demonstration activities for Human Beat Box

The Human Beat Box (HBB) is an artistic form of human sound production in which the vocal organs are used not only to imitate percussion instruments, but also wind and string instruments. In contemporary western popular music, human beat-boxing is an element of hip-hop culture, performed either as its own form of artistic expression or as an accompaniment to rapping or singing. This technique originated in the hip-hop movement in the United States in the 1980s. HBB was originally used to replace expensive electronic machines, but then it has grown to become a genuine

art form of its own. Today beatboxers meet in "battles" and a strong community develops online.

The goal of the HBB demonstration was to showcase the usability of the i-Treasures platform for boosting the HBB singing technique. HBB can be considered as part of our still growing cultural heritage, but it remains on the margins since there are no schools of HBB yet. The knowledge transmission is oral and can be done either online or by introductory workshops. It is usually taught and learnt in informal contexts by oral transmission and imitation, so the demonstration aims to explore the potential of the i-Treasures tools in supporting a more formal educational path with different learning activities, online or face-to-face. Sensitization of associations or classes of schools would make this art accessible by the general public, would raise people's interest and curiosity and would encourage them to learn and practice HBB.

Three demonstration scenarios have been adopted as described below. The first corresponds to the educational plan already described in D5.1 "*Report on analysis of educational scenarios*" and involves a structured educational path for students interested in HBB, while the second scenario involves the demonstration of the LMS course and the HBB game-like application (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*") to by-passers of any age coming to a cultural exhibition/festival. Finally, the third demonstration scenario involves an online course offered to adults interested in HBB. The demonstration activities were organised by CNRS and UPMC in cooperation with HBB experts (Table 4).

Table 4: Overview of demonstration activities for Human Beat Box

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Introduction to HBB for children via a structured educational path	French Sciences Festival Science City, Parc de la Villette, Paris, France	7 October 2016	• 2 groups of 20 children • 1 HBB expert • 3 CNRS & UPMC researchers	• Web platform • HBB course in LMS • Tool for vocal tract signal capturing, visualization and analysis	• PCs • Microphones • Hyper-helmet with embedded sensors
Introduction to HBB for the general public in an exhibition/ festival	French Sciences Festival Science City, Parc de la Villette, Paris,	8 October 2016	• 60 adults from the general public • 1 HBB expert • 3 CNRS & UPMC researchers	• Web platform • HBB course in LMS • Tool for vocal tract signal capturing, visualization	• PCs • Microphones • Hyper-helmet with embedde

	France			and analysis	d sensors
Online course on the basics of HBB	CNRS-LPP, Paris	17 February 2017	• 6 students interested in Cantu in Paghjella • 1 HBB expert • 3 CNRS & UPMC researchers	• Web platform • HBB course in LMS	• PCs • Microphones • Headphones

3.1.4.1.1 Scenario 1: Structured educational path for children

This demonstration scenario aims to provide a structured educational path for children who want learn more about HBB, but have no background in this kind of music. The learning path, which is partly based on the corresponding LMS course (*Human Beat Box (Fr)*)[18], starts with a theoretical module that allows learners to systematize and consolidate their theoretical knowledge about beatboxing, rhythms and basic sound production, through material that has been uploaded on the LMS, quiz tests, inquiry-based activities and assignments. Beatboxing competences are fostered by means of made-on-purpose video resources stored in the LMS, which present the different phases of sound production in HBB as well as the different instruments' imitation. Some breathing exercises are also proposed, in particular by listening to different rhythms of inhalation/exhalation, followed by voice production exercises. The activities of the LMS course were associated with practice sessions that included live demonstration by the expert and active participation of the children. Tests to assess their knowledge were realized as guessing games. The hyper-helmet was also presented to the children and was used by the expert to introduce the technologies developed within the project and explain the mechanism of voice production.

Participants & venue

This demonstration activity took place during the French Sciences Festival[19] in the Science City at the Parc de la Villette in Paris, France on October 7, 2016. The following actors were involved:

- Learners: two groups of 20 children, 7-12 years old. All the children were attending the event with their music class and their teacher.

[18] LMS course for HBB: http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/HUMANBEATBOX
[19] French Sciences Festival: https://www.fetedelascience.fr/

- Experts: Our expert Mr Paul Vigne, an experienced HBB artist, taught the class and helped the children practice HBB live.
- i-Treasures partners: the sub-use case leader CNRS in cooperation with UPMC presented the hyper-helmet and the Web-platform.

Demonstration outline

The objective of the demonstration was to present an alternative to discovering HBB in a non-formal way, suitable for a young population, very keen on modern rhythms and sounds.

The demonstration began with a presentation of the hyper-helmet and its various sensors. The expert wore the hyper-helmet and demonstrated its use for capturing and visualizing vocal tract articulation movements. The helmet was used as an educational tool that helped the expert to illustrate what happens when a signing voice is produced and which articulators (tongue, larynx, lips, etc) are involved in voice production. The children were very interested and curious about the different organs involved in sound production and the different signals captured by the helmet and had a lot of questions for both the HBB expert and the i-Treasures researchers. It was decided that the children would not wear the hyper-helmet because its manipulation is too delicate and the sensors are too fragile to be handled by young children.

The hyper-helmet presentation served as an introduction to the HBB course and the corresponding learning path in the LMS. There were two computers managed by our expert and the CNRS/UPMC team and there was video projection of the different learning modules of the LMS course. The expert presented one by one the learning activities of the LMS course, commenting and providing additional information and explanations where it was required, and the children were involved by answering questions asked by the expert (the questions were taken from the available LMS tests) or asking questions themselves that allowed further discussion. After the theoretical presentation of each LMS activity and the questions in the form of guessing games, there was a practice part, which allowed the young learners to practice the different sounds, imitating musical instruments, animal noises, and beats, and, thus, better understand the mechanisms for their production. This practical step was very much appreciated by both the children and their teachers.

Some photos from this demonstration activity can be seen in Figure 13.

Figure 13: The HBB expert Mr Paul Vigne and children participating at the demonstration of the HBB use case at the City of Sciences in Paris.

Data collected

No questionnaires were distributed to the users since they were really young and not interested in filling any questionnaires. Feedback was collected through discussions with the children and their teachers.

Challenges, problems encountered and lessons learnt

In order to keep the children's interest during the learning process, it is important to design a learning path with various activities including different stimuli, so as to ensure that they stay concentrated, quiet and invested. Children were very interested in HBB singing and the proposed learning activities were able to keep them focused and entertained.

The main problem encountered during the demonstration was the Internet connection at the Science City. The connection had interruptions, which created some problems in the demonstration, e.g. there were a few times when we could not access the LMS. The HBB expert saved the situation by providing live examples corresponding to the presented LMS material. Moreover, due to such connection problems it was

not possible to use the HBB game-like application (since it requires real-time communication with the sound-processing server for the evaluation of the learner's singing performance).

User feedback

In this section, we briefly present the feedback received by the children based on our interaction/discussions with them. The playful approach followed during the demonstration allowed children to explore their articulatory possibilities in an interesting, effective and enjoyable way. The hyper-helmet with the sensors stimulated the children's curiosity and it was nicely welcomed. The possibility to see in real time the movement of the tongue and the lips during the pronunciation of the HBB sounds was fascinating for them. The practice sessions with the expert in combination with the theoretical knowledge offered by the LMS course kept the children's interest high and made learning easier and more effective. The learning activities and the educational material offered by the LMS were considered to be quite satisfactory, especially the activities involving video and audio examples illustrating the description of the sounds and the acoustic result, which the teachers thought that were quite effective from a pedagogical point of view.

The children were in general very receptive and had no difficulty to follow or imitate the expert. The teachers agreed that this way of teaching (using new technologies and different kinds of activities) seems to be more effective than traditional teaching techniques. They were very interested in the Web-platform and the LMS course and thought that it could be interesting to introduce such tools and technologies in their classroom.

The HBB expert was also very satisfied by this new way of transmitting his knowledge. He was nicely surprised and pleased by the interest expressed by the children. Furthermore, he pointed out that our tools offer not only a way to effectively transmit a vocal technique, but also a way to provide solid theoretical knowledge, which can be acquired through an enjoyable educational approach. The expert thought that the LMS course is a great tool to learn the basics of the HBB and the hyper-helmet is very interesting in the sense that it helps to illustrate what happens with hidden articulators such as the tongue and larynx and their synchronisation, in addition to the fact that it helps the expert and users to capture all the different vocal tract signals.

3.1.4.1.2 Scenario 2: Introduction to HBB for the general public in an exhibition/ festival

This scenario aims to give a brief introduction to the HBB singing technique to by-passers of any age coming to an exhibition/festival/museum/music club, by learning a few basic sound productions, representative of this singing technique. Given the exhibition setup chosen for this scenario, the interaction with the system is designed to be very short.

Discovering HBB can be in the form of an interactive show. The audience is invited to take part in a story and to intervene in its unfolding. By working their imagination, repeating and imitating the narrator, they learn three basic HBB sounds (kick, snare, hi-hat), and master some combinations. This could make them more open and receptive to the hip-hop culture and other singing techniques that inspire HBB. Moreover, the aim is to increase their listening abilities and, whether possible, singing competences.

The flow of activities in the LMS reflects these objectives, but all the activities are optional, since visitors can come at any time and join one activity while having skipped all the others.

Participants & venue

This demonstration activity took place during the French Sciences Festival in the Science City at the Parc de la Villette in Paris, France on October 8 2016 and involved the following actors:

- General public: 60 adults, 16-65 years old with no special background in singing or music.
- Experts: 1 HBB expert. The expert performed live and helped the audience to learn how to imitate sounds and rhythms.
- I-Treasures partners: 3 CNRS and UPMC researchers presented the i-Treasures technologies to the audience and coordinated the delivery of the LMS course and the hyper-helmet sessions.

Demonstration outline

The objective of this demonstration activity was to give a brief introduction to the HBB singing technique and present a new approach to ICH learning based on the use of computers, sensors and e-courses. It was designed for people who have no special knowledge about this kind of artistic expression. This kind of activity serves as an

example about the kind of reach-out or informational activities that could be easily organised in music festivals/events or even museums to increase people's awareness and interest about an ICH expression involving singing by using the tools developed within i-Treasures.

The demonstration began with the presentation of the hyper-helmet and its sensors. Our HBB expert Mr Paul Vignes wore the hyper-helmet to record some basic HBB sounds. The CNRS and UMPC researchers presented the i-Threc software and the possibilities offered for the visualization and analysis of the signals captured by the hyper-helmet. Although there was only one hyper-helmet available, the attendees were invited to try it and record their own voice when producing HBB sounds. About ten people decided to try the hyper-helmet.

Next, the LMS course was introduced to the audience using video-projection on a large screen so that the attendees could easily follow the demonstration of the different learning modules of the LMS course. Special emphasis was given to activities including different audio-visual examples for sound production and a dialogue was initiated between the expert and the i-Treasures researchers with the audience to provide additional explanations and answer their questions.

Finally, the expert performed live and demonstrated the different sounds produced in HBB, inviting at the same time the audience to reproduce these sounds and also encouraging them to try the helmet and explore the LMS course to know more about this vocal technique (Figure 14).

Figure 14: Demonstration of the HBB use case at the City of Sciences in Paris.

Data collected

No questionnaires were collected, since the attendees were by-passers in a festival. They were interested in the demonstration but not concerned by an evaluation process.

Challenges, problems encountered and lessons learnt

The Internet connection was problematic and consequently created some problems in the demonstration, since at times we could not access the LMS or the game.

The audience that participated in this activity was very “touristic”. On one hand, they were interested in discovering the developed new technologies and, on the other, they were interested to learn more about a new musical technique like HBB. Some people attended the whole demonstration while others just went by and attended only some parts, which is of course an expected risk when participating in a big festival. At the same time, this was a very good opportunity to introduce our technologies to/ have them tested by a wide range of people.

User feedback

Since no questionnaires were collected, we present a short analysis focusing mainly on attendees’ comments, reactions and discussions during the demonstration.

Most attendees were impressed by the quality of the course and the large amount of documentation and resources available. They thought that the proposed learning path with the different activities and tools is quite innovative and could help them to learn the basics of HBB in a meaningful way. They especially appreciated the fact that theoretical activities were alternated with practice sessions, allowing them to better understand and finally produce basic HBB sounds.

The overall assessment was that such a course would be of a great interest to people that are interested in HBB or hip-hop culture in general. The participants believed that the developed tools can be very useful for ICH preservation and transmission and could see them being adopted by different organisations or music schools to promote HBB or other types of singing ICH. They also pointed out that these tools are of great use for “at home” training. Finally, they said that the demonstration motivated them to further explore this ICH expression.

3.1.4.1.3 Scenario 3: Online HBB course for the general public

The third scenario involved an online course for people interested in music and, more specifically, in HBB and who are familiar with the use of computers. It aimed at

testing the behaviour and interest of people who would follow the course online, either on an individual initiative at home or in the context of a social group of musicians, musical societies or cultural institutions. Another objective of this scenario was to test the possibility to offer a permanent online HBB course for free.

Participants & venue

The demonstration took place in a classroom at LPP-CNRS in Paris on February 17, 2017. The participants were 6 students, 20-25 years old, interested in HBB and 5 CNRS researchers, 30-60 years old, familiar with phonetics.

Demonstration outline

The objective of the demonstration was to evaluate the quality and the accessibility of the platform and the LMS course on an audience that was familiar with computers and online courses.

After a general presentation of i-Treasures, its objectives and outcomes, as well as the goal of the LMS course and the learning path offered, the users were invited to navigate the learning path and complete all the learning activities of the course. CNRS and UPMC researchers assisted the users and were available for questions or help during the demonstration. At the end, the participants filled in questionnaires to evaluate their experience.

Data collected

At the end of this demonstration activity, we collected 6 questionnaires[20] from the participants, which evaluate the different components of the i-Treasures system, focusing on the HBB use case.

Challenges, problems encountered and lessons learnt

Some participants required some time to get used to the LMS environment and had some difficulty navigating the learning path, initially. However, once started, these preliminary difficulties were overcome and they proceeded without problems.

User feedback

A full statistical analysis of the collected questionnaires is presented in D7.3. Here we present a short qualitative analysis, focusing mainly on users' experience.

Most of the users were impressed by the quality of the course and the large amount of documentation available. The learning material was found to be satisfactory,

[20] Questionnaire for HBB: http://i-treasures.multimedia.uom.gr/evaluation/hbb.doc

complete and well-organised, providing examples on acoustics, articulatory gestures and rhythms that allowed them to learn the basics of HBB in a meaningful way, while also encouraging them to explore other resources and materials.

The most positive/helpful aspects of the proposed educational path, as pointed out by the users, were: a) the fact that it provided a variety of activities and educational materials, which made the learning experience more interesting and enjoyable, b) the fact that the activities included both a theoretical part but also a practice part, c) the fact that they could assess their performance in every step of the learning process, through well-designed tests in the LMS.

The overall assessment was that this course could be very helpful to people interested in HBB, since it provides all the necessary basic knowledge about this kind of artistic expression, while at the same time provides links for further exploration of/ engagement with HBB. Moreover, the users believe that this course and the technologies developed within i-Treasures could be very helpful for ICH preservation and transmission and agreed that they would recommend our technologies to other people interested in ICH.

3.2 Demonstration activities for the “Rare Dance Interactions” use case

UMONS is the partner responsible for the dancing use case as well as for the Walloon dance and contemporary dance sub use-cases. CERTH is responsible for the Tsamiko dance, Salsa dance and Calus dance sub-use cases. In the following subsections, we present in detail the different activities organised for the demonstration of each sub-use case under Task 6.3 “*System Demonstration for use case “Rare Dance Interactions*””. The demonstration scenarios vary from structured educational paths for students to online courses for amateurs to demonstration of the developed technologies in dedicated workshops. Calus dance was only partially demonstrated during a dedicated workshop on “*ICT technologies for dance education*” (see Section 3.2.1.1.2) since it was not possible to organise a full demonstration activity in Romania where our Calus dance expert works.

In the context of the dance sub-use case, the consortium also decided to showcase the usability of the i-Treasures platform and technologies not only in classic learning scenarios, where experts teach a form of ICH and students/users learn using the offered LMS courses, game-like applications and tools like the TTS, but also in scenarios where our technologies are used by experts or teachers to create their own

pedagogical plans and new educational materials for some kind of ICH. More specifically, we demonstrated the usability of the Pedagogical Planner tool (see D5.4 "*First version of the Integrated Platform*") and the generic dance game development framework (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*") in a scenario where dance experts have used the aforementioned tools to deliver new pedagogical plans, LMS courses and game-like applications for teaching and learning Greek traditional dances.

Moreover, the usability of motion capture and analysis tools and tools for the analysis of stylistic variations was demonstrated under a new sub-use case, namely the Tai-chi-chuan martial art, instead of the contemporary dance use case, as will be explained in the corresponding sub-section.

Details on all demonstration activities for the dance use case are provided in the following subsections.

3.2.1 Demonstration activities for Tsamiko dance

Tsamiko is a popular traditional Greek folk dance, enjoyed throughout Greece by both men and women. It is danced in a semi-circle, with the leader performing variations while the other dancers follow the basic steps. The dance follows a strict and slow tempo with emphasis on the "attitude, style and grace" of the dancer. The steps are relatively easy to imitate but have to be precise and strictly on beat. Its variations consist of both smooth and leaping steps. Although an eight measure (sixteen steps) dance has been taught at schools and a five measure (ten steps) dance is common in northern Greece, the six measure (twelve steps) dance is by far the most widely danced in Greece and elsewhere.

The scope of the demonstration is to showcase the usability of the i-Treasures platform in teaching Tsamiko to students and adults. Also, since Tsamiko, like many other cultural expressions, is usually taught and learnt in formal or informal contexts by imitation, the demonstration mainly aims to explore the potential of the platform functionalities in supporting a more formal educational path, which includes both online and face- to-face activities.

Two demonstration scenarios have been envisaged as described below. The first corresponds to the educational plan already described in D5.1 "*Report on analysis of educational scenarios*" and is targeted at university students, while the other involves the demonstration of dance capture, analysis and education technologies to dance experts and the general public in the context of a dedicated workshop (Table 5).

Table 5: Overview of demonstration activities for Tsamiko dance

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Structured educational path for university students	Department of Physical Education and Sports Science, AUTH	November 2016 - January 2017	• 33 university students • 2 experts • CERTH researchers	• Web platform • Tsamiko course in LMS • Tsamiko game-like application	• PCs • Kinects • Web-cameras
Workshop on ICT technologies for dance education	CERTH	25 April 2017	• 5 dance teachers, experts and choreographers • 3 Physical Education and Sports Science faculty stuff • 6 ICT researchers interested in human motion • 5 university students • CERTH researchers	• Web platform • LMS courses for different types of dance • Dance game-like applications + generic framework • Motion capture and analysis tools • MotionMachine Toolbox	• PCs • Kinects • Web-cameras

3.2.1.1.1 Scenario 1: Structured educational path for university students

The first scenario involves a structured educational path for university students of the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki[21]. The learners' profile is close to the one assumed by the corresponding pedagogical scenario described in D5.1, i.e. any individual wanting to learn Tsamiko, with or without knowledge of other traditional dances. This scenario is of great value, since some of the students of this dance course will become future dance teachers/educators.

The scenario provides a structured educational path based on the corresponding LMS course, starting with a theoretical module, which gives learners the opportunity to systematize and consolidate their theoretical knowledge about Tsamiko through material already available on the Web-platform or inquiry-based activities and assignments. Moreover, dancing competences are fostered by means of made-on-

[21] http://www.phed.auth.gr/index.php/en/

purpose video resources stored in the LMS about the phases/steps of Tsamiko dance as well as about the variations of the dance. Furthermore, dancing competences are also fostered in face-to-face sessions with the dance teacher and traditional dance experts, but also by using the available game-like application. At the end of the demonstration, the learning experience was evaluated via questionnaires.

Participants & venue

This demonstration activity took place at the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki and was realized as an optional project to be undertaken by students attending the "*Didactics of Greek Traditional Dances.*"[22] course. The course is taught by our dance expert Prof. Stellla Douka[23] to undergraduate students during the first year of their studies. The demonstration lasted about 6 weeks, from 14 November 2016 to 13 January 2017, and took place in parallel with the actual course. It involved several actors:

- Students: a group of 33 undergraduate students (16 female and 17 male) of the Department of Physical Education and Sports Science of Aristotle University, 19-23 years old. All the students were attending the class of Prof. Douka and had different levels of dance competency.
- Experts: Prof. Stella Douka and an experienced Tsamiko dance teacher/expert that is currently cooperating with Prof. Douka in teaching the course. Our experts have significant expertise in Tsamiko and they also teach Greek traditional dances in classes organised by several dance associations.
- i-Treasures partners: the sub-use case leader CERTH presented the platform and its main components to experts and users, coordinated the learning activity that was based on the educational game and provided technical support in problems related to the use of the Web-platform.

Demonstration outline

As mentioned above, this demonstration activity was realized as an optional project to be undertaken by the students of the "*Didactics of Greek Traditional Dances*" class and resulted in a better grade for the students involved. The demonstration followed the structure of the corresponding LMS course in the i-Treasures Web-platform (LMS

[22] https://qa.auth.gr/en/class/1/600059480
[23] https://qa.auth.gr/en/cv/sdouka, http://www.phed.auth.gr/index.php/el/department/people/faculty/28-assistant-professors/80-Douka

course: *Τσάμικος (Gre)*[24]), which is comprised of five distinct modules: a) *Familiarization with the platform*, b) *Cultural background*, c) *Recognizing Tsamiko dance and its variations*, d) *Practicing Tsamiko*, e) *Dancing in a group*. The course is delivered in a "blended" format, i.e. it is made up of modules in which activities are envisaged to be carried out either in the classroom or remotely (self-study). However, all the activities are accompanied by explanations, which allow the students to access them autonomously. Based on this structure, the demonstration spanned a period of six weeks; one week for each module of the course and a final week for using other functionalities and tools offered by the Web-platform e.g. LMS courses for other kinds of dance, the advanced search functionality, etc.

During the first day of the demonstration, the sub-use case leader (CERTH) presented the project, its objectives and its main outcomes to the students using available audio-visual material. The presentation mainly focused on the introduction of the i-Treasures Web-platform and its main modules and functionalities through videos or live demonstration, as well as on the structure of the educational path and corresponding activities to be followed by the students. An electronic guide for the Tsamiko LMS course was provided to the students as well as a set of clear instructions on what is expected from them and how they can get technical help from the CERTH team.

During the following weeks, the students followed the learning path as defined in the course, completing one learning unit (module) per week. The first three modules, which aimed to consolidate their theoretical knowledge about Tsamiko as well as their dancing skills mainly through videos available in the LMS, were followed by students online (at home or in the computer lab) and involved self-study, while the latter two, which aimed at fostering their dancing competency through the game and face-to-face real dance sessions, were realized in the Department of Physical Education and Sports Science. More specifically:

- During the first week, the students completed the first unit of the LMS course online, at home or in the lab, which allowed them to get familiar with the Web-platform and the Learning Management System as well as the with the structure of the course. Most of the material was already presented during the initial introductory presentation for the project and the Web-platform.

[24] LMS course for Tsamiko dance: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/TS00002 (Greek version), http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/TSAMIKOCERTH (English version)

- During the second week, the students completed the second unit ("*Cultural background*"), also online. This module helped students organise their knowledge regarding the theoretical aspects of Tsamiko such as history, local variations, costumes, music, lyrics, and photos. The level of the acquired knowledge was tested through an online test.
- During the third week, the students completed the third unit ("*Recognizing Tsamiko dance and its variations*"), also online. This module helped them to increase their knowledge regarding the basic dance steps of Tsamiko and the different variations of the dance by watching videos of experts performing the different moves/steps and studying images with text description of moves/steps, etc. The degree of their comprehension was again tested through an online test that asked them to identify the different steps of the dance in several videos.
- During the next two weeks, the students carried out the activities of the fourth unit ("*Practicing Tsamiko*") in the premises of the Department of Physical Education and Sports Science with the help of the CERTH team and their teacher. This module helped students practice the basic steps of Tsamiko and some of the main variations of the dance by using the corresponding game-like application developed by TT and CERTH. As already described in D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*", this game-like application provides real-time feedback to the user about his performance when executing different steps or the whole choreography, thus, making the learning experience more .efficient and satisfying. The students were organised on two groups, so as to facilitate the demonstration, and performed the sensorimotor learning activities on two different instances. The CERTH team demonstrated the game to the students live and answered their questions, before inviting them to use the game by themselves. Two set-ups with laptops and Kinect[25] sensors were available and each student spent 30-40 minutes on average on playing the game till the end (Figure 15).
- During the following week, the students carried out the activities of the final module ("*Dancing in a group*") again in the University premises. This module aims to check the ability of the learner to dance in a group with other dancers, since Tsamiko is a group dance. The students danced in groups without

[25] Microsoft Kinect sensor: http://www.microsoft.com/en-us/kinectforwindows/

being evaluated at first so as to practice. And then danced again in groups and were evaluated by their teacher.

- During the final week, the students were requested to explore the i-Treasures Web-platform on their own, based on a predefined navigation scenario, and use the different tools offered by it. More specifically, the students were encouraged to take a look at the LMS courses created for other kinds of traditional dance and also use the advanced search functionality for the ICH repository. The latter allowed them to search our ICH repository for dance expert performances based on high and medium level metadata. A detailed guide about the functionalities offered by the platform was provided.
- At the end of the last week, the students were requested to complete an online questionnaire[26] so as evaluate the proposed educational path and the activities carried out and provide feedback about their experience.

Figure 15: Students of the Department of Physical Education and Sports Science of AUTH engaging with the Tsamiko game-like application.

[26] Questionnaire for Tsamiko dance : http://i-treasures.multimedia.uom.gr/evaluation/tsamiko.doc

Data collected

At the end of this demonstration activity, we collected 30 e-questionnaires from the participants (both experts and students), which evaluate the different components of the i-Treasures system, summarize their experience and provide valuable information about the system's user acceptance. Moreover, valuable data was also collected from the use of the LMS and the game-like application by the students, which was stored in the form of LMS and game analytics in the Web-platform database (see deliverable D5.7 *"Final version of the Integrated Platform*", Section 3.1.2 on the learning analytics collected by the system). The analytics provide rich statistical information on the progress of each student but also of the classroom as a whole and allow the teacher to assess how the class is doing and what is the level of their competency, as well as identify learning activities or material that the students have difficulty with.

Challenges, problems encountered and lessons learnt

As in all cases, where real users are involved in the evaluation or the demonstration of a system, our main challenge was to convince the students to participate without forcing them, so as to make sure they participate in good will. The fact that this scenario was carried out as an optional project in the context of the course that was rewarded with additional points helped considerably in this direction. While the students where very positive about using the game-like application, they were less enthusiastic about the use of the LMS. To fill in the questionnaires, the intervention of the teacher was required.

The technical support of a large group of students was another challenge, which was however effectively tackled by providing them with detailed guides and instructions that allowed them to easily navigate the Web-platform and the LMS. Most questions/problems were resolved by simple exchange of emails. The fact that students had to go through the theoretical parts of the learning path at home on their own was also proven to be quite helpful since they could complete the activities at their pace and take their time to study the available material. We have to note here, that this approach worked because the students are adults that can manage their time according to their workload or needs. In case of younger students, e.g. students at an elementary school, this would have proven to be more challenging and, in that case, it would be better to cover the theoretical aspects or at least most of the activities about them at school as well.

As expected, we have experienced some problems with software bugs or failures but these were quickly solved without affecting the demonstration. The most challenging part was the live demonstration of the game-like application where several users were playing the game in different setups at the same time but since we had a similar experience during the evaluation of the first development phase at the end of year 2, we did not face significant problems. While the vast majority of the users were not familiar with the use of sensors like Kinect or the concept of serious games for education, they were quite familiar with gaming applications for entertainment and, thus, they were very receptive to the use of the game-like application and understood quite easily how the game worked and what they were supposed to do in each exercise, without requiring much help from our technical team. Actually, the use of the gaming like-application was the most interesting and innovative part of the proposed educational path according to the users. The other modules of the LMS that focused on online self-study were also quite interesting but since nowadays learning management systems are widely used by a lot of educational institutions, and especially universities, they didn't provide the same feeling of excitement or innovation.

What was also interesting was the fact that while practicing by using the game-like application was an activity that was supposed to be carried out individually, and it was, a lot of students helped each other by pointing out mistakes or giving guidelines on how to use some of the game functionalities. This made the whole experience more entertaining and engaging and provided some good ideas for future versions of the game. The most interesting and promising one would be to support activities that would involve multiple users playing the game at the same time and competing for the best dancing performance.

User feedback

In this section, we briefly present the users' opinion about their experience in the demonstration based on the questionnaires they have filled but also on our discussions with them during the demonstration. A full analysis of the questionnaires was performed under Task 7.3 and the results are presented in detail in D7.3. Here, we focus on a more qualitative than quantitative analysis, examining the users' satisfaction about the specific tools/system modules used in this demonstration scenario, i.e. the LMS course and the game-like application, as well as their general feeling about i-Treasures technologies as a whole and their potential for ICH education.

More specifically, regarding the LMS course, the users have found that the course has succeeded to teach them the basics of Tsamiko dance in a meaningful and satisfactory way and that the offered resources are well-organised and complete, while also encouraging them to explore other resources and materials as well. They also thought that the game-like application was easy to use, precise in the visualization of their movements and the evaluation of their performance and succeeded to teach them the steps of the dance, while it also provided an enjoyable experience.

Moreover, the majority of users believes that the i-Treasures technologies contribute in the preservation and transmission of ICH and the i-Treasures platform is a useful tool that can be adopted by ICH organisations/schools/ institutions to help them promote endangered ICH expressions and they would recommend it to other people.

One of the most positive things of the proposed structured educational path as pointed out by the users was the fact that it provided a variety of activities and educational materials, which made the learning experience much more interesting. They appreciated the fact that the activities included both a theoretical part that required self-study but also a practice part that was realized both by using the game-like application that allows self-practice but also a team dance session that allows them to experience the dance in real settings. The alteration of different kinds of activities and tools was especially welcomed by students and significantly contributed to making the whole learning experience more enjoyable. They also appreciated the fact that in every step of the learning process, they had the opportunity to assess their performance either through online tests in the LMS or through the sensorimotor learning approach adopted in the game. The fact that their progress could be accessed through the LMS (by means of the LMS and game analytics) was also a very positive and helpful element. Some students were also very positive about the idea of developing a full-suite of similar courses for different traditional dances that would be provided as a whole-package that would allow people to get acquainted with the folklore dance culture in different parts of the country.

As mentioned above, the use of the game was considered the highlight of the whole process, mainly because it provides a novel experience and includes cut-of-the-edge technologies. The students pointed out that although it cannot substitute the real dance experience with other dancers, it is a very helpful tool that allows individuals to practice and improve by themselves on their own time and without requiring the presence of a dance class or teacher. Moreover, they recognised that it is really attractive for children and younger people. They also proposed several ways in which

the game could be improved, e.g. by offering several 3D environments or avatars to select from or by including activities that support more than one user or support users competing against each other. Finally, in a discussion with their teacher and since they are students of the Physical Education department, they were very positive on developing game-like applications for practicing other forms of physical exercise like gymnastics or martial arts.

The teacher, who also helped us develop the pedagogical plan and the LMS course and design the game, was very pleased by how the students handled the whole path of educational activities and was very positive about the use of such technologies along with traditional learning techniques.

Another element of our research that both the students and the expert found very intriguing was the analysis of the dance performance to automatically extract medium and high level-features and also evaluate the user. They found the semantic search functionality very interesting, especially the support of medium level features such as dance figures/body part movements. They believe that such an analysis can be very useful for discovering correlations or differences between traditional dances in different parts of the country but also for documenting these dances.

3.2.1.1.2 Scenario 2: Workshop on ICT technologies for dance education

This scenario aimed to present and demonstrate the dance use case of i-Treasures, focusing mainly on traditional Greek dances like Tsamiko (but also including other use cases such as Calus, Salsa and Walloon dance) to dance experts and practitioners and to a lesser extent to the general public.

To this end, a half-day workshop involving key dance stakeholders (dance teachers, dance professionals, owners of private dance schools) but also ICT researchers with research interests focused on motion analysis was organised by CERTH and the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki.

Participants & venue

This demonstration activity was held in CERTH, on April 25th, 2017. In total, 19 people attended the event, which was open to the general public, but mainly focused on involving the following actors:

- dance experts/ practitioners: 8 experienced Greek traditional dance teachers/experts, including faculty from the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki, teachers in dance schools, and choreographers;
- dancers amateurs: 5 students from the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki that are amateur dancers and have special research interest in dance as part of their studies;
- i-Treasures partners: the sub-use case leader (CERTH) and other i-Treasures partners from Thessaloniki attended the event;
- other ICT researchers with research interests focusing on dance or physical education: 2 researchers from the National Technical University of Athens that are the coordinators of the Terpsichore project[27] on affordable digitization, modelling, archiving, e-preservation and presentation of ICH content related to folk dances. CERTH is also a partner in this EU research project and 4 researchers form the University of Thessaly and the Aristotle University of Thessaloniki that are interested in physical activity analysis and embio-mechanics.

Demonstration outline

As mentioned above, this demonstration activity involved the organisation of a Workshop addressed to dance stakeholders and researchers. It was organised by CERTH in cooperation with our dance expert, Prof. Stella Douka from the Department of Physical Education and Sports Science of AUTH. The program of the Workshop is presented in Figure 16.

i-Treasures Workshop on "Intangible Cultural Heritage and ICT technologies: the dance example"		
09:00-09:30	Welcome	Dr Nikos Grammalidis (CERTH)
09:30-10:00	Introduction to i-Treasures project: Capturing the Intangible Cultural Heritage and learning the rare know-how of Living Human Treasures	Dr Nikos Grammalidis (CERTH)
10:00-10:30	New ICT technologies for body/motion analysis in ICH expressions: The dance use case	Dr Kosmas Dimitropoulos (CERTH)
10:30-11:00	Serious games & novel educational tools for ICH learning: The dance example	Dr FilaretiTsalakanidou (CERTH)
11:00-11:20	Coffee break	

[27] Terpsichore project: http://terpsichore-project.eu/

11:20-11:40	Use of i-Treasures technologies in dance didactics: The paradigm of Greek traditional dances	Prof. Stella Douka (AUTH)
11:40-12:10	The EU project Terpsichore: Transforming Intangible Folkloric Performing Arts into Tangible Choreographic Digital Objects	Prof. Anastasios Doulamis (NTUA)
12:10-12:40	Live demonstration of i-Treasures technologies	
12:40-13:20	Discussion - Conclusions	
13:20-14:20	Lunch break	
14:20	Close of meeting	Dr Nikos Grammalidis (CERTH)

Figure 16: Agenda of i-Treasures Workshop on "*ICT technologies for dance research and education*".

CERTH presented the technologies developed within the i-Treasures project for dance capture, analysis and education, with special focus to a) the capture of dance performances with different sensor setups, b) the algorithms and techniques for the analysis of dance performances based on Kinect or mocap sensor data and the recognition of dance figures, c) the generic framework for the development of educational applications for dance learning based on low-cost sensors, d) other educational tools like the Pedagogical Planner and the LMS for the creation of novel educational material for ICH and the development of structured educational paths, e) the multimodal semantic analysis of dance performances for the extraction of high level and medium level metadata that can be used in dance research (e.g. for semantic search), f) novel tools and techniques for stylistic analysis and comparison of ICH performances to explore locality and performer-based variations (MotionMachine Toolbox). Prof. Douka presented her own experience as a dance expert and teacher that has used the developed technologies for teaching traditional dances to university students as well as for creating novel structured educational paths and educational games. In addition, Prof. A. Doulamis, coordinator of the Terpsichore Marie Curie Research and Innovation project, shared his own experience on dance capture and visualization using new technologies.

The i-Treasures Web-platform and its components, including the generic game-development framework and the game-like applications for different traditional dances, were demonstrated to the Workshop participants, who were then invited to experience/use our technologies by themselves.

A discussion followed, which allowed the participants to express their opinion about the developed technologies, their benefits and limitations, and exchange ideas with the i-Treasures researchers on how these technologies but also ICT technologies in general could further aid the transmission and safeguarding of traditional dances in Greece and other countries both on the local communities level but also on a national level through public education. The discussion also addressed how our technologies can be used for other applications and research areas involving human motion.

Some photos from this event are shown in Figure 17.

Figure 17: Demonstration Workshop on "ICT technologies for dance research and education" organised at CERTH.

Data collected

No questionnaires were handed out to the participants. Feedback from participants was collected during the discussion sessions.

Challenges, problems encountered and lessons learnt

The most significant problem/challenge we faced in this demonstration activity was convincing participants to attend the Workshop. Initially, we targeted selected groups of users (dance associations, physical education faculty and students, ICT researchers in Thessaloniki) via email and announcements in social media. These approaches were only partially successful, thus, in a second phase, we contacted specific users through CERTH's network of ICT researchers and the networks of the dance experts we have cooperated with in the context of the project.

User feedback

Here we briefly discuss the feedback received through our discussions with the Workshop participants and summarize the main outcomes of the Workshop.

The reaction of the Workshop participants to the presented technologies was really positive. People with a background on dance were pleasantly surprised by the opportunities offered by new technologies for dance capture, analysis and education. Some of them (those with a connection to the university) were already familiar with mocap technologies like VICON and had already used them, mainly for applications requiring dance capturing and 3D visualization. However, they were not familiar with depth sensors and low-cost solutions like Kinect and commented very positively on the fact that we had developed tools based on such sensors, which can be easily used and acquired by both dance researchers and dance professionals.

They particularly liked the idea of using game-like applications for self-practice and improvement of dancing competencies. They thought that the developed games were attractive, simple and easy to use, while at the same time quite effective and innovative. They were particularly interested in the sensorimotor learning aspect and the feedback provided to the learners. They thought that the provision of an instant evaluation score is a good solution for providing simple real-time feedback to the user about his/her performance. However, they argued that if we could also provide additional feedback in the form of messages, which simply explain what is the mistake made by the user (e.g. raising the foot in the wrong direction), that would make practicing and learning even more efficient.

They were also extremely positive about the idea of the generic game and were surprised by how easily we could design and develop a simple game with a few activities within a very limited time. They were very interested in using the generic game-development framework in other fields of physical education as well and pointed out the numerous other areas in which we could apply such solutions.

People practicing or teaching traditional dances stressed the advantages of our tools for documenting folk dances in a spherical way that covers both the theoretical aspects of the dance as well the practical ones. They pointed out that we could use the different tools developed within the project for capturing folk dances in 2D and 3D, visualising the movements of expert dancers in 3D (thus offering a much clearer and detailed view compared to traditional 2D representations like videos), analyzing/breaking the dance choreography down to step-level features for research purposes and documenting the historical and social aspects of these dances using tools like the LMS. In this context, they were also particularly interested in the semantic analysis aspect of our research. They were impressed by the automatic analysis of dance sequences and the extraction of features like the movement of the feet or the torso and argued that this could be extremely useful for researchers interesting in finding correlations between different dances or exploring variations of the same dance in different areas of the country. They were also very impressed by the functionalities offered by the MotionMachine toolbox (see D4.5 "*ICH Indexing by Stylistic Factors and Locality Variations*"), especially for the stylistic analysis of dancers and dance performances.

In general they agreed that the tools developed within i-Treasures can significantly contribute to the safeguarding and transmission of rare dance interactions and should be adopted by institutions or individual experts for preserving and promoting this valuable ICH.

People with a background on ICT were also positive. They also agreed that our tools are innovative and can significantly contribute to ICH safeguarding. Moreover, they pointed out that they could have extremely valuable contribution in a variety of other fields related to human motion. They were especially impressed by the MotionMachine Toolbox and the generic game development framework. They commented on the simplicity of their interfaces and their user-friendliness. They said that they would download and check the toolbox with their own data (the toolbox supports manipulation of all the standard formats of mocap data.) They also discussed how they could use our tools or apply our algorithms in their own research areas, including bio-mechanics for sports and athletes, applications for rehabilitation

of patients after physical injuries, applications for the elderly including physical exercise and dance learning, applications for improving mobility in Alzheimer patients, etc.

Participants with experience in motion analysis also commented very positively on the variety of capturing set-ups and methodologies examined within the project, which cover from expensive mocap systems based on inertial sensors used for contemporary dance to multi-Kinect setups used for couples' dances to simple Kinect setups used for simpler dances. They were impressed by the variety of algorithms and feature extraction techniques developed to handle the different cases and discussed what the best solutions would be for their own research problems. Interesting collaborations and exchange of know-how where discussed and decided, including sharing of equipment and common experiments.

The main conclusions of the Workshop can be summarized as follows:

- The i-Treasures technologies significantly contribute to ICH safeguarding and provide innovative solutions for dance capture, analysis and education.
- The proposed ICH learning methodology and tools can significantly improve dance education by providing novel educational paths that offer a variety of different learning activities covering all ICH aspects (historical and social background, exploring of ICH and practicing the ICH) based on a variety of resources and novel tools.
- The generic game-development framework and the proposed game-like applications for dance learning offer powerful and innovative tools for self-regulatory learning and practicing, which can be also used for a variety of other applications that involve human motion (e.g. learning of martial arts, physical exercise, sports, etc).
- The developed algorithms and, especially, the MotionMachine Toollbox, offer a variety of solutions that can be used for human motion capturing, analysis, visualization and evaluation under different scenarios. The algorithms are not limited to dance and can be easily generalized for other applications involving human motion.
- The developed tools are in general innovative, extendable and easy to use.

3.2.2 Demonstration activities for Walloon dance

Walloon traditional dances are a cultural heritage of the Walloon region in Belgium, which has been forgotten by most people, even in the Walloon Region itself. Walloon traditional dances are essentially peasant originated from the 18th, 19th and early 20th centuries. They were originally mostly danced in popular balls in villages but almost disappeared at the end of the 19th century and the beginning of 20th century.

The scope of the demonstration was to showcase the usability of the i-Treasures technologies for the preservation of Walloon traditional dances. The idea is to install some of the developed tools, like the game like-applications for dance learning, in museums/ exhibitions/ dance festivals/ any other space, in order to give a brief introduction to these dances by allowing people to learn a few representative basic steps using the aforementioned tools. These tools provide a way to inform people about the existence of this patrimony and encourage them to learn more about it by getting in touch with dance associations and cultural heritage organisations.

One demonstration scenario has been adopted, which corresponds to the educational plan already described in D5.1 "*Report on analysis of educational scenarios*" and is targeted at the general public in a museum/exhibition/dance festival/ other space. Two demonstration activities have been realized based on this scenario (see Table 6).

Table 6: Overview of demonstration activities for Walloon dance

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Workshop on traditional dance and new technologies	Numediart Institute, University of Mons	28 October 2016	• 3 amateurs in Walloon dances • 1 dance expert • 1 museum representative • 5 university students • General public • UMONS researchers	• Walloon game-like application + generic dance game development framework • Motion capture and analysis tools	• PCs • Kinect 2
Use of educational tools for Walloon dance learning in	A.S.B.L Pas d'la Yau, Quevaucamps, Belgium	3 December 2016	• General public • 3 dance experts • 2 journalists • UMONS researchers	• Walloon game-generic dance game development framework • Motion capture	• PCs • Kinect 2

traditional music and dance event				and analysis tools	

3.2.2.1.1 Activity 1: Workshop on traditional dance and new technologies

The aim of this activity was to showcase the use of i-Treasures tools for the preservation of Walloon traditional dances and raise awareness about this endangered ICH expression.

The activity was realized in the context of a Workshop for the presentation of the Walloon dance at the Numediart Institute, in the University of Mons, which was targeted at both the general public and the scientific community. Most of the participants did not have any background in Walloon dances, but they were interested in them as part of their cultural tradition. The i-Treasures project, its objectives and outcomes were presented to the participants. The history of the Walloon dance, the risk that this ICH could die out or disappear and the need to safeguard it were discussed. Following the presentations, the Walloon game-like application (see D5.5 "*Final version of 3D visualization for sensorimotor learning*") was demonstrated and the participants were able to follow the scenario presented in the game and learn/practice the basic steps of the Walloon dance.

Participants & venue

This demonstration activity took place at the University of Mons. The presentations were made in the conference room of the university, while the live demonstration of the game-like application took place at the Numediart motion capture room. The demonstration lasted half a day (October 28th, 2016, 14:00-19:00h) and involved the following actors:

- Students: 5 students from UMONS (1 male and 4 females), 22-25 years old. The students had a computer science background and no prior knowledge about the Walloon dance.
- Dance experts: 1 dance expert was present and participated in the demonstration session.
- General public: 12 people, 30-70 years old, that live in Mons and are interested in the Walloon dance tradition.

- Cultural heritage expert: a representative of the Museum of Walloon Life[28] in the Province of Liege. He showed particular interest in the game-like application and discussed a possible installation of the game at the museum.
- i-Treasures partners: the sub-use case leader UMONS presented the platform and its main components to the participants and coordinated the live demonstration.

Demonstration outline

The demonstration was held with the following structure:

- Presentation of the i-Treasures project: UMONS presented the project, its objectives and its main outcomes to the Workshop participants using audio-visual material. The presentation included the introduction of the i-Treasures Web-platform and its main modules and functionalities and focused on the technologies developed for dance performance capture, analysis and visualization.
- Presentation of the Walloon dance: Mr. Marc Malempré, a Walloon dance expert and a choreographer made a presentation about the history of Walloon dance and outlined the dangers/risks that threaten this ICH expression, while also discussing what should be done for the safeguarding of this important local tradition.
- Presentation of Walloon dance game: UMONS organised a live demonstration of the game-like application for learning and practicing the Walloon dance with the help of the expert. During the demonstration, they discussed technical details and provided more information on the sensors used, the visualization of the dance movements in the 3D environment and the algorithms/features employed for the evaluation of the user's performance.
- Use of the game by the participants: after the live demonstration of the game with the help of the expert Walloon dancer, the participants of the event were invited to test the game-like application by themselves. Two setups were installed in the Numediart mocap room to allow people to play the game and, thus, learn the basics of the Walloon dance and practice some basic steps/styles.

[28] Museum of Walloon Life :http://www.provincedeliege.be/en/viewallonne

- Filling the questionnaires: after the end of the presentations and the live demonstration, the users were asked to fill in questionnaires in order to provide their feedback about our technologies.

Some photos from this event are shown in Figure 18.

Data collected

At the end of the demonstration activity, we collected 6 e-questionnaires[29] from the participants, which evaluate mainly the Walloon dance game, summarize their experience and provide valuable information about the system's user acceptance.

Challenges, problems encountered and lessons learnt

The main challenge of this scenario was to convince people to participate in the demonstration. In fact, most of participants were seniors, and despite their interest in the Walloon dance and its history, only some of them were able to practice the game. Younger people were not directly interested in this kind of ICH tradition, although they were very interested in testing the game.

Moreover, and as expected, we faced some minor technical problems, which however did not affect the demonstration. Regarding the idea of the game-like application itself, participants thought that it was very interesting and innovative.

User feedback

The user feedback from both demonstration events is discussed at the end of the next subsection.

[29] Questionnaire for Walloon dance: http://i-treasures.multimedia.uom.gr/evaluation/walloon.docx

Figure 18: Photos from the mini-workshop for the Walloon dance demonstration at the University of Mons. The last four images show some of the participants using the game-like application to practice the basic steps of Walloon dance.

3.2.2.1.2 Activity 2: Use of educational tools for Walloon dance learning in traditional music and dance event

The aim of this activity was again to showcase the use of i-Treasures tools for the preservation of Walloon traditional dances and raise awareness about this endangered ICH expression.

The activity took place in the context of an event about traditional dances and songs in the Walloon region, namely "*That's Folk 2016*" organised by Le Foyer Culturel de Beloeil and the Pas d'la Yau association, which gathered many people interested in these traditional ICH expressions. The i-Treasures project, its objectives and outcomes were presented to the participants to give them a general idea about our research and developed tools. Following the presentation, the Walloon game-like application was demonstrated and the participants were able to learn/practice the basic steps of the dance. Local media also attended and filmed the event.

Participants & venue

This demonstration activity took place at the cultural centre of Beloeil in Quevaucamps, Belgium. The presentation and the demonstration were made in one of the rooms of the cultural centre on December 3rd, 2016, and involved the following actors:

- Dance experts: 3 dance experts from the Pas d'la Yau dance association[30]. The Pas d'la Yau dance association was founded in 1983 at Quevaucamps. It consists of about 100 members and focuses on safeguarding folk dances from Wallonia. The experts that danced in the Walloon dance recording sessions organised by UMONS during the previous years were members of this association.
- General public: 16 people, 16-70 years old, interested in the Walloon dance tradition. Also, some children.
- Media: 2 journalists were present and filmed the event.
- i-Treasures partners: the sub-use case leader UMONS presented the platform and its main components to the participants and coordinated the live demonstration.

Demonstration outline

The demonstration was held with the following structure:

- Presentation of the i-Treasures project: UMONS presented the project, its objectives and its main outcomes to the Workshop participants using available audio-visual material. The presentation included the introduction of the i-Treasures Web-platform and its main modules and functionalities and

[30] Pas d'la Yau dance association: https://fr-fr.facebook.com/PasdlaYau/

focused on the technologies developed for dance performance capture, analysis, and visualization.

- Demonstration of Walloon dance game: UMONS organised a live demonstration of the game-like application for Walloon dance with the help of one of the experts. During the demonstration, they discussed technical details and provided more information on the sensors used, the visualization of the dance movements in the 3D environment and the features used for the evaluation of the user's performance.
- Use of the game by the participants: after the live demonstration of the game, the participants of the event were invited to test the game-like application by themselves. One set-up was installed to allow people to play the game and learn/practice some basic steps/styles with the help of the expert dancer and UMONS team partners.
- Filling the questionnaires: after the end of the demonstration, the users were asked to fill in questionnaires in order to provide their feedback about our technologies.

The journalists that attended the event and filmed the different activities created a short documentary, which focused on the event and the efforts of the i-Treasures project to save the Walloon dance tradition in an innovative way. The documentary was aired during the news at a local TV station in Belgium. The film can be also viewed online[31].

Some photos from this event are shown in Figure 19.

[31] Short documentary on i-Treasures and Walloon dance: http://www.notele.be/list13-le-jt-a-la-carte-media47423-les-pas-de-la-y-au-au-secours-des-danses-wallonnes.html

Figure 19: Photos from the Walloon dance demonstration at the cultural center of Beloeil (taken from the short documentary).

Data collected

At the end of the demonstration activity, we collected 4 e-questionnaires from the participants, which mainly evaluate the Walloon dance game.

Challenges, problems encountered and lessons learnt

The challenges were similar to the previous demonstration event. Again, the main challenge was to convince people to participate in the demonstration and, then, fill in the questionnaire. More people attended this second demonstration event, since we put extra effort to disseminate it and reach out to as many people as possible through email, social media, and e-announcements.

Most of the participants were seniors, and despite their interest in Walloon, only some of them were able to practice the game. Younger people, on the other hand, were more curious and eager to try the game but were more difficult to reach out to since they were not interested in traditional dances.

User feedback

In this section, we briefly present the feedback collected by users in both demonstration activities for Walloon dance.

The participants found the research performed within the project and the different tools developed within its context very interesting. They liked the game and provided

useful feedback that helped us improve it. Their main comments were related to the visualization of the dancer's movements and the game scenario. They asked to a) include longer sequences of dance movements in order to be able to follow the expert avatar more efficiently and b) to be able to switch between different views in the main screen, e.g. to see the expert avatar from the back or the front.

In summary, the users found that the game meets its objectives, it is generally efficient, satisfactory, very easy to use (they had no problem understanding what they had to do in each activity or in which area they were supposed to move so as to be captured by the sensor) and offers a novel tool for ICH transmission and education, which can be particularly appealing to younger people. Moreover, they believe that the game respects the tradition of the Walloon dance, i.e. the clothing of the dancer/avatar and the 3D environment have succesfully incroporated elements of the Walloon tradition.

Although, the attendees liked the game and found it interesting, useful and enjoyable, they do not believe that it could/should be used to substitute the traditional way in which people learn how to dance. It should rather be an educational tool to be used in parallel with traditional dance teaching techniques, especially for attracting younger people or enabling individuals to practice the dance on their own without the presence of a teacher or a dance class. As expected, younger people that are more familiar with ICT technologies were more excited for the use of new technologies for the transmission of traditional forms of art. Older people were also very positive, but were more reluctant to try them, mainly, because they were not feeling confident using new technologies in general.

Following the first demonstration, we had many discussions with representatives of the Museum of the Walloon Life in Liège. They thought that the project is very interesting and innovative and could help introducing multiple novel ways in which to animate the museum and make it more interactive and attractive to visitors. The Walloon game was one of the main topics discussed. They asked for a copy of the captured data to keep at the archive of the museum and proposed to have a temporary installation of the Walloon dance game in the museum premises.

3.2.3 Demonstration activities for Salsa dance

Salsa is a popular form of social dance that originated in the Caribbean in the 1920's. The movements of Salsa have origins in Cuban Son, Cha-cha-cha, Mambo and other Latin dances. The dance and music soon spread to Miami and North America.,

where renowned musicians began to incorporate the rhythms into their sets, while dancers followed along, adding more complicated moves depending on their experience. Some salsa styles are fast, almost frenetic, with whirling partner moves, while others seem more relaxed and sensual with elements of Argentine tango or slow rumba. Nowadays, Salsa dancing is spread worldwide and Salsa can be considered as an international dance that can be found in most metropolitan cities around the world. It is usually taught in private dance schools and danced in different venues including dance schools, night clubs, and dance contests.

The scope of the demonstration is to showcase the usability of the i-Treasures platform in teaching Salsa to adults without a prior knowledge of this dance or other similar Latin dances. Since Salsa is usually taught and learnt in formal or informal contexts by imitation, the demonstration mainly aims to explore the potential of the platform functionalities in supporting a more formal learning path, which includes both online and face-to-face activities.

Two demonstration scenarios have been realized as described below. The first corresponds to the educational plan already described in D5.8 "*Final Report on analysis of educational scenarios*" and is targeted at adult students in a dance school, while the other involves an open online Salsa course for learning the basics of the dance, combined with dance practice sessions with the use of the game-like application. The second scenario targets the general population.

3.2.3.1.1 Scenario 1: Structured educational path for dance school students

The first scenario involves a structured educational path for adults that want to learn how to dance Salsa. The scenario is realized in the context of a Salsa dance class in a local dance school. The learners' profile is close to the one assumed by the corresponding pedagogical scenario described in D5.8, i.e. any individual wanting to learn Salsa dancing, with or without knowledge of other Latin dances.

The scenario provides a structured educational path based on the corresponding LMS course, starting with a theoretical module, which allows them to learn the basics of the Salsa history through material already available on the Web-platform or inquiry-based activities. Moreover, dancing competences are fostered by means of made-on-purpose video resources stored in the LMS about the basic steps/figures of Salsa dance as well as about the variations of these steps. Furthermore, dancing competences are also fostered in face-to-face sessions with the dance teacher and

other students, but also by using the available game-like application. The students involved follow the educational path according to their level of competences.

Participants & venue

This demonstration activity took place at the "Dance Stage"[32] dance school in Thessaloniki, Greece, during a Salsa dance class. The demonstration lasted 3 weeks (March 2017) and involved several actors:

- Students: a group of 8 students (3 female and 5 male), aged between 25-40 years old. The students were attending a Salsa class at the aforementioned school. They were all familiar with computers and were beginners in Salsa.
- Dance experts: 3 dance teachers (1 female and 2 male) teaching different dances, i.e. a Salsa dance teacher, a Greek folk dance teacher, a classical ballet teacher. The Salsa dance teacher was responsible for the class.
- i-Treasures partners: the sub-use case leader CERTH presented the platform and its main components to experts and users, coordinated the learning activity that was based on the educational game and provide technical support in problems related to the use of the LMS/Web-platform.

Demonstration outline

The demonstration followed the structure of the corresponding LMS course in the i-Treasures Web-platform (LMS course: *SALSA (Gre)*[33]), which is comprised of five distinct modules: a) *Familiarization with the platform*, b) *Cultural background*, c) *Recognizing Salsa dance and its variations*, d) *Practicing Salsa*, e) *Dancing in couples*. The course is delivered in a "blended" format i.e. it is made up of modules in which activities are envisaged to be carried out either in the classroom or remotely (self-study). All the activities are accompanied by explanations, thus allowing students to access them autonomously. Based on this structure, the demonstration spanned a period of three weeks, one week for completing 1 or 2 modules of the course.

During the first day of the demonstration, CERTH presented to the students the i-Treasures Web-platform and its main modules and functionalities as well as the structure of the educational path and corresponding activities to be followed by the students. An electronic guide for the Salsa LMS course was provided to the students

[32] http://dancestage.gr/

[33] LMS course for Salsa dance: http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/SALSADANCE (Greek version)

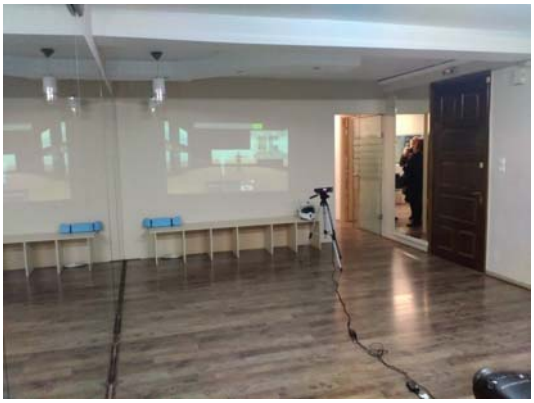
as well as a set of clear instructions on what is expected from them and how they can get technical help from the CERTH team.

In the following weeks, the students followed the learning path as defined in the course, completing a few learning units (modules) per week. The first three modules, which aimed to consolidate their theoretical knowledge about Salsa as well as their dancing skills mainly through videos available in the LMS, were followed by students online (at home) and involved self-study, while the latter two, which aimed at fostering their dancing competency through the game and face-to-face sessions, were realized in the dance school with the help of the dance teacher.

- During the first week, the students completed the first two units of the LMS course online, by themselves. The first unit allowed them to get more familiar with the Web-platform and the LMS. The second unit ("*Cultural background*") helped them acquire the basic knowledge about Salsa dance covering aspects such as history, music, lyrics, local variations, postures and gestures, costumes, etc. The level of the acquired knowledge was tested through quizzes.
- During the second week, the students completed the third unit ("*Recognizing Salsa dance and its variations*"), also online in the form of self study. This module helped students to learn and recognise the basic steps of Salsa and its different variations by watching videos of Salsa dancers, where these aspects were clearly highlighted. The degree of their comprehension was again tested through an online quiz that asked them to identify the basic steps of the dance in several videos. During the same time, the teacher showed them the basic moves in the classroom.
- Next, the students carried out the activities of the fourth module ("*Practicing Salsa*") in one of the dance school halls with the help of the CERTH team and their teacher. This module helped students practice the basic steps of the dance and some of its variations by using the corresponding game-like application developed by TT and CERTH (based on the generic game development framework). As already described in D5.7 "*Final version of the Integrated Platform*", this game-like application provides real-time feedback to the user about his/her performance when executing different steps or the whole choreography, thus, guiding him/her towards a better performance. The CERTH team demonstrated the use of the game to the students and answered their questions, before they used the game on their own. One set-

up with a laptop and a Kinect sensor was available and each student spent 30 minutes on average on completing all the activities of the game (Figure 20). The teacher was there to help them if they had problems with some exercise.

- In the following days, the students carried out the activities of the final module ("*Dancing in couples*") again in the dance school premises. In this activity, learners danced with other learners in couples. The couples danced on their own based on what they have learned watching the videos in the LMS and performing the exercises of the game-like application. After this practice phase, the learners danced again in couples and their dancing skills were evaluated by their teacher.
- Finally, the students and experts were requested to explore the i-Treasures Web-platform on their own, based on a predefined navigation scenario, and use the different tools offered by it. More specifically, the students were encouraged to take a look at the LMS courses created for other kinds of dance like Tsamiko and also use the advanced search functionality for the ICH repository.
- After they completed all the activities, the students and experts were requested to complete an online questionnaire[34] so as evaluate the proposed educational path and the activities carried out and provide feedback about their experience.



[34] Questionnaire for Salsa dance : http://i-treasures.multimedia.uom.gr/evaluation/salsa.doc

Figure 20: Salsa learners in local dance school using the Salsa game-like application during the demonstration.

Data collected

At the end of this demonstration activity, we collected 11 e-questionnaires from the participants, which evaluate the different components of the i-Treasures system, summarize their experience and provide valuable information about the system's user acceptance. Moreover, data was also collected from the use of the LMS and the game-like application by the students, which was stored in the form of LMS and game analytics in the Web-platform database.

Challenges, problems encountered and lessons learnt

The challenges in this demonstration scenario were similar to those encountered in the corresponding scenario of the Tsamiko dance sub-use case, however, to a much lesser degree since the number of participants was smaller. Moreover, all of them were adults more than 25 years old that had agreed to take part in this activity voluntarily and not as an extra assignment during a school class. Participants in this demonstration have shown more interest, curiosity and enthusiasm for the use of new technologies and since they were also less familiar with ICT technologies than, for example, university students, they seemed to be more impressed by the demonstration and particularly by the games and the Kinect sensor.

Based on discussions with them, we discovered that the main problem they had encountered was the fact that the 3D avatar in the practice mode of the game-like application was facing them, i.e. they were facing their mirroring image, thus, sometimes getting confused as to which foot they should move next. Based on their observations, we added this feature (facing the avatar's back or front) in an updated version of the generic game.

User feedback

In this section, we briefly present the users' opinion about their experience in the demonstration based on the questionnaires they have filled but also on our discussions with them during the demonstration. A quantitative statistical analysis of the questionnaire results is presented in D7.3. Here we focus on a more qualitative analysis, mainly based on our interaction and discussions with them.

The general feeling of this demonstration was very positive. The learners were excited to explore the proposed technologies, pointing out that it was the first time that they were using such ICT tools for learning. They found that the learning path of the proposed LMS course succeeded in teaching them the basics of this cultural expression in a meaningful and innovative way. They appreciated the fact that there was a variety of leaning activities, which succeeded to keep their interest and make the whole process more enjoyable than they could think it was possible. They also liked the idea of quizzes and tests based on videos that assessed whether they have learnt the basic dance movements.

Again, the highlight was the use of the game-like application. Since none of them had previous experience with serious games or sensors like Kinect, they found the whole concept of capturing, visualizing and evaluating dance movements in real time very intriguing. They asked a lot of questions about how the system works, how the data is captured, how the evaluation algorithm works. The idea of using games for learning was also new to them and they embraced it with enthusiasm. As in the case of the Tsamiko demonstration with university students, although the learning activity involving practice with the game was conceived to be done individually, it turned out to be a group activity, especially since the number of learners in this case was smaller. The learners watched each other practice using the game, commenting on their progress and offering advice or encouragement. The teacher also intervened to help students improve their performance or explain/demonstrate some movement. This activity turned to be a quite enjoyable experience that allowed the learners to learn how to perform the basic Salsa movements in a simple and easy but, at the same time, effective way. They liked the game interface, thought that the visualization of their movements and the evaluation of their performance were quite accurate and found that it was easy to learn how to play the game and complete the proposed exercises, after a short demonstration by the CERTH team. Actually, after the first learner completed his practice session with some help by CERTH researchers and the Salsa teacher, the rest of the learners that were watching him

were already familiar with the game environment and functionalities and were more confident and fast in their own practice sessions.

The users also proposed ways in which the game could be further improved or expanded, e.g. by introducing different view angles (a feature we have already implemented), having avatars dressed with more appropriate clothes (the Salsa game was created using the generic game development framework and, thus, offers standard avatars, however, in the future we could allow the game developer to choose among a selection of avatars) or supporting two users (a couple) dancing at the same time. That last feature, although very interesting, cannot be supported when using low-cost sensors like Kinect, since in couple dances like Salsa the skeletons of the two dancers are very close, often obstructing each other from view, and body parts cannot be correctly identified by the Kinect. We could support such a feature only by using multiple-Kinect setups or inertial suits like in the case of contemporary dance. The latter is quite an expensive approach and would require the practice sessions of the learners to take place in dedicated places with appropriate equipment and not in typical dance schools or at home.

The users stated that they would propose the developed tools to other people interesting in dance and they would use them themselves again to learn other types of dance. All of them believed that the proposed technologies can significantly contribute in the preservation and transmission of ICH and that the i-Treasures platform and its tools should be adopted by ICH organisations/schools/ institutions to help them promote endangered ICH expressions. They also pointed out that these tools could be used as part of an interdisciplinary approach, also promoting other aspects of a specific tradition. E.g., they could be used in the context of a festival or a permanent exhibition that provides an insight into the traditional lifestyle of Caribbean countries, where different aspects of this culture would be presented, like dancing, singing, local cuisine, along with societal and historical aspects that contributed to the creation of this lifestyle.

The dance experts/teachers were also very satisfied by this demonstration. They were happy to get introduced to novel tools for dance capture, analysis and education. They thought that the resources provided in the LMS provide a very good basis for getting novices introduced to the Salsa dance tradition and allow them to acquire a solid theoretical background about Salsa history and basic dance styles. Since this is an aspect usually not addressed in typical dance schools (i.e. the historical and social aspect), this free online course could be very helpful for dance teachers who could propose it to their students.

They also appreciated the fact that the learning path comprised of so many different activities that could be followed either individually or in a dance class. Although, they made it clear that the game-like application could not substitute practicing in a real dance room with other dancers, they agreed that it is a very useful complementary tool that offers a lot of possibilities for self-practice at home or even in the dance school without requiring the teacher's constant presence. They were also very positive about the idea of a suite of game-like applications for practicing different kinds of Latin dances or other kinds of dance. They specifically pointed out that such a tool would be very attractive for younger learners, especially young children that are easily bored or get restless when traditional teaching approaches are used.

The teachers were also interested in the ICH repository and the search functionality offered by the Web-platform. They liked the idea of a database where different annotated performances for different kinds of dance are stored and documented. They were especially impressed by the search functionality and the fact that it allowed to retrieve performances based on medium-level features like dance steps or feet movements. This was something that interested them very much and they expressed interesting ideas for its improvement

Finally, all the users agreed that the whole experience motivated them to learn more about Salsa and Latin culture and encouraged them to search for more information/videos online. Moreover, it encouraged them to explore the available LMS courses for other types of dance or other kinds of ICH studied in the context of the project.

3.2.3.1.2 Scenario 2: Open online Salsa course for amateur dancers

The second scenario grounds on the first one, but it targets a wider potential population. The idea here was to offer an online course for free, for anyone who is interested to learn the basics of Salsa, but also offer the possibility of practicing this dance using the game-like applications to people who live in Thessaloniki.

The course was advertised to dance lovers and amateurs who live in Thessaloniki.

Participants & venue

The second scenario targets at the general population. 9 individuals (5 females, 4 males), 25-45 years old, that live in Thessaloniki, expressed interest and participated in this demonstration activity. Most of them are practicing other types of dance (traditional Greek dances or Latin dances) as amateurs and were interested in getting familiar with new dances and/or were curious to experience non-traditional

ways of dance learning that involve new technologies. One of them was a dance teacher. The students, who were all very familiar with computers, completed the learning activities of the LMS course online following a self-study approach and were then invited to practice the dance using the game-like application at an open session organised at CERTH premises.

Demonstration outline

Again, the demonstration followed the learning path of the LMS course offered in the i-Treasures Web-platform (LMS course: *SALSA (Gre)*). As mentioned in Section 3.2.3.1.1, the learning path comprises of five distinct modules: a) *Familiarization with the platform*, b) *Cultural background*, c) *Recognizing Salsa dance and its variations*, d) *Practicing Salsa*, e) *Dancing in couples*. The users completed the first three modules online and the last two in CERTH's premises.

Since the users were not familiar with the project or the developed technologies, first, an introductory session was held at CERTH, during which CERTH researchers illustrated the platform, its modules and functionalities to the participants. However, and since this scenario aims at online users, not all users attended it. Instead, they were able to be introduced to the project and its objectives/outcomes through online material (videos, leaflets, etc) and links provided to them. Moreover, an electronic manual describing the Web-platforms' functionalities and a guide for accessing the learning path of the Salsa course was also provided to the students as well as a set of clear instructions on what is expected from them and how they can get technical help from the CERTH team.

In the following couple of weeks, the students followed the proposed learning path in the LMS, completing the various activities of the first three learning modules. As in the previous demonstration scenario, the first three modules, which aimed to consolidate their theoretical knowledge about Salsa as well as their dance skills mainly through videos available in the LMS, involved self-study and were completed online at home. The first module allowed them to get more familiar with the Web-platform and the LMS by studying the introductory material provided to them by CERTH and, then, navigating and exploring the different tools and functionalities by themselves. The second unit ("*Cultural background*") helped them acquire the basic knowledge about Salsa dance covering aspects such as history, music, lyrics, local variations, postures and gestures, costumes, etc., while the third one ("*Recognizing Salsa dance and its variations*") helped them learn and recognise the basic steps of Salsa and its different variations by watching videos of Salsa dancers. The level of

the acquired knowledge after completing the second and the third module was tested through the available online tests.

After completing the theoretical modules at home, the students were invited at CERTH premises to complete the last two modules, which aimed at fostering their dancing competency through the game-like application and a face-to-face live dance session.

After a live demonstration of the game and discussion about technical issues, the students were able to practice the basic steps of Salsa and some of its variations by using this game. Two set-ups with a laptop and a Kinect sensor were available and each student spent 30 minutes on average on completing the activities of the game. Next, the learners carried out the activities of the final module by dancing in couples with other learners and their dancing skills were evaluated by the teacher.

After they completed all the activities, the learners were requested to complete an online questionnaire (same as in the previous scenario) so as to provide feedback about their experience.

Data collected

At the end of this demonstration activity, we collected 8 questionnaires from the participants, which evaluate the LMS course and the game-like application. LMS and game analytics were also collected and stored in the Web-platform database.

Challenges, problems encountered and lessons learnt

The main challenge of this activity was attracting users to participate in the demonstration. Although, many people expressed interest, a limited number has actually participated and completed the proposed learning path. Participants were reached through emails sent to dance schools and dance associations and also through direct contacts with people that we knew had an interest in dance and were already dancing other traditional or modern dances. The latter approach seemed to be far more effective and it is the way to proceed in order to attract a first group of users, who could then talk about their experience to other people and motivate them to participate as well.

Most of the people that expressed interest were already familiar with using computers in their everyday lives, which meant that there were not significant problems when it came to using the LMS, especially, since the guidelines provided to them were very detailed.

The use of the game presented more challenges. However, the introductory live demonstration and the assistance provided by our technical team throughout this activity contributed to a smooth practice session, which, after some initial effort, became very enjoyable.

Although, the theoretical part of the learning path (which, as mentioned above, also included learning all the basic steps by watching videos of dance experts) provided a solid basis for getting acquainted with this kind of ICH and learning the basics of its practice, it can only serve as a necessary introduction and it is important that is followed by some kind of practice session to foster the learner's dancing competency, which can performed either individually at home by using the game-like application (which, and this is crucial, allows the evaluation of the user's performance and, thus, helps him improve and perfect his/her performance) or in classroom with a teacher. Practicing/ dancing at home is a solution when one is not able to attend a dance class but requires installation of the game and the necessary sensors. It would be an interesting activity to organise in the future, especially among people that have an interest in and familiarity with ICT technologies, so as to explore scenarios were all activities are executed individually at home (of course, in this case also, it is necessary to have a final live practice session with other dancers.)

User feedback

Overall, this experience was perceived very positively by the participants. They all agreed that they learned more, in both a theoretical and also a practical level, about Salsa than what they initially thought or expected and were pleasantly surprised by the variety of different learning activities and tools they were offered. Although they all had a lot of experience with dancing and had previously taken dance lessons in dance associations or schools, this was the first time that they were able to also focus on the cultural, societal and historical aspects behind a dance tradition, and agreed that introducing these aspects is important in order to really understand it.

They also enjoyed the practice session involving the game. They thought that the game is a very useful and effective tool for fostering dance competencies on an individual level and without the intervention of a teacher. They also expressed the opinion that the game can be a valuable tool for attracting younger users and some of them said that it would certainly motivate their children to show more interest in folk dances and the tradition behind them. They found the game easy to use and they thought that it had successfully accomplished its objective, i.e. allow the users to learn/practice the basic Salsa steps on their own. Most of them believed that they

would be able to use the game at home by themselves as long as a detailed manual was provided. They thought that the main problem they would have to deal with in that case would be the installation of the sensor, but if this could be done in an easy and straightforward way, then navigating through the game activities would not present any difficulties, since the game scenario is simple and clear and the virtual tutor provides feedback about the scope of each exercise/activity and the performance of the user.

In general, they were intrigued by the opportunities offered by ICT technologies for ICH education and transmission and the fact that the developed technologies could be easily used by any individual familiar with computers. They also pointed out how these tools could potentially allow people to get in touch in a structured way with ICH expressions from all over the world. But also how these tools can help local communities document in an easy and systematic way their own ICH expressions and also attract and engage younger generations that may otherwise show limited interest in practicing or safeguarding this tradition.

3.2.4 Demonstration activities for Contemporary Dance/ “Tai-chi-chuan” martial art

The goal of this use case demonstration was to showcase the usability of the i-Treasures technologies for the analysis of dance performances and more specifically for testing whether the higher level stylistic features discovered through automatic analysis and machine learning in the contemporary dance recordings (see D4.5 “*ICH Indexing by Stylistic Factors and Locality Variations*”) are useful for contemporary dance experts.

Basically, the scenario targeted contemporary artists from the school for contemporary dance P.A.R.T.S[35], with whom we have cooperated during the first three years of the project. However, due to the unavailability of dancers, and after several attempts to schedule a demonstration with no success, we decided to organise a demonstration activity with the same objectives, i.e. demonstrating our stylistic analysis tools, but focusing on a different ICH expression, namely the “Tai-chi-chuan” martial art.

The scope of this activity was to showcase the usability of the i-Treasures technologies for the analysis and expertise evaluation and transmission of Tai-chi-

[35] P.A.R.T.S school of contemporary dance :http://www.parts.be/en/presentation

chuan through different modules developed during the project, and particularly MotionMachine related tools, like the high level features extractors and MotionExplorer for automatic analysis of motion capture data (see D4.5 "*ICH Indexing by Stylistic Factors and Locality Variations*"). The activity was realized as a workshop targeting at Tai-chi-chuan experts and beginners as will be described below.

Brief overview of the Tai-chi-chuan martial art

Tai-chi-chuan, or Taijiquan, is an internal Chinese martial art practiced for both its defence training and its health benefits[36]. Though originally conceived as a martial art, it is also typically practiced for a variety of other personal reasons: competitive wrestling in the format of pushing hands (tui shou), demonstration competitions, and achieving greater longevity. As a result, a multitude of training forms exist, both traditional and modern, which correspond to those aims with differing emphasis. Some training forms of Tai-chi-chuan are especially known for being practiced with relatively slow movements.

The concept of the taiji ("supreme ultimate"), in contrast with wuji ("without ultimate"), appears in both Taoist and Confucian Chinese philosophy, where it represents the fusion or mother of yin and yang into a single ultimate, represented by the taijitu symbol . Tai-chi-chuan theory and practice evolved in agreement with many Chinese philosophical principles, including those of Taoism and Confucianism.

Tai-chi-chuan training involves five elements: taolu (solo hand and weapons routines/forms), neigong and qigong (breathing, movement and awareness exercises and meditation), tuishou (response drills) and sanshou (self-defense techniques). While Tai-chi-chuan is typified by some for its slow movements, many Tai-chi styles have secondary forms with faster pace.

Today, Tai-chi-chuan has spread worldwide and is followed by a lot of people, often with little or no interest in martial training, for its benefit to personal health. Medical studies of tai-chi support its effectiveness as an alternative exercise and a form of martial arts therapy.

[36] The Tai-chi-chuan martial art: https://en.wikipedia.org/wiki/Tai_chi

3.2.4.1.1 Scenario 1: Workshop on Tai-chi-chuan practice and new technologies

The activity was realized at the Numediart institute in UMONS and targeted mainly experts and beginners of Tai-chi-chuan. All the participants had some knowledge of the Tai-chi-chuan martial art and had practiced for at least a few months. The i-Treasures project, its objectives and outcomes were first presented to the participants, followed by discussions with experts and then capturing all the participants practice Tai-chi-chuan using the Qualisys high precision motion capture system[37]. On a follow-up event on a different day, our stylistic analysis tools were presented to the participants and were tested by the experts, who provided feedback about their experience with our technologies.

Participants & venue

This demonstration activity took place at the Numediart motion capture room of UMONS. The demonstration was conducted on two separate days. A day for presenting the project and our technologies to participants and also for having a motion capture session (August 19th, 2016) and a day for the demonstration of our tools and their exploration by the experts and also for feedback collection (September 2nd, 2016). The demonstration involved 12 participants, 6 male and 6 female, from the Eric Caulier Taijiquan school[38], one of the biggest schools of Tai-chi-quan in Belgium and France. The participants had different level of expertise and experience in Tai-chi-chuan. More specifically, the participants included:

- 3 Tai-chi-chuan experts that were also teachers in the aforementioned school.
- 3 Tai-chi-chuan advanced practitioners that had been practicing Tai-chi-quan for several months or years.
- 3 Tai-chi-chuan novices that had been practicing Tai-chi-quan for a few months.
- 3 Tai-chi-chuan beginners.

Demonstration outline

The demonstration was held with the following structure:

[37] Qualisys motion capture system: http://www.qualisys.com/
[38] Eric Caulier Taijiquan school: http://www.taijiquan.be/

- Presentation of the i-Treasures project: During the first day, UMONS presented the project, its objectives and its main outcomes to the Workshop participants using audio-visual material. The presentation included the introduction of the i-Treasures Web-platform and its main modules and functionalities and focused on the technologies developed for capture, analysis and visualization of human body motion in dance and the MotionMachine Toolbox.
- Motion capture session: during the rest of the first day, participants were captured while practicing Tai-chi-chuan using the Qualisys motion capture system. They were asked to record two scenarios called “the five exercises” and “the eight techniques”, which are two different sequences of movements related to Tai-chi.
- Data correction: During the following two weeks, UMONS partners worked on correcting the huge amount of captured data. In fact, the mocap system cannot, in some cases, track some markers or miss-identifies some of them, thus, we had to correct the data manually. At the end, we had almost 6 hours of motion captured data and approximately 1500 segmented sequences.
- Data analysis and exploration of our tools by the experts: After correcting the data, the UMONS team met again with the experts to show them some preliminary results of a first analysis and work together to further analyze the data and extract more results. MotionMachine and other related tools developed by UMONS within the i-Treasures project have been used to analyse the captured data in order to explore high-level features, develop new features related to Tai-chi-chuan (36 new features) defined by the experts, and compare the automatic evaluation of the tai-chi practitioner’s performance (using the developed tools) with the evaluation made by the experts (Figure 21, Figure 22). The three experts had the chance to use the MotionMachine tools by themselves to explore features and also to explore the captured dataset using the MotionExplorer tool (Figure 23).
- Demonstration of the generic game: After the demonstration of different analysis and evaluation tools, the generic game has also been showed to the experts and we demonstrated the creation of a small game by capturing the experts. Using the ITGD (i-Treasures Game Design) tool (see D5.5 “*Final Version of 3D Visualization for Sensorimotor Learning*”), we have designed a game including two activities, with two exercises in each activity.

- Collection of feedback: After the different demonstrations, the experts were interviewed in order to provide their feedback regarding our technologies.

Some photos from the Tai-chi recording session performed during this demonstration activity are shown in Figure 24.

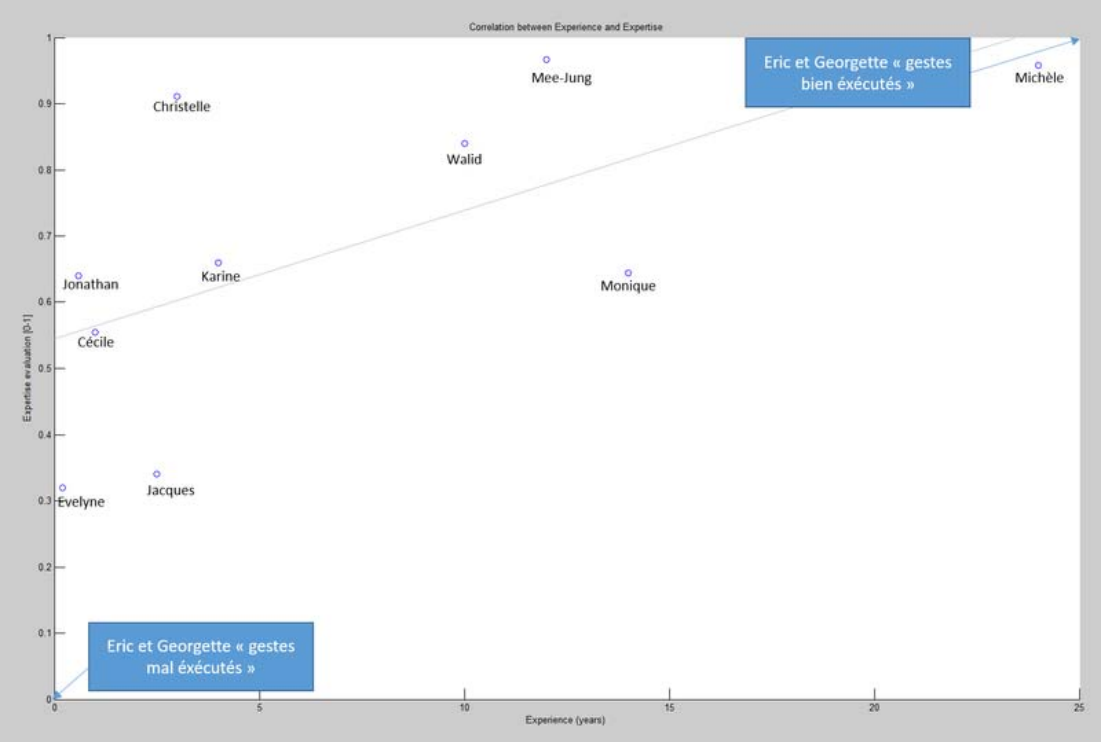


Figure 21: Classification of performers by their experience.

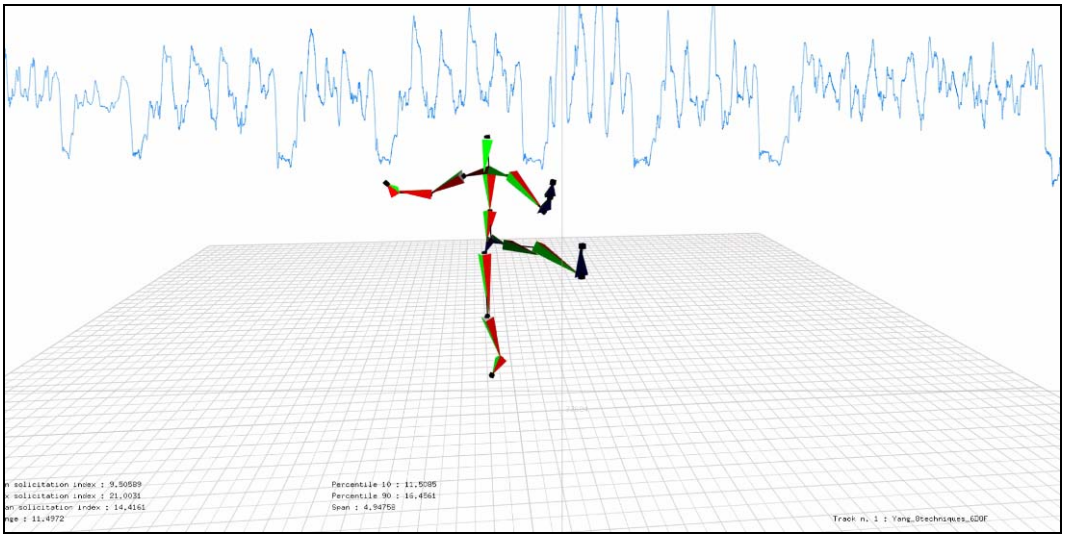


Figure 22: Screenshot from the MotionMachine tool, showing one Tai-Chi feature (postural load) designed by the expert. The feature has been described by the expert and developed by UMONS. 35 other features related to Tai-Chi have been developed in the same way.

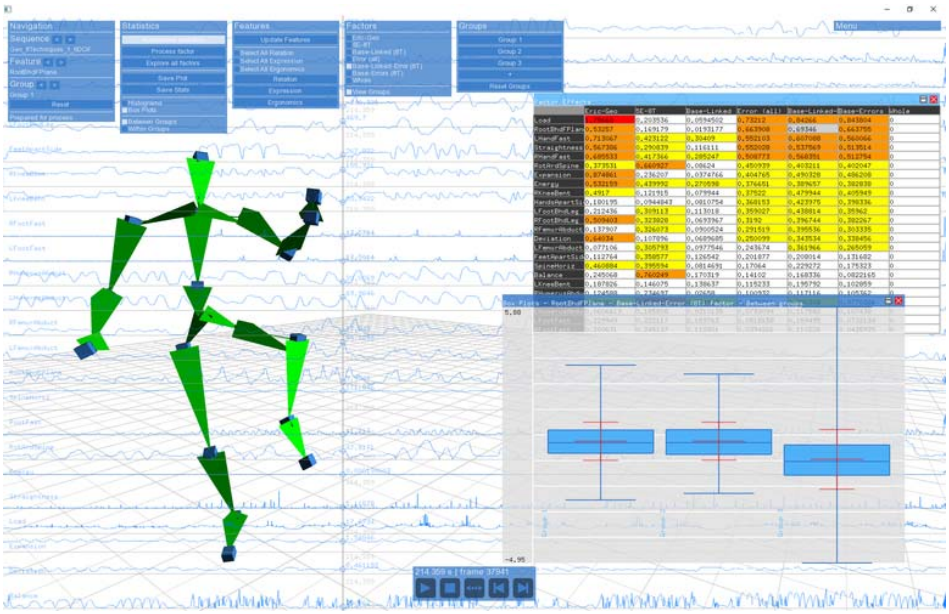


Figure 23: Screenshot from the MotionExplorer tool, which explores different parameters of Tai-chi-chuan performances and with different performers.

Figure 24: Recording of Tai-chi-chuan experts and learners using the Qualisys motion capture system during the motion capture session of the Tai-chi-chuan demonstration.

Data collected

At the end of the demonstration activity, we collected a new motion capture dataset for Tai-chi-chuan (12 subjects, approx. 1500 sequences) and 3 interviews of experts in forms of discussions, summarizing their experience and their opinions about the usability and effectiveness of our analysis and evaluation tools.

Following the demonstration, a paper about feature extraction has been submitted to MOCO2017 conference and another paper about Tai-chi-chuan performance evaluation is currently under preparation.

Challenges, problems encountered and lessons learnt

The main two challenges of this scenario were the time required to capture the data and, then, the time and effort required to correct these data.

Differently to what happened during the Walloon dance demonstration activities or in our contacts with contemporary dance experts, the Tai-chi experts were very responsive and cooperative. However, we still could not collect feedback from all the participants, only from the three experts, which were of course the most valuable ones.

For future activities, we may need to use motion capture sensors that do not require extra work, like the Microsoft Kinect, to avoid a) the long time required for correcting the data, and b) requiring the presence of experts, that are usually extremely busy, on different occasions (once for the recording and then, after the correction of data, for the analysis). However, we need to validate our tools using these sensors.

User feedback

The participants found the research performed within the project and the different tools developed within its context very interesting and promising. Mr Eric Caulier, the founder of the Eric Caulier school of Taijiquan, pointed out that he was surprised by the work done by the Consortium, both quantitatively and qualitatively.

Experts agreed that the choices made to study this discipline and the extracted features are intuitive. Regarding the automatic evaluation of the performance of different participants, the experts said that it corresponded well to their feeling and empirical view of the practitioners' expertise and provided a useful feedback that could allow the practitioner to improve his performance by himself. They found the results very encouraging and were looking forward to seeing what can be done next.

Regarding the use of the tools, they found them very easy and intuitive to use, particularly the MotionExplorer tool, which does not require any background in ICT, and by simply dragging and dropping the motion files (captured data), it makes an automatic analysis of the dataset.

Finally, regarding the generic game development framework, the experts were surprised by the developed tools and the short time required to actually create a simple but meaningful game, making the comparison to a previous experience they had with Microsoft interns, who required months to make a similar game (although with better graphics). Experts expressed their interest in developing a full game dedicated to Tai-chi-chuan learning, which will allow beginners to earn the basic move sequences.

3.2.5 Demonstration activities for the use of i-Treasures technologies for the creation of novel educational tools for dance teaching and learning

Most of the demonstration activities that have been organised for the dance use case as well as for the other i-Treasures ICH use cases involve a scenario where a group of learners uses the educational material and tools developed within the project, like

the LMS courses, the games, the TTS, to learn the basics of an ICH expression and practice it. They are usually supported by a teacher/ ICH expert or in some cases rely on just self-study.

As already mentioned above, in the context of the dance sub-use case, the consortium decided to also showcase the usability of the i-Treasures platform and technologies in a scenario where the developed technologies are used by experts to create their own pedagogical plans and new educational material for dance teaching. More specifically, the aim of this activity was to demonstrate the usability of the Pedagogical Planner tool (see D5.4 "*First version of the Integrated Platform*") and the generic dance game development framework (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*") in a scenario where dance experts use the aforementioned tools to deliver new pedagogical plans, LMS courses and game-like applications for teaching and learning Greek traditional dances.

Participants & venue

This demonstration activity took place at the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki in cooperation with our Greek traditional dances expert Assoc. Professor Stella Douka. It involved 13 undergraduate students (8 female and 5 male), 21-25 years old, at the last year of their studies whose major/specialty was "*Dance didactics*" and who were studying under the supervision of Prof. Douka. These students are already experienced dancers and they are usually already teach traditional dances in local dance associations or schools. Almost all of them will continue teaching traditional dances in public schools, dance schools or local communities after they graduate. They are the future teachers/ experts of this kind of ICH, which adds to the importance of this demonstration scenario, since they can be the ones that will establish the use of new ICT technologies for ICH learning and transmission.

This demonstration activity spanned a period of almost 4 months (December 2016-March 2017).

Demonstration outline

The demonstration was held with the following structure:

- Presentation and live demonstration of i-Treasures technologies to the users. Outline of the assignments to be undertaken by the students, discussion about technical details.
- Design of educational plans for each selected dance.

- Organisation of recordings of the selected dances to collect data (video and skeletal streams) for the development of the games and the LMS.
- Development of one game-like application per dance.
- Creation, population and delivery of LMS courses for the selected dances.
- Filling of questionnaires.

In the following, we elaborate on the different stages of this demonstration activity and the produced outcomes.

After initial discussions with CERTH, Prof. Douka discussed with her students about the possibility of participating in such a demonstration and undertaking assignments that involved use of our tools and technologies. They decided that they would design and deliver a suite of educational tools for teaching different Greek traditional dances. The students individually or in teams comprised of two persons would use the Pedagogical Planner to produce pedagogical plans for each dance and would then deliver an LMS course and a game-like application for the corresponding dance using as an example the plans, courses and games delivered for Tsamiko and Salsa. As mentioned above, thirteen students expressed interest to participate and undertake assignments.

The first phase of this demonstration activity involved the presentation of the i-Treasures technologies to the participants. On 28 November 2016, CERTH researhers presented the i-Treasures Web-platform and its main modules and functionalities to the students, as well as the tools offered for the creation of new educational materials or tools. More specifically, we focused on a) the technologies/sensors used for the capture of dance performances, the kind of data captured and the techniques used for their analysis, b) the generic game development framework, which aims to provide a basis for those who want to create their own game-like applications for learning and training of dance and/or any other physical (body-motion-based) activity based on low-cost sensors such as the Kinect, c) the Pedagogical Planner software and the LMS system for the design of structured educational paths for ICH teaching and learning and the creation of novel educational material for ICH. All the software tools were demonstrated live to the students who were able to see how they could create pedagogical plans, produce LMS courses from the plans, populate the courses with videos/photos/text, design and create game-like applications. We also demonstrated live the Salsa game developed within i-Treasures using this generic framework. The demonstration was followed by discussion where CERTH explained several technical details, discussed about the

assignments to be undertaken by the students, made a schedule for the delivery of the different parts of the assignments, and made clear how technical support will be provided by the CERTH team.

In the following days, the students together with Prof. Douka decided on the type of dances they would like to create educational material for and started getting familiar with the Pedagogical Planner and the LMS in the Web-platform, also studying the existing courses and pedagogical plans available in the Web-platform. During the following couple of weeks, they created educational plans for the selected dances based on the plans already available for Tsamiko, Walloon, Salsa and Calus (see D5.1 "*Report on Analysis of Educational Scenarios*" and D5.8 "*Final report on Analysis of Educational Scenarios*").

Since most of the students were familiar with the use of computers but did not have a background on ICT or using educational software as teachers (they did use such tools as students to study for their classes), we organised another meeting between the CERTH team and the students in the Physical Education and Sports Science department's lab. Students brought their laptops with them and were shown step-by-step how to use the pedagogical planner tool, generate the corresponding course in the i-Treasures LMS and then populate the LMS with audio-visual material (videos, photos, pdf and ppt files, quizzes, etc). e-guides for the use of these tools were also provided, while the CERTH team answered questions and provided technical support by email or phone.

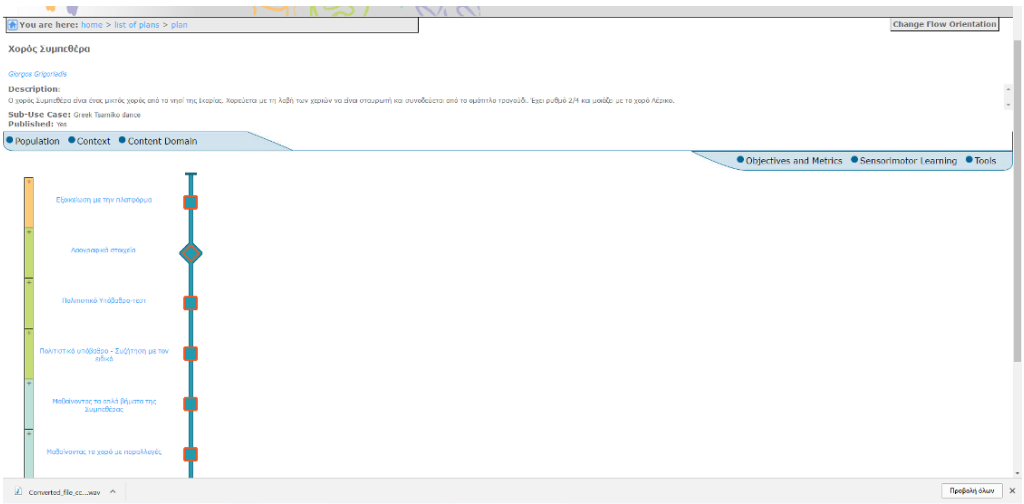
After this training session, the students were able to create their own pedagogical plans and create the course structure in the LMS. Almost all plans follow the structure of the Tsamiko plan. They're comprised of five modules: i) getting familiar with the platform; ii) theoretical background of the dance; iii) learning and recognizing the dance steps through audiovisual material; iv) practicing the dance by using the game-like application, and v) dancing with other people. In Table 7, the list of the ten Greek traditional dances and one dance form Cyprus for which pedagogical plans and educational tools were created is presented. As one can see, these dances come from different regions of Greece and cover almost the whole country. One dance is coming from Cyprus. In Figure 25, some screenshots from the pedagogical plans created by the students are shown. The pedagogical plans can be found at the Pedagogical planner Web-page[39].

[39] Pedagogical plans for different traditional dances: http://i-treasures.itd.cnr.it/list.php?uc=dancing&SelP=0

Another similar training session was organised on a later date, focusing on providing instructions and guidance for the population of the LMS courses.

Table 7: List of Greek folk dances for which educational tools were created.

	Name of folk dance	Region of Greece the dance originates from/ is practiced in
1	Sybethera (Mother in law)	Ikaria island, North Aegean
2	Baintouskino	Macedonia
3	Kori Eleni (Daughter Helen)	Macedonia
4	Leventikos	Macedonia
5	Olympia	Macedonia
6	Pentozali	Crete
7	Tsourapia	Macedonia
8	Zamantas	Serres, Macedonia
9	Syrtos	Well-known folk dance danced across the country
10	Syre-Syre	Macedonia
11	Cypriotic Zeibekiko	Variation of the male Greek dance Zeibekiko danced in Cyprus



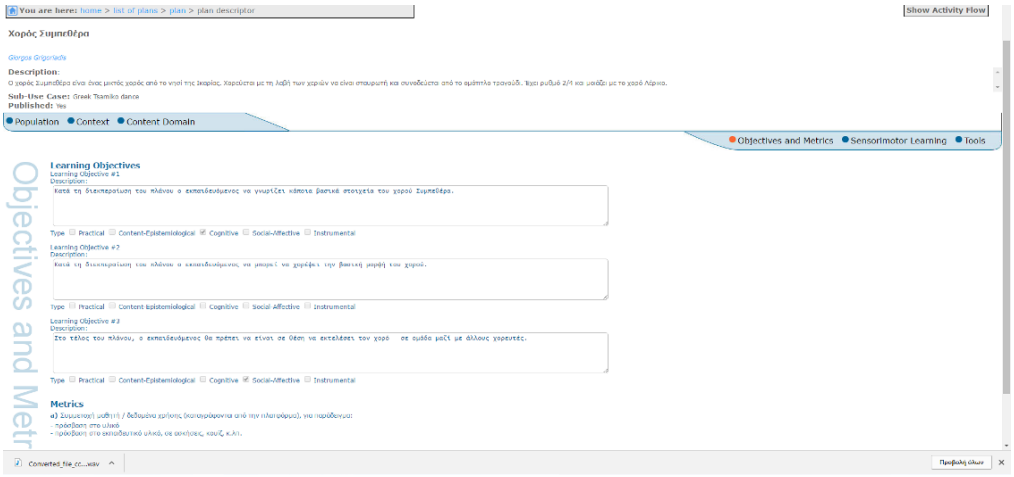


Figure 25: Screenshots from the pedagogical plan for teaching Greek traditional dances developed by students of the Physical Education and Sports Science Department. This plan was prepared for the folklore dance "Sybethera" from the island of Ikaria.

The next step was the recording of dance performances using the ITGD (i-Treasures Game Design) module developed by UMONS and the Kinect sensor in order to collect data (video and skeletal streams) for the games and the LMS. The ITGD interface enables the user to design the game scenario (define activities/ exercises, provide small descriptions, select performance evaluation algorithm, etc.), capture the necessary expert motion data and save this information in an xml file (see D5.5 "*Final Version of 3D Visualization for Sensorimotor Learning*", Section 5.2). The recordings took place in the Physical Education and Sports Science Department in December 2016. Researchers from CERTH used the software to capture the performances of the students as they danced the various dances (or parts of each dance) several times. Next, the students with the help of the CERTH team used the ITGD tool to design the game scenario, i.e. define the activities and exercises for learning the steps of a specific dance, provide small descriptions for each activity /exercise, and edit the recorded videos so as to create the corresponding video segments (and motion data files) for each envisaged activity /exercise. They also provided audio files of the music accompanying each dance. The output of this step was the creation of one XML file per game, accompanied with the appropriate video and skeletal data files, which was then used for the generation of the corresponding game-like application.

Once the design of the games using the ITGD interface was completed, the CERTH team fed the XML files and motion data to the generic framework and created eleven game-like applications, one for each dance. Figure 26 depicts screenshots from

some of the developed games. Once created and tested by the CERTH team, the games were shown to the students so as to examine them and test them by themselves. Changes and improvements were made base on the students' requests and the updated versions of the games were released at the end of January 2017. The final versions were released in March 2017.

Figure 26: Screenshots from the game-like applications for Greek folk dance learning created by students of the Physical Education and Sports Science Department using the generic game development framework. a) Observe mode of 'Leventikos' dance game, b) evaluation score for user performance in Pentozali dance game.

Between, February and March 2017, the users developed corresponding courses in the LMS based on the already delivered pedagogical plans. Despite the fact that 11 pedagogical plans were created (and corresponding games), only 4 courses were created at the end in the LMS, since not all students could follow up with all the tasks of the demonstration activity. More specifically, courses have been developed for the

following dances: Sybethera[40], Olympia[41], Zamantas[42] and Syrtos[43]. The users populated the courses with learning material of different kinds, including videos captured during the dance recording, power point presentations, pdf files, etc. The courses include blended activities, i.e. self-study focusing on the cultural background (history, social aspects, music, folk costumes, etc) and learning the dance steps (through videos showcasing the choreography) followed by tests to assess the acquired knowledge, practice activities with the game-like applications and face-to-face sessions for practice with other real dancers. Figure 27 illustrates some screenshots from the LMS courses created by the students. Again, online technical support was offered by CERTH, UOM and CNR during this phase.

At the end of this demonstration activity, a suite including 4 LMS courses and 11 game like applications for teaching and learning different Greek folk dances was delivered, which can be used by Prof. Douka in the context of the "*Didactics of Greek Traditional Dances*" course, taught to undergraduate students in the Department of Physical Education and Sports Science of AUTH.

Data collected

At the end of this demonstration activity, we collected 5 e-questionnaires[44] from the participants, which evaluate the Pedagogical Planner tool, the Learning Management System and the generic game development framework and provide valuable information about how teachers/experts assess our technologies potential for designing and developing new ICH education material and tools.

We also captured motion data for 11 different Greek traditional dances using Kinect sensors. These sequences were partly used for the creation of 11 game-like applications for learning Greek traditional dances. Moreover, we have created 4 LMS courses for these dances, each course including several activities supported by audio-visual and other resources.

[40] LMS course for Greek traditional dance Sybethera: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/CHOROS_SUMPETHERA/
[41] LMS course for Greek traditional dance Olympia: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/CHOROS_OLUMPIA/
[42] LMS course for Greek traditional dance Zamantas:http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/EKMATHESETOUKHOROUZAMANTAPENTAPOLESE
[43] LMS course for Greek traditional dance Syrtos: http://i-treasures.multimedia.uom.gr/chamiloprivate/courses/*_SURTOS_MAKEDONIKOS/

[44] Questionnaire for generic game and Pedagogical Planner : http://i-treasures.multimedia.uom.gr/evaluation/generic_gr.doc

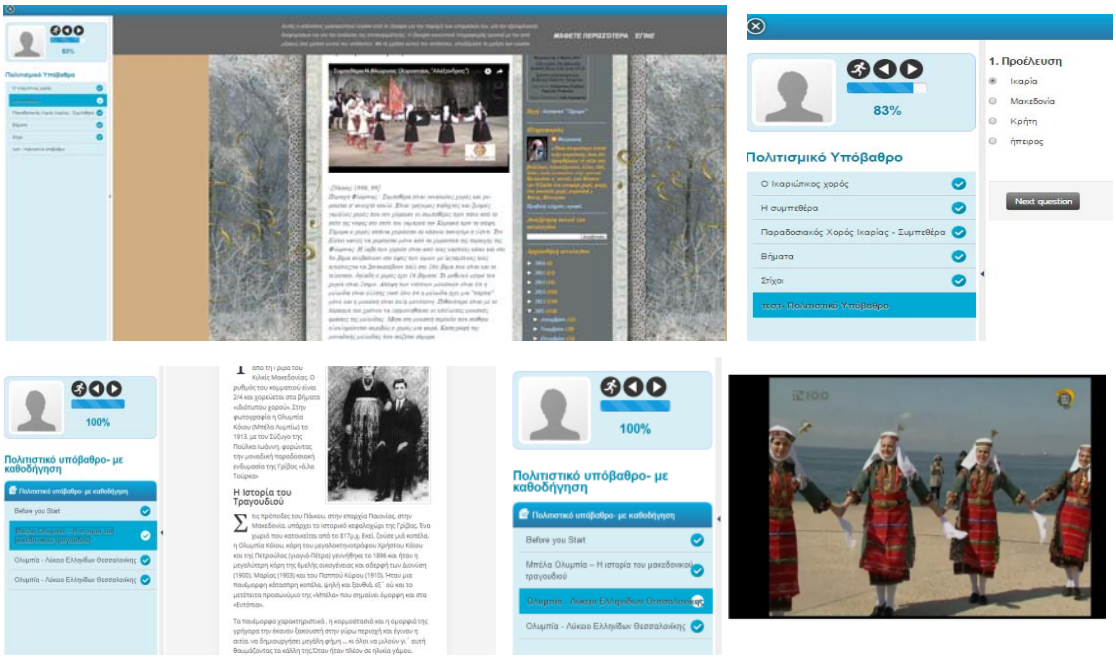


Figure 27: Screenshots from the LMS courses for Greek traditional dances developed by students of the Physical Education and Sports Science Department: a) Sybethera dance (first row), b) Olympia dance (second row).

Challenges, problems encountered and lessons learnt

As already mentioned, this scenario was fundamentally different compared to the other demonstration scenarios presented in this report, since it did not target simple users of our technologies, i.e. teachers or learners that use already available tools/ resources for dance teaching and learning, but rather dance teachers that want to create their own educational material for dance teaching and learning using our modules. As can be easily understood, this scenario presented significant challenges for both the users and the i-Treasures partners, especially in terms of technical support, since the participants/users were not particularly familiar with ICT technologies and have never used such tools before. To overcome this obstacle, we organised training sessions to guide the participants on using our tools (like the Pedagogical Planner or the LMS), while also helping them on hands (e.g. with the ITGD tool) or supporting them through e-collaboration (e.g. the exchange of emails for relatively simple issues or questions).

The lack of experience in the use of ICT technologies was our main obstacle in this case, as also admitted by the users. The training sessions and the step-by-step guidance has really helped in this direction and was proven to be crucial for the success of this particular demonstration scenario, especially after some first failed attempts by the users to do everything without help. And this was also the main

lesson learnt from this experience. Training the ICH experts and providing as much as possible clear instructions and well-written user guides/manual is extremely important in our effort to persuade ICH experts to use and promote the use of ICT tools for ICH transmission. The more in control and skilled and adequate they feel, the easier they will adopt such tools and make them part of their every-day work routine and, thus, change the way ICH is taught and learnt.

User feedback

In this sub-section, we attempt a brief qualitative analysis of the user feedback, mainly based on our discussions and interactions during the demonstration, but also taking into account the collected questionnaires. In general, the users were very positive about the use of both the Pedagogical Planner and the generic dance game development framework.

In regard with the Pedagogical Planner, they believe that it provides a simple and easy way to design and plan educational paths not only for ICH expressions but also for other kinds of physical and spiritual practices related to human body motion such as martial arts, yoga, etc. They also thought that it was very important the fact that this tool offered the possibility to design educational interventions including different kinds of learning activities: activities that help the learner establish a theoretical background (history of dance, cultural background, basic dance movements) and activities for practicing the dance, activities that are followed individually at school or at home and team activities designed for the classroom, activities based on sensorimotor learning and activities that are based on traditional student/teacher interaction, activities involving tests or discussion through forums, etc. This variety of activities keeps the learners interested and stimulated and makes the learning process much more effective and enjoyable.

They also thought that the automatic creation of educational scenarios in the i-Treasures LMS based on the conceived pedagogical plans greatly facilitates their workload inside the LMS. Moreover, they found very useful the storage of LMS and game analytics for each student and believed that this is a great tool for assessing the progress of each learner individually or the class as a whole.

As far as the generic game development framework is concerned, the response of the users was even more positive. They though that it provided them a very simple and quick way to design and create an attractive and easy to use game-like application for practicing any kind of dance. They thought that the game design and data capturing process was simple and believed that they could probably do it by

themselves after receiving some training on how to use the tool. What they found very intriguing was how fast the design process was and how user-friendly and functional the produced game-like application was shown to be. Another attractive feature was the fact that the game could be also used at home since it is really simple to play and only requires a PC and a Kinect, while at the same time provides sensorimotor feedback about the learner's performance, which is considered necessary for meaningful practice without the presence of the teacher.

Finally they all agreed that the proposed tools allowed them to design educational interventions that allow teaching the basics of a dance tradition in a meaningful and innovative way.

3.3 Demonstration Activities for the "Traditional craftsmanship" use case

In the use case of traditional craftsmanship, i-Treasures focused on the art of wheel-throwing pottery, which also is the art or craft of the potter or the manufacturer of pottery. Pottery is made by forming a clay body into objects of required shape (most commonly vessels) and heating them to high temperatures in a kiln (high temperature chamber), which removes all the water from the clay and induces reactions that lead to permanent changes including increasing their strength and hardening and setting their shape. In wheel-throwing pottery, the ball of clay is placed in the centre of a turntable, called the wheel-head, which the potter rotates with a stick, with foot power or with a variable-speed electric motor as he shapes the object.

The scope the demonstration is to showcase the usability of the i-Treasures platform and tools in teaching wheel throwing pottery to beginners. Pottery is usually taught and learnt by imitation, thus, the demonstration aims to explore the potential of the developed technologies in supporting a structured educational path, which includes both online and face- to-face activities. The scenario envisaged for the demonstration under Task 6.4 "*System Demonstration for Use Case "Traditional Craftsmanship*"" involves a formal educational path for adult inexperienced pottery learners and is described in the following.

3.3.1.1 Demonstration scenario 1: Structured educational path for pottery beginners

The demonstration scenario involves a structured educational path for adults that have no prior knowledge of pottery but want acquire basic knowledge and pottery

making skills. The scenario is realized in the context of a pottery class taught by an expert potter. The learners' profile is close to the one assumed by the corresponding pedagogical scenario described in D5.8.

The scenario aims to provide a structured educational path based on the corresponding LMS course, starting with a theoretical module, which allows the learners to learn the basics of wheel-throwing through material already available on the Web-platform or inquiry-based activities. Moreover, pottery-making competences are fostered by means of made-on-purpose video resources stored in the LMS about the different phases of wheel-throwing pottery as well as about the construction of different objects. Furthermore, pottery-making competences are also fostered in face-to-face sessions with the pottery teacher and other students, but also by using the available game-like application. The students involved followed the educational path according to their level of competences.

Participants & venue

This demonstration activity took place during a pottery class for adults, taught in a municipal cultural centre in the municipality of Pavlos Melas, in Thessaloniki by our pottery expert Mr Theodoros Galigalidis[45]. The demonstration lasted about 3 weeks (February-March 2017) and involved several actors:

- Students: a group of 6 learners (3 female and 3 male), 35-50 years old. The students were attending a pottery class offered in the Cultural Centre of Polichni. They were beginners in pottery. Some of them were not very familiar with computers.
- Experts: 1 pottery expert, Mr Galligalidis, who also helped us record the pottery data, create the LMS course and design the pottery game-like applications.
- i-Treasures partners: the use case leader (CERTH) presented the platform and its main components to the users, coordinated the learning activity that was based on the educational game and provided technical support in problems related to the use of the LMS/Web-platform.

Demonstration outline

[45] https://galigalidis.wordpress.com/

The demonstration followed the structure of the corresponding LMS course in the i-Treasures Web-platform (LMS course: *Αγγειοπλαστική (Gre)*[46]), which is comprised of five distinct modules: a) *Familiarization with the platform*, b) *Pottery making background*, c) *Basic pottery exploration,* d) *Practicing basic pottery phases*, e) *Making different objects.* The course is delivered in a "blended" format, i.e. it is made up of modules in which activities are envisaged to be carried out either in the classroom or remotely (self-study). All the activities are accompanied by explanations, thus allowing students to access them autonomously. Based on this structure, the demonstration spanned a period of 3 weeks, one week per one or two modules of the course.

During the planning of the demonstration, our pottery expert Mr Galigalidis, who also teaches the course to residents of Polichni, had to request a special permission by the municipality of Pavlos Melas so as to be able to incorporate our technologies in his course and make the course part of our demonstration activities. A presentation of the project along with audiovisual material accompanied the request and permission was granted a few days later.

During the first day of the demonstration, the use case leader (CERTH) presented to the students the i-Treasures Web-platform and its main modules and functionalities as well as the structure of the educational path and corresponding activities to be followed by the students. An electronic guide for the Pottery LMS course was provided to the students as well as a set of clear instructions on what is expected from them and how they can get technical help from the CERTH team.

In the following weeks, the students followed the learning path as defined in the course, completing a few learning units (modules) per week. The first three modules, which aimed to consolidate their theoretical knowledge about pottery as well as their pottery-making knowledge mainly through videos available in the LMS, were followed by students online (at home) and involved self-study, while the latter two, which aimed at fostering their pottery making competency through the game and face-to-face sessions, were realized in the pottery workshop with the help of their teacher.

- During the first week, the students completed the first two units of the LMS course online, by themselves. The first unit allowed them to get familiar with the Web-platform and the LMS by navigating the platform based on what they

[46] LMS course for traditional wheel-throwing pottery: http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/POT00002 (Greek version), http://i-treasures.multimedia.uom.gr/drupalprivate/lms/courses/POTTERYCERTH (English version)

had learned during the initial introductory presentation as well as the material provided to them. The second unit ("*Pottery making background*") helped them acquire basic knowledge about pottery such as its origins and history, the materials used, the types of pottery wheels, pottery tradition in different countries etc. The level of the acquired knowledge was tested through online tests.

- During the second week, the students completed the third unit ("*Basic pottery exploration*"), also online through self-study. This module helped students to learn and recognise the four basic phases of object creation, comprehend the differences in creating different objects (i.e. they are able to identify, recognise and understand the variations in the creation of different small objects, e.g. a bowl and a sphere) and learn about a basic pottery object decoration technique. This was achieved by watching different videos showing an expert creating different objects. The degree of their comprehension was again tested through an online test that asked them to identify the basic phases of pottery and the type of objects created.
- Next, the students carried out the activities of the fourth module ("*Practicing basic pottery phases"*) in the pottery workshop with the help of the CERTH team and their teacher. This module helped students practice the basic phases of pottery and create different kinds of virtual objects by using the "*Pottery master*" game-like application developed by TT. As already described in D5.7, this game-like application includes several exercises through which the learners can practice the basic gestures of pottery trying to re-create a pot that is presented to them (Figure 28). After they have completed their effort, an evaluation score is displayed assessing the degree of similarity between the two virtual pots. The game also includes a free-form exercise where the learners can create a virtual model of a pot they have imagined. The CERTH team demonstrated the use of the game to the students live, before they used it by themselves. Two set-ups with a laptop and a Leap motion[47] sensor each were available and each student spent 30-40 minutes on average on completing the activities of the game (Figure 29).
- Afterwards, the students carried out the activities of the final module ("*Making different objects*") again in the pottery workshop. In this activity, the learners created pottery objects in real conditions with real clay and a pottery wheel.

[47]Leap Motion sensor: https://www.leapmotion.com/

The teacher showed them the procedure and the learners tried to create an object under his guidance and then on their own. The learners learned how to make different objects and their skills were evaluated by their teacher.

- Finally, the students and experts were requested to explore the i-Treasures Web-platform on their own, based on a predefined navigation scenario, and use the different tools offered by it.
- After they completed all the activities, the students and expert were requested to complete an online questionnaire[48] so as evaluate the proposed educational path and the activities carried out and provide feedback about their experience.

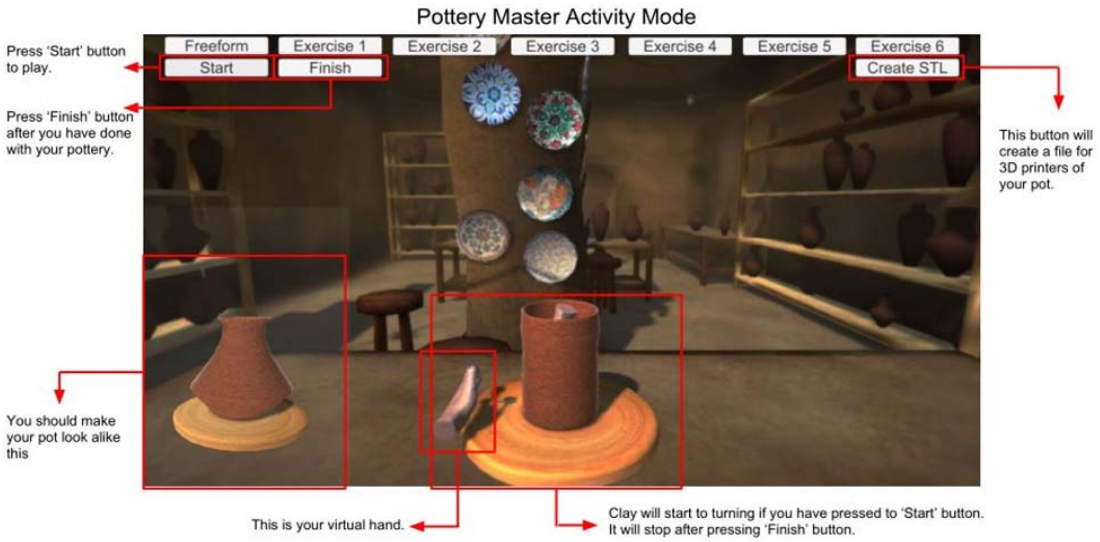
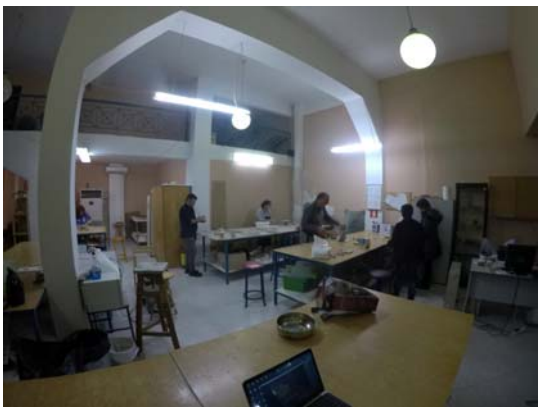


Figure 28: The "*Pottery master*" game-like application for learning virtual pottery gestures using a Leap-motion sensor.



[48] Questionnaire for traditional pottery: http://i-treasures.multimedia.uom.gr/evaluation/pottery.doc

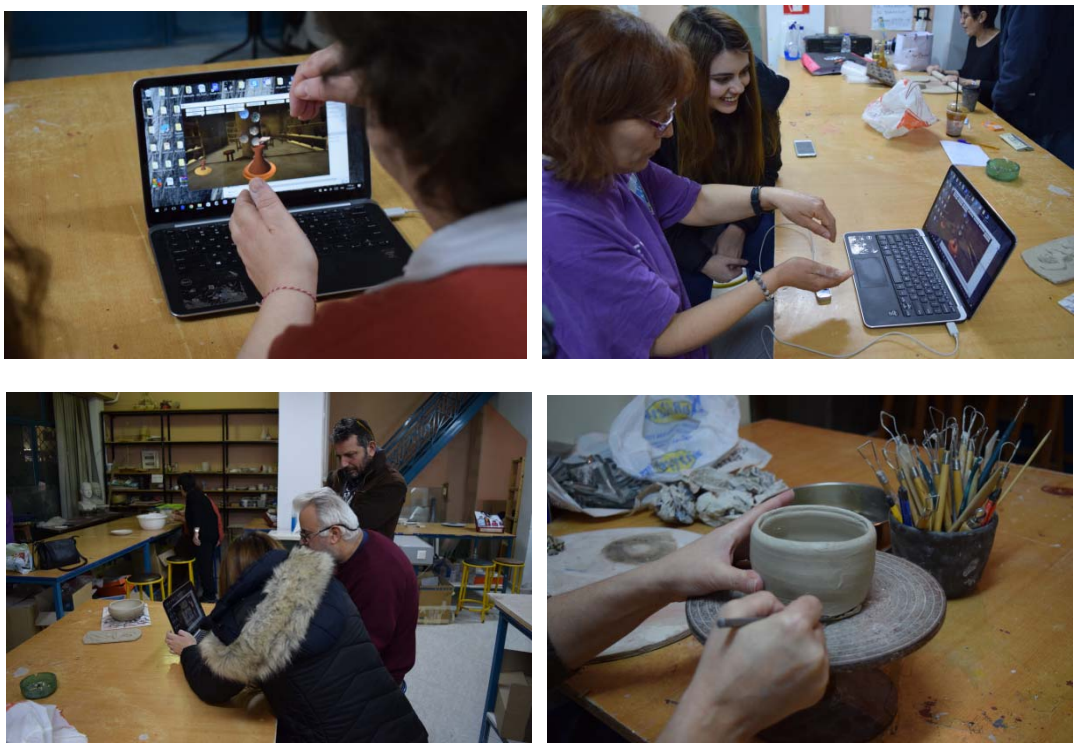


Figure 29: Pottery learners in the pottery workshop during the demonstration.

Data collected

At the end of this demonstration activity, we collected 7 e-questionnaires from the participants, which evaluate the different components of the i-Treasures system, summarize their experience and provide valuable information about the system's user acceptance. Moreover, data was also collected from the use of the LMS and the game-like application by the students, which was stored in the form of LMS and game analytics in the Web-platform database.

Challenges, problems encountered and lessons learnt

The main challenge in this demonstration activity was the lack of experience of the users in ICT technologies. The participants in this activity were older than the users involved in the demonstrations of the other use cases and, as a consequence, they were less familiar with the use of computers or gaming applications and sensors. This resulted in additional effort required by CERTH to explain and demonstrate how the different modules work. On the other hand, this increased the participants' curiosity and enthusiasm when they were able to learn how the modules work and use them by themselves. It is clear that training the users on new technologies is an important step towards the adoption of such technologies for ICH education and transmission.

User feedback

In this section, we briefly present the users' opinion about their experience in the demonstration. A detailed quantitative analysis of the questionnaire results is presented in D7.3. Here, we focus on a more qualitative analysis, mainly based on our interaction and discussions with them.

In general, the users were really positive about the use of our technologies. As mentioned above, none of them had previous experience with similar ICT tools, and were, thus, interested in exploring them. They found the approach adopted by i-Treasures innovative and effective and thought that it constitutes a clear advancement over traditional methods of ICH safeguarding and transmission since it provides a variety of tools and resources organised in a clear and structured way, which succeed to sustain their interest throughout the learning process, allowing them to acquire a solid theoretical background about pottery making and increasing their interest in this kind of ICH.

They were pleasantly surprised by the learning activities offered by the LMS course and all agreed that they helped them not only to explore the history of this ICH from ancient times to the present but also to learn the basics of pottery making (learn/identify the phases of the pottery making process, recognise/understand variations in the creation of different objects, etc) in a pleasant and effective way. They felt that after completing the proposed learning path, they had acquired a meaningful insight and basic knowledge of this ICH: not only they were able to create basic pottery objects but also understood the historical and social aspects of this tradition. A feature that they also found helpful was the assessment of the acquired knowledge in every step of the process.

As expected, the use of the game-like application also captured their interest. Although, almost all of them had no previous experience in gaming applications and had some trouble at the beginning to understand what the game scenario is and how to play it (e.g. where to place their hands in regard to the sensor, how to navigate the interface), they were very quickly able to complete the game activities by their own. As expected, the first activities of the game took more time to complete, but as the game progressed, the users were more accurate and fast and were able to correct their mistakes by themselves based on the optical feedback received through the game. Actually, we have noticed that the less experienced the users were with such technologies, the more confident and enthusiastic they felt when they finally understood how to use them. The users found the game interface very satisfying and

thought that the activities offered actually helped them to practice the basic pottery making movements for creating different objects even if those objects were virtual. They found the representation of their hand movements captured by the Leap motion sensors very accurate. Also, through our discussions, they made clear that they thought that the game-like application was a great tool for practicing the basic pottery movements since it could be used at home or any other place where no clay or wheel is available. They also thought that this tool could be extremely attractive to young kids and would be a great way to motivate them to explore the pottery tradition.

The pottery expert was also very satisfied by the demonstration process and by how the developed tools and proposed learning path was received by his students. Since he has taught a lot of students over the years, he was able to comment in the differences between the traditional teaching techniques and the proposed approach, which offers a variety of activities from theoretical to practical, from self-study to team-work in the classroom. He pointed out that the students that followed the proposed learning scenario have shown more enthusiasm and interest and have acquired a far more spherical knowledge of this form of ICH. Offering a variety of activities or tools, allows the user to focus or use the ones that better suit him/her based on his background and competencies. He focused on the fact that we succeeded to offer a structured path that covers different aspects of this ICH in a way that is simple, meaningful, engaging, enjoyable and, most of all, effective. He also stressed that these tools would be very successful and effective if used in schools, e.g. for teaching pottery during an art class, in museums focusing on local tradition for motivating more people to get interested in traditional handicraft, or in folk festivals to attract the general public, and especially children, and get them engaged in this ICH.

The expert was also very positive about the techniques developed for capturing and analyzing this kind of ICH. Until recently, the only way to document and analyze the pottery making process was by capturing it by 2D cameras and, then, manually annotating or describing the potter's gestures. Given the nature of pottery making, this 2D representation, essentially, cannot capture these movements effectively since there is a lot of obstruction. The use of multiple sensors (2D cameras, Kinect, Leap motion) that can also capture the 3D movement of the potter's hands, arms and body offers increased accuracy and reveals information that has never been captured before, which according to the expert is crucial for the accurate documentation of handicrafts.

Moreover, the use of computer vision algorithms for the analysis of the captured data and the recognition of pottery gestures, allows the automatic annotation of the pottery making process, and, thus, its inclusion in digital databases and its effective and quick retrieval. The design of an ICH repository that allows semantic search based on medium and high level features was considered to be an important outcome of the project since it allows the creation of a database of pottery making sequences depicting different experts and techniques from all around the world. That would constitute a treasure of knowledge and would allow a much deeper understanding of this tradition and how it is practiced in different places. It can also unveil differences and similarities between different creators or locality variations.

Finally, the expert was particularly pleased by our efforts for the 3D visualization of pottery movements in the 3D gaming environment and thought that this was a very important tool for educational purposes, since the usual 2D representations cannot accurately represent the hand/finger movements. Of course, the visualization needs to be further improved, especially to be able to overcome current restraints caused when the potter interacts with the clay (currently, we visualize only virtual pottery movements).

Overall, both the learners and the expert felt that the developed technologies can significantly benefit ICH safeguarding and transmission and can be adopted by ICH organisations or schools to motivate more people to be interested in endangered traditions, and especially younger people.

3.4 Demonstration activities for the “Contemporary Music Composition” use case

A novel Intangible Musical Instrument (IMI) has been designed and implemented in the context of the contemporary music composition use case (see deliverables D4.2 “*First version of mapping sound to gestures and emotions*” and D4.4 “*Final version of mapping sound to gestures and emotions*”). The IMI aims to facilitate access to the knowledge of music performers using technologies that are easily accessed from the general public. More specifically, this prototype is able to capture, model and recognise musical gestures (upper body including fingers) as well as to map them with sound (gesture sonification). The emotional status of the performer (expert or learner) impacts also the sound parameters at the synthesis level.

The scope of this use case demonstration is to justify the usability of the i-Treasures platform and the IMI in music education and composition. Three demonstration scenarios were envisaged that include structured educational paths for students, use of the IMI for learning musical gestures and music composition, and performance of musical pieces based on the IMI.

UOM is the partner responsible for the contemporary music composition use case in close cooperation with ARMINES and AUTH. In the following subsections, we present in detail the different activities organised for the demonstration of this use case under Task 6.5 "*System Demonstration for use case "Contemporary Music Composition*"". These are also summarized in Table 8.

Table 8: Overview of demonstration activities for Contemporary Music Composition

Scenario	Venue	Dates	Participants	i-Treasures modules demonstrated	Equipment used
Structured educational path for students	Multimedia, Security and Networking (MSN) Lab, University of Macedonia, Thessaloniki	16-25 January 2017	• 33 university students and musicians • 3 music experts • UOM and AUTH researchers	• Web platform • Contemporary Music Composition course in LMS • Contemporary Music Composition game-like application • IMI	• PCs • Kinect • Leap motion Controller • Emotiv • Table of IMI
Use of IMI for music learning and composition	International Symposium on Movement and Computing (MOCO16), Thessaloniki, Greece	5-6 July 2016	• 10 university students, musicians and researchers • ARMINES, UOM and AUTH researchers	• IMI	• PCs • Kinect • Leap motion Controller • Table of IMI
Use of IMI for music learning and composition	International Conference on New Interfaces for Musical Expression (NIME'16), Brisbane, Australia	11-15 July 2016	• 10 university students, musicians and researchers • UOM researchers	• IMI	• PCs • Kinect • Leap motion Controller • Table of IMI
Use of IMI for music	SomeTimeStudio	19 September	• 5 musicians	• IMI	• PCs

learning and composition	(creative ideas and projects incubator), Paris, France	2016	• 5 researchers • ~40 persons from the general public		• Kinect • Leap motion Controller • Table of IMI
Concert of IDEASMOS musical piece combining acoustic musical instruments and the IMI	International Symposium on Movement and Computing (MOCO16), Thessaloniki, Greece	5-6 July 2016	• ~80 university students, musicians and researchers • ARMINES, UOM and AUTH researchers	• IMI	• PCs • Kinect • Leap motion Controller • Table of IMI
Concert of IDEASMOS musical piece combining acoustic musical instruments and the IMI	"Musique aux Mines" festival, Paris, France	7 September 2016	• 50 university students • 10 musicians • 5 researchers • 15 ARMINES researchers	• IMI	• PCs • Kinect • Leap motion Controller • Table of IMI

3.4.1.1 Scenario 1: Structured educational path for adults interested in music composition

The first demonstration scenario aimed at presenting music learning and transmission tools by emphasizing on pedagogical aspects. First, the pedagogical material available through the corresponding LMS course in the Web-platform, covering theoretical aspects of music (historical aspects, and concepts, such as harmony chords, intervals, metric values, etc.), is demonstrated.

The second part of this scenario concerns more practical aspects, such as performing in real-time simple musical gestures inspired from piano. After the learner gets familiarized with the Web-platform and its content s/he is invited through the learning path to use the IMI. The learner puts on the sensors and makes practice with the suggested musical gestures, in such a way that the system gives both visual and auditory feedback. The visual feedback refers to the accuracy of the performance, while the auditory feedback refers to how similar is the reproduced sound to the expert's sound. Furthermore, with the real-time capturing of the emotional state of the performer via the emotional module of IMI, the latter provides

visual and auditory feedback to the performer regarding the target and his/her achieved emotional state, all previewed to an augmented score that consists of conventional notes, along with gestural and emotional information.

Participants & venue

This demonstration activity was held at the Multimedia, Security and Networking Lab (MSN Lab) of UOM in Thessaloniki, on 16-25 January 2017. The event was open to the general public, but mainly focused on involving the following actors:

- Students/musicians: a group of 33 learners (13 female and 20 male, 19-47 years old).
- Experts: a group of 3 experts (1 female and 2 male, 30-42 years old).
- i-Treasures partners: the use case leader UOM in cooperation with AUTH presented to the users the platform and its main components as well as the IMI and its sensors.

Demonstration outline

The demonstration followed the structure of the corresponding LMS learning path in the i-Treasures Web-platform, which is comprised of four distinct modules: a) *Familiarization with the platform*, b) *Basic elements in Music Theory*, c) *Triplets, Ornaments, Dynamics and Chords,* d) *Sensorimotor Learning Musical Gestures with the Intangible Musical Instrument*[49]*.* All the activities are accompanied by explanations, thus, allowing learners to access them autonomously. Based on this structure, the demonstration lasted 3 hours approximately per participant (learner).

More specifically,

- First, the i-Treasures Web-platform and its main modules and functionalities as well as the structure of the educational path and corresponding activities were presented to the learners. In addition, the learners had the opportunity to get familiar with the Web-platform and the LMS through the first learning module ("*Familiarization with the platform*") (30 minutes).
- Next, the learners moved on to the second unit ("*Basic elements in Music Theory*"), which helped them to acquire basic knowledge about music theory such as notes, duration, intervals, etc. The level of the acquired knowledge was tested through online quizzes (30 minutes).

[49] LMS course for contemporary music composition: http://i-treasures.multimedia.uom.gr/drupalprivate/lms

- With the completion of the third unit ("*Triplets, Ornaments, Dynamics and Chords*"), learners acquired knowledge of triplets, ornaments, dynamics and chords. The level of the acquired knowledge was again tested through online quizzes (30 minutes).
- After completing the theoretical part, learners had the ability to practice what they had learned with the use of a game-like application along and the IMI ("*Sensorimotor Learning Musical Gestures with the Intangible Musical Instrument*"). First, the learners had to stand in front of the capture system (Kinect and Leap Motions) and wear the Emotiv sensor on their head (to capture EEG data), so as to see their skeletal representation on the IMI's interface and attempt to perform the musical expert gestures as well as to embrace the respective emotional status (45 minutes). This was accomplished through the Contemporary Music Composition (CMC) game, which includes the following activities (see D5.5 "*Final version of 3D visualization for sensorimotor learning*"):
    - *"Learning the gestures"*: the learners were able to learn the expert musical gestures by a) observing the expert's gestures (such as ascending-descending arpeggio, ascending-descending scale, etc.) and, then, b) imitating the same expert gestures with the use of IMI and its set up.
    - *"EmoActivity"*: the learners were able to learn how to embrace specific emotional states by observing different images or videos.
    - *"Augmented music score"*: this is the final activity, which combines both expert musical gestures and emotional status (Figure 30).
- After completing all the activities, the learners and experts were requested to complete an online questionnaire[50] so as evaluate the proposed learning path and provide feedback about their experience (duration 30 minutes).

[50] Questionnaire for contemporary music composition: http://i-treasures.multimedia.uom.gr/evaluation/cmc_en.doc

Figure 30: Learners following a structured educational path for music education. The learners experimented with the IMI wearing the Emotiv sensor on their head and performing musical gestures that were captured by Kinect and Leap-motion sensors.

Data collected

At the end of this demonstration activity, we collected 36 e-questionnaires from the participants, which evaluate the Web-platform and the LMS, the game-like application as well as the IMI. Moreover, learning analytics and game analytics were stored in the Web-platform database.

Challenges, problems encountered and lessons learnt

The main challenges in this demonstration activity were a) the lack of experience of the users/musicians in ICT technologies, and b) the duration of the demonstration, which caused some participants to get tired after some time. This required additional effort by UOM and AUTH in order to explain and demonstrate in a simple but sufficient and attractive way how the whole system works and what is required by the participants to do. The duration of this activity caused some distress, which was, however, outweighed by the learners' motivation, enthusiasm and curiosity for using innovative technologies instead of the traditional approach for music education.

In order to avoid such problems, it would be more efficient to allow the participants to a) study the theoretical modules of the learning path at their own pace at home (or in the lab), thus, keeping their interest high and not burdening them, and then, b) complete the practical session with game and the IMI in the music school, conservatoire, etc, with the help of their teacher. What is also important is the initial introductory session, where the students are trained on how to use the different educational tools, especially in the case of learners with small experience in ICT

technologies. This step proves to be of crucial importance for the success of the learning process.

User feedback

A full statistical analysis of the collected questionnaires was performed under Task 7.3 "*Use cases evaluation*" and the results are presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis, taking into account our discussions and interactions during the demonstration.

In general, participants were very satisfied with the Web-platform and the IMI. Some indicative answers are presented below. Not only did participants find the learning material satisfying, but they also agreed that these mixed activities (theoretical modules and practice sessions) and the use of innovative tools like the game-like application and the IMI were more engaging and enjoyable than the traditional learning/teaching approaches. Moreover, they expressed the opinion that these technologies will be very appealing to younger users, since they are more familiar with ICT technologies.

According to the participants, the most interesting, exciting and innovative thing of this experience was the fact that they could just put their hands above the IMI and perform musical gestures without any difficulty/constraint and without any prior music knowledge. The sound is produced even if the executed gesture is not the correct one, thus, providing useful feedback to the user to correct and improve his/her performance.

In regard with the LMS course, the users have found that the course was easily accessible, the navigation was easy, the interface was attractive, the interaction was adequate and the available resources were efficient. Regarding the game-like application, the majority of the users found the idea innovative and the game scenario clear and easy to follow. They enjoyed playing the game and found the feedback provided very helpful.

3.4.1.2 Scenario 2: Use of IMI for music learning and composition

The second demonstration scenario aimed at allowing users to learn simple musical gestures inspired from piano by using hand and body gestures to evoke imaginative gesture sonification. In this scenario, users had the opportunity to compose their own piece of contemporary music, by combining different kinds of musical gestures and mapping them to different sounds using the Intangible Musical Instrument.

Participants & venue

Three demonstration activities were organised in the context of this demonstration scenario that were held at different places/venues:

- at the Concert Hall of Thessaloniki (Greece) on 5-6 July 2016, in the context of the International Symposium on Movement and Computing (MOCO16)[51]. This demonstration activity was organised by ARMINES, UOM and AUTH.
- at Griffith University in Brisbane (Australia) on 11-15 July 2016, in the context of the 2016 International Conference on New Interfaces for Musical Expression (NIME2016)[52]. This demonstration activity was organised by UOM.
- at SomeTimeStudio[53] (a creative ideas and projects incubator) in Paris (France) on 19 September 2016. This demonstration activity was organised by ARMINES.

The events were open to the general public, but mainly focused on involving the following actors:

- Musicians
- University students
- Researchers
- i-Treasures partners: the use case leader UOM as well as partners ARMINES and AUTH.

In total, 30 musicians, university students and researchers as well as almost 40 people from the general public participated in these demonstration events and used the IMI (more details can be found in Table 8).

Demonstration outline

The aim of these events was to showcase the use of the IMI for contemporary music performing and composition. The events followed a similar structure:

- In the beginning, an introduction to the i-Treasures project was presented by the partners, focusing mainly on the aim of the Contemporary Music Composition use case and the creation and scope of the IMI. The IMI and its main functionalities were demonstrated live to the participants (30-45 minutes).

[51] http://moco16.movementcomputing.org/
[52] http://nime2016.org/
[53] http://www.sometimestudio.org/2016/09/embodme-edgar-hemery/

- Then, the participants were invited to experience/use the IMI by themselves and a) perform any musical gestures they wanted or/and b) compose their own pieces of contemporary music (30-45 minutes) (Figure 31).
- After they completed all the activities, the participants were requested to complete a questionnaire so as evaluate the demonstrated instrument and provide feedback about their experience.

Data collected

At the end of this demonstration activity, we collected 28 questionnaires from the users, which focused on the evaluation of the IMI.

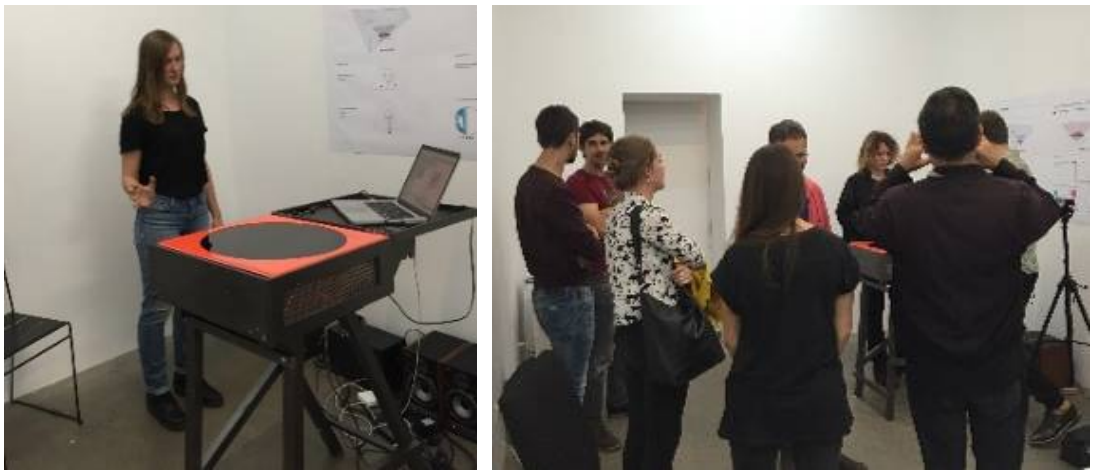


Figure 31: Participants experiment with the IMI in the context of the music performing/composing scenario.

Challenges, problems encountered and lessons learnt

A practical problem presented during this demonstration activity was the fact that the Plexiglas table of the IMI was getting dirty because of the fingerprints of the different users, thus, affecting the Leap-motion sensitivity and the instrument's performance. Therefore, it had to be cleaned with a towel quite often. There were no other major problems or challenges encountered during this demonstration. Most users were quite familiar with new technologies and music so they did not have any problems using the IMI, which, was easy to use after an initial short training session.

User feedback

A statistical analysis of the collected questionnaires is presented in detail in D7.3 "*Final evaluation report*". Here, we attempt a brief qualitative analysis, taking also into account our discussions and interactions with the users during the demonstration.

In general, the users were very satisfied with the Intangible Musical Instrument. They found the IMI to be a very innovative and useful tool for music composers, since it allows them to add or select from a variety of sounds and map them to any kind of gesture.

Younger users were especially fascinated by the concept of exploring and synthesizing sounds by performing gestures in a simple interface and without using any kind of traditional musical instrument. They thought that it was easy to place their hands correctly and perform with the IMI since the majority of them were familiar with both ICT technologies and music. They also said that the resynthesized sound was fluid and immediate. Finally, the majority of users stated that using the IMI for music composition is satisfactory, enjoyable and exciting.

3.4.1.3 Scenario 3: Use of IMI for composition and live performance of musical pieces

The aim of this demonstration scenario was to showcase the use of the IMI for the composition of new and original works of contemporary music. In this context, a musical piece called IDEASMOS was composed by our music expert Ms Vasiliki Tsekouropoulou by combining the IMI with acoustic musical instruments.

IDEASMOS comprises of a string quartet, 2 IMIs and a percussion performance. The concept of this musical piece is lying between two worlds. The real world, the one we see, feel, touch and the one which is intangible, the world of ideas that we cannot fully understand and which exists beyond the phenomena. The interaction between the two worlds of acoustic and "intangible" musical instruments is obvious and can be felt. Simultaneously, they hide special relationships based on knowledge and intellect, which can only be perceived by someone who can 'see and read between the lines'.

Participants & venue(s)

Two concerts of IDEASMOS were held in Greece and France under this demonstration scenario:

- at the Megaron Concert Hall of Thessaloniki (Greece) on 5-6 July 2016, in the context of the International Symposium on Movement and Computing (MOCO16). The concert was organised by ARMINES, UOM and AUTH.
- at MINES ParisTech in Paris (France) on 7 September 2016, in the context of "Musique aux Mines" festival[54]. The concert was organised by ARMINES and UOM.

Both events were open to the general public, but mainly focused on involving the following actors:

- Scientific community (researchers).
- Student community.
- Artistic community (musicians, dancers, digital art performers, etc).
- i-Treasures partners: the use case leader UOM as well as partners ARMINES and AUTH.

In total, 160 people from the aforementioned communities and the general public attended the musical performance of IDEASMOS in both Thessaloniki and Paris (more details can be found in Table 8).

Demonstration outline

The musical piece of IDEASMOS was presented in front of an audience in a concert hall. Seven performers participated in the concert: the Linz Quartet, comprised of four performers for four acoustic instruments (two violins, a viola and a violoncello), two performers using IMIs and one percussion performer. The performance was directed and conducted by the composer Ms Tsekouropoulou. A small except from the performance of IDEASMOS in Megaron Concert Hall in Thessaloniki can be found online[55] (Figure 32).

[54] http://www.mines-paristech.fr/Agenda/Festival-quot-Musique-aux-Mines-quot/3310
[55] Concert of IDEASMOS: https://www.youtube.com/watch?v=0rvOEgojcVs

Figure 32: Musical performance of IDEASMOS in Thessaloniki (top) and Paris (bottom).

Data collected

No questionnaires were collected in these demonstration activities.

Challenges, problems encountered and lessons learnt

We did not face any significant problems in these demonstration activities. However, since the IMI is a new approach to music composition, some time was required in the beginning of the rehearsals to ensure that the interaction between the acoustic instruments and the IMIs works perfectly. This was quite challenging, since the musicians were not familiar with this kind of intangible instruments. Moreover, although the composer has a musical background and was familiar with such technologies, the partners that developed the IMI had to make sure that she understood in depth how this instrument works and what were the risks of using such a technology in real-time, before starting working for the concert with both the musicians and the performers.

User feedback

Here, we briefly present user feedback received through discussions with the concert attendees and the music performers. In general, the audience was very satisfied with the performance of IDEASMOS. They commented very positively on how smooth the

combination of the acoustic musical instruments with the IMIs was. Moreover, many musicians in the audience were really interested in the IMI's technology and asked whether they could use it and integrate it within their musical pieces in the future. The performers and the composer, on the other hand, found the IMI very easy to use and felt that it increased their freedom in terms of artistic creation and expression.

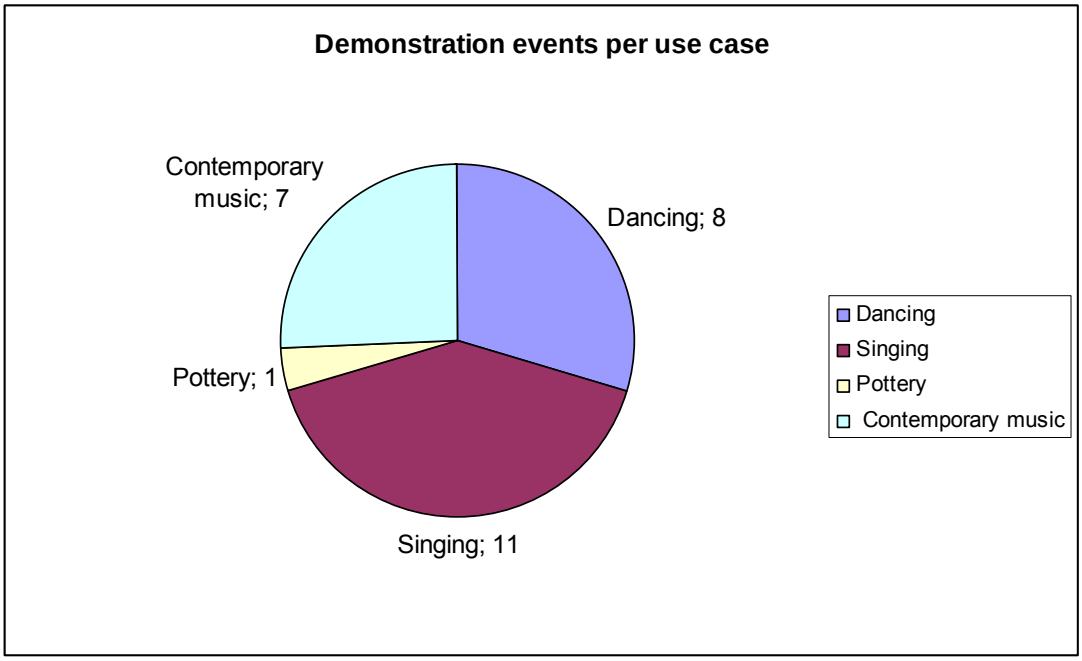
In our discussions with the audience (musicians, research scientists, general public) and the performers, some interesting ideas on how to use the IMI in other contexts were also expressed. Some musicians suggested that the IMI could also be used in education to help students/learners acquire music knowledge or knowledge on the other subjects, through an experiential learning process. Another idea was to use the IMI in entertainment centres for creating performances where the audience will interact with the performer through gestures and emotions. It was also proposed to use the IMI in research laboratories and medical centres to help patients that suffer from Alzheimer to perform memory exercises that include music, thus, also making them calmer.

4. Conclusions

In this report, we presented in detail the demonstration activities organised by i-Treasures partners in the context of the four ICH use cases (and the corresponding sub-use cases) and we also discussed the feedback we received from the demonstration participants.

The scope of the demonstration was to showcase the usability of the developed technologies under different operational scenarios and to different audiences in the context of different ICH use cases. The demonstration activities were based on the demonstration plans proposed in D6.1 *"Demonstration Plan*", which were effectively revised and finalized during the last year of the project, after a lot of discussions with our experts and other stakeholders that helped us organise these events.

The demonstration activities involved a variety of users covering a wide range of population including students of all ages, experienced ICH practitioners, ICH apprentices, and general public in different European cities and villages. For some sub-cases we targeted a very specific audience, such as secondary-school students, while for others we targeted the general public. The activities also covered different demonstration scenarios ranging from structured learning paths for school students to online courses for ICH beginners to applications for museum visitors to demonstration sessions during festivals. The demonstration events were organised in a variety of locations, including public schools, universities, dance schools, pottery workshops, museums, festivals as well as open days and dedicated workshops organised by the Consortium. In total, we have organised 26 different demonstration activities in the context of 10 sub-use cases, which involved more than 650 users of all ages. In Figure 33, Figure 34 and Figure 35, we present some statistics about these demonstration events including type of event, venue, participant background and gender, etc.



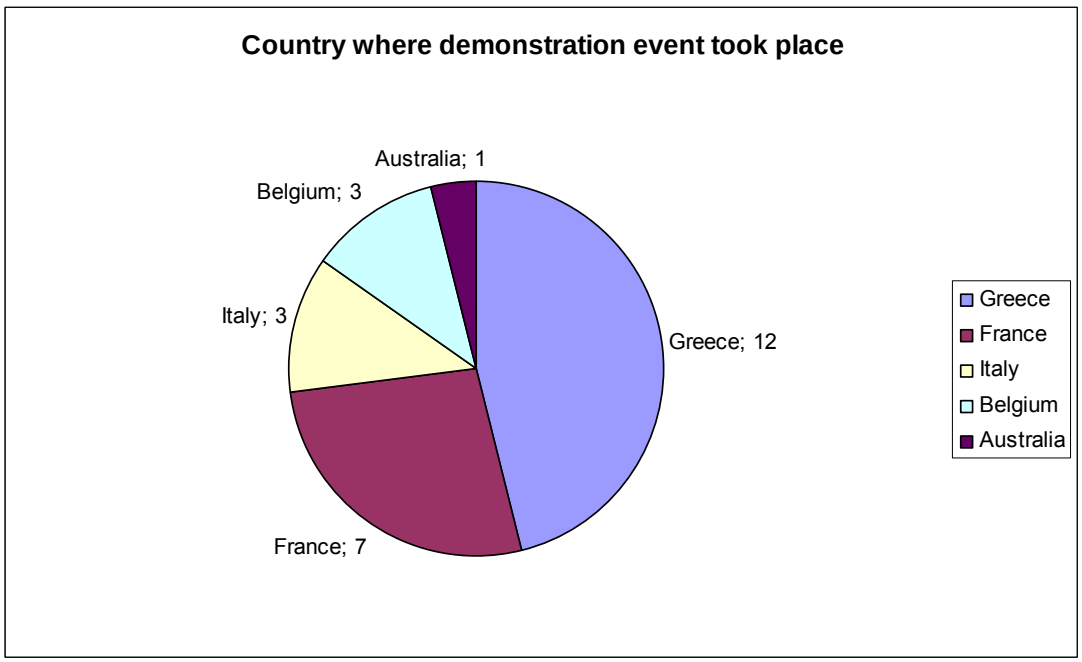
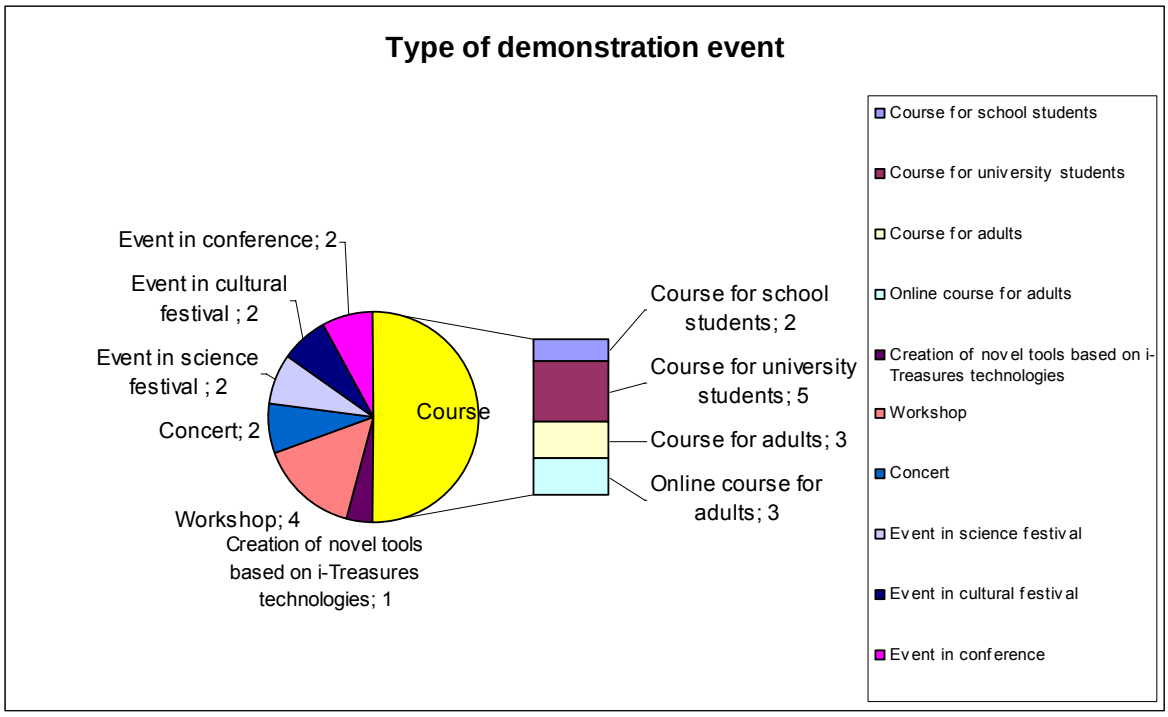


Figure 33: Statistics for demonstration events organised under WP6.



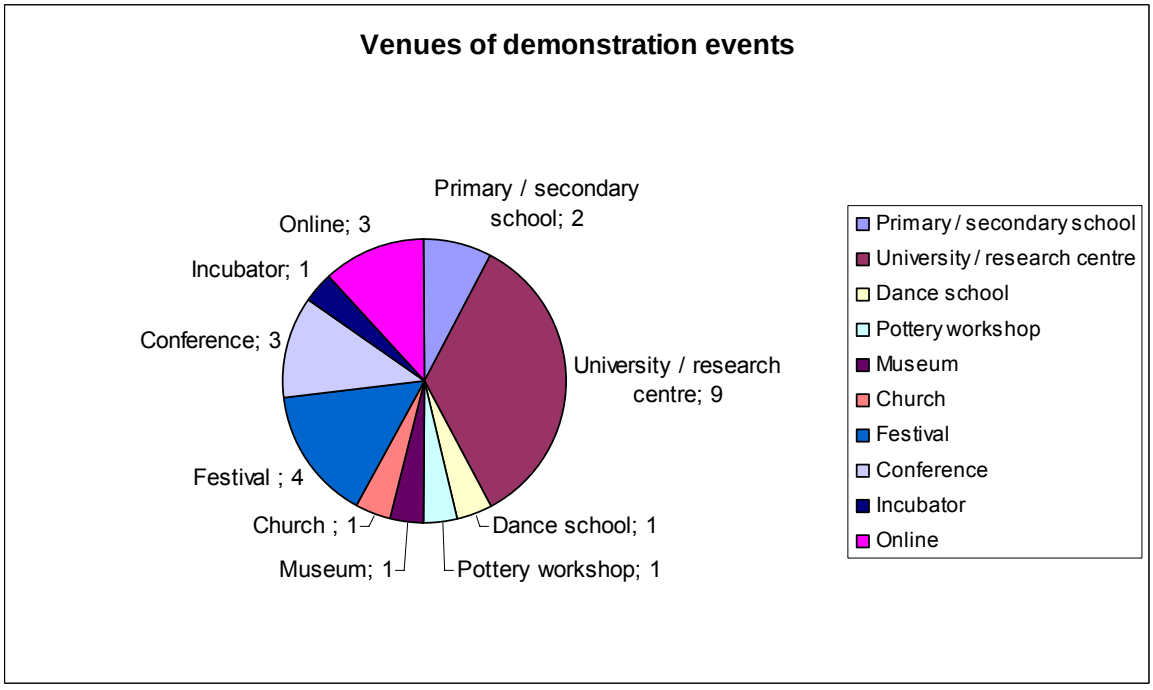


Figure 34: Statistics for demonstration events type and venue.

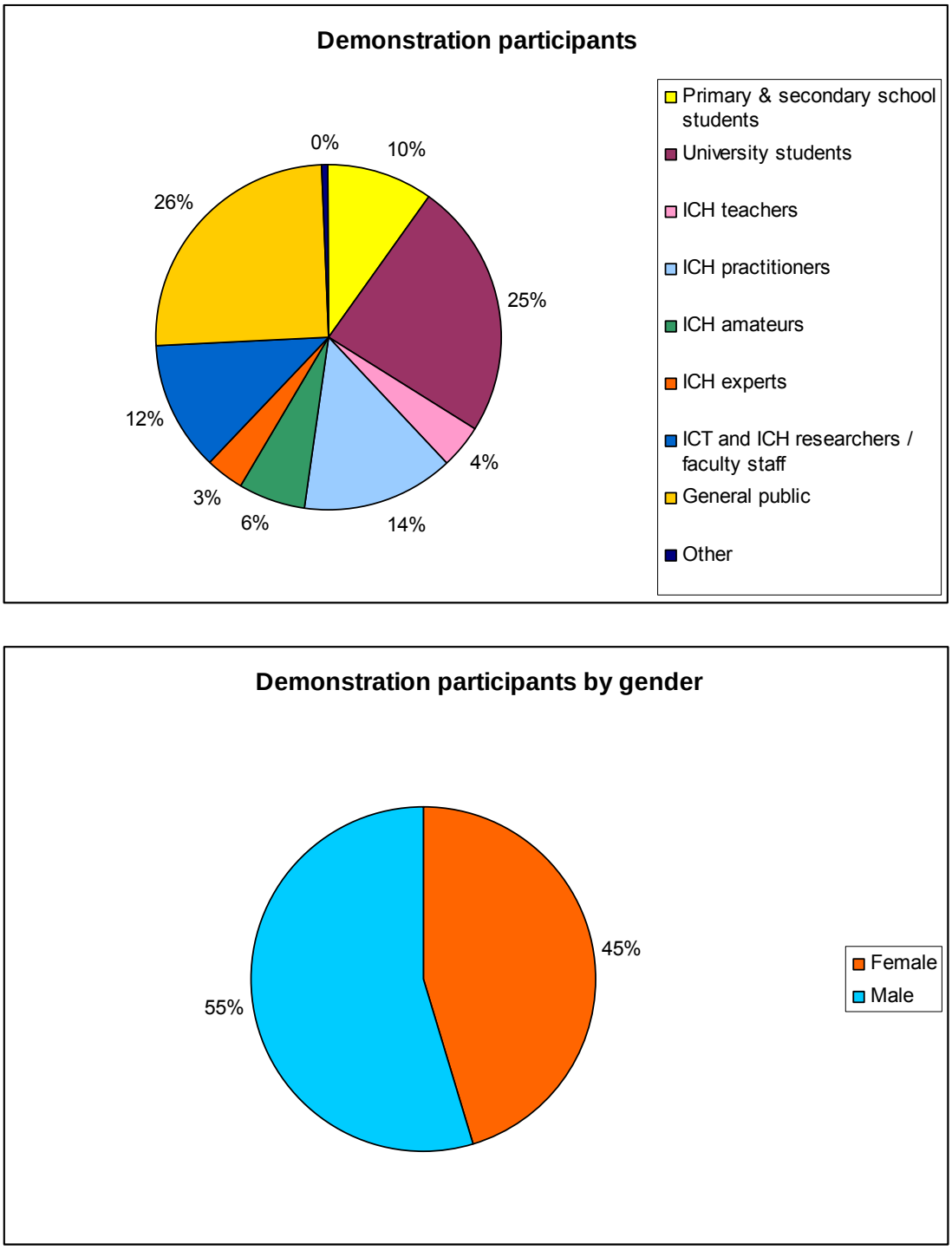


Figure 35: Statistics for demonstration events participants.

The design and organisation of these events presented significant challenges, which can be summarized as follows:

- Communication with ICH experts, stakeholders and users to organise the events. This included people with different backgrounds, ages and ethnicities and involved numerous face-to-face meetings, phone calls and email

exchanges with them. In several cases, we had to revise the initial plans and either replace them with new ones (e.g. in the case of contemporary dance) or modify some of their aspects, because of unforeseen obstacles such as uncooperative/unavailable experts, organisations changing their minds about hosting an event, low user participation, etc. Finalising the details of these events has been a long and time-consuming process.

- The demonstration participants included users of different ages and backgrounds, from elementary school students to ICH professionals/ practitioners to the general public. There were children and adults, beginners and amateurs and experts, people with no ICT background and people familiar with computers. Each group of users had to be treated differently and required a different level of preparation and support by the consortium. People with limited experience in computers (as was the case with many ICH practitioners in local villages where the specific ICH is practiced) required a lot of help by the experts and by members of the consortium. This aspect became much more challenging as the technology used became more advanced.
- The demonstration activities were organised in different venues, which required a different kind of preparation and also a different way of running the demonstration. Demonstration within educational institutions like schools or universities was conducted in a structured way, which allowed close cooperation with and inspection of the participants on the spot, a fact that greatly facilitated the demonstration process and allowed to quickly correct problems or slightly revise the demonstration scenario, whenever was required, based on the users' reactions. Activities that involved users working at a distance on their own computer and at their own pace presented more challenges since it was often difficult to convince some users to complete some tasks within a given time-framework or even to complete some task/activities of the scenario at all. This required a lot of extra communication and reminders, mainly in the case of younger users that were participating in the demonstration as part of their school activities. Moreover, as expected, more time was required for answering user questions or solving any technical problems they may have experienced. In this case, and since an expert/teacher was not available at any time, it was far more important to provide detailed guides for using the different modules and a clear scenario that presented what the user had to do in every step of the demonstration.

On the other hand, demonstration activities that were organised in the context of festivals or events open to the general public were, apparently, the most difficult to organise in order to have a meaningful outcome, mainly because the users were usually by-passers that did not want to spend much time using a tool or a technology. In these cases, we also had some unexpected technical problems, e.g. with the internet connection. In such places, it was important to demonstrate the technology in the most efficient and effective way within a limited time because people's interest quickly faded or was captured by something else.

- Convincing people to participate in the demonstration, especially in cases where the envisaged activity was not part of other compulsory activities (as was the case with activities organised within a school), was a significant challenge. This was especially true in the case of demonstration scenarios that involved the participation of individual users (e.g. online courses, demonstration in festivals or museums) and not groups of users that were already acquainted or had participated in other activities together (e.g. people that went to the same dance school or belonged to a music association). Several means were adopted to reach out to potential users, the most important one being through our ICH experts. In fact, in almost all cases, the ICH experts were the ones inviting users and bringing us into contact with the authorities in schools, museums or other organisations to get the necessary permits for organizing the demonstrations. This was the case for all the activities organised within schools of all kinds, museums and festivals. In other cases, the consortium directly or indirectly contacted the users, e.g. in the case of the contemporary music composition or events organised within universities. In other cases, like the online courses for the general public or groups of experts, users were invited via emails to organisations or groups that practice or safeguard a specific ICH or via social media. In these cases, the contribution of our experts was also crucial since they have indicated which potential users to target and how, while also making a lot of contacts/invitations by themselves (e.g. in the case of the free online course for Canto a Tenore). Actually, involving experts that are recognised members of the ICH communities is very helpful in all the activities of the project from definition of requirements to evaluation.
- As expected, children were more eager to participate, motivated by their natural curiousness and openness to new experiences and new technologies,

while adults were usually more hesitant. Their hesitation was attributed to several factors, depending on the user profile: a) the fact that they were not familiar with research projects and were not sure what was that was expected by them during the demonstration and what the consequences would be if they made “mistakes” or could not perform all the activities, b) the fact that their were not very experienced with computers and new technologies, aside from using them for specific tasks like browsing the internet or accessing their social media or writing some document, and were afraid that they would not be able to use the developed tools, c) the fact that they had to follow, in many cases, a predefined scenario within a predefined time-framework, d) the fact that some of them lived in local communities and were very cautious and preserved, or even negative sometimes, towards the use of new technologies for the safeguarding or the transmission of ICH expressions that had been transmitted in a very specific way for a very long period of time. These people were afraid that the developed tools and technologies would somehow disrespect or hurt their tradition and were, thus, reluctant in participating in such activities. Again, the intervention of our experts that are respected ICH practitioners within their communities convinced a lot of these people to finally participate.

- In addition to this, it has proven to be even more difficult to convince the users to provide feedback in a written form via the questionnaires. Most of them were happy to share how they felt about the demonstration and evaluate our technologies in face-to-face discussions or small interviews during the demonstration but were reluctant to fill in the questionnaires. In many cases, some of the people that successfully participated in the demonstration did not fill in or had partially filled in the questionnaires.
- As expected in similar activities, there is always the risk of unexpected software or hardware failures that could interrupt a demonstration or cause significant problems. Despite the fact that we had tested our tools and sensors in laboratory conditions as well as during other activities in a smaller-scale, we faced several technical problems, especially given the fact that many sensors are also involved. Some problems were due to software bugs that could not have been previously identified and were observed under specific conditions we were not able to simulate beforehand; others had to do with the unexpected problems like failures in our internet connection. There were also some problems that were due to the infrastructure of the host of the

event that were not identified before (e.g. some computers in the school lab with older versions of Windows). Most of the problems were solved relatively easily and quickly without affecting the demonstration. For others, we had to come –up with ad-hoc solutions (e.g. using our own laptops or mobile internet connection) that also allowed for the activities to be performed as planned or, in other cases, we had to revise the demonstration schedule, e.g. have students perform activity *b* instead of *a* , and then go back to *a* later. What helped us in this regard, was the fact that we organised a lot of activities for each use case (e.g. for singing), which allowed us to fix problems and organise the next demonstration activity in a more efficient way. That was especially true for fixing some problems in the Web-platform and the LMS but also in the game-like applications based on the experience of the first few demonstration events.

Despite the aforementioned challenges, the demonstration of the i-Treasures Web-platform was successful. The users were in general satisfied by the developed technologies and believed that they constitute an innovative and promising set of tools that help and advance ICH analysis, education and research. They felt that the offered tools respect ICH tradition and can significantly contribute to its safeguarding and transmission, taking advantage of recent advances in ICT technologies to analyse ICH content in a deeper and more effective way and to boost ICH education in ways that make it more appealing and attractive to younger generations. In the following, we briefly summarize our main conclusions from the demonstration activities:

- The vast majority of users feel that the use of new technologies greatly benefits ICH safeguarding since it provides a variety of new tools that are able to a) capture, document and analyze ICH in a more meaningful and efficient way that also allows a deeper understanding of the different ICH elements, b) contribute to ICH learning and transmission in a more innovative, modern, enjoyable but also effective way, especially when it comes to attracting younger users and getting them interested in their local culture.
- In some cases, and especially when we are dealing with ICH expressions for which the aspect of locality is very strong (e.g. in the case of Canto a Tenore or Cantu in Paghjella traditional songs that are practiced mainly in the two islands and are a strong element of their culture), the experts but also some learners were initially cautious or worried about our tools and how they could

potentially affect the authenticity of their ICH or, in the case of transmission, whether these tools were an attempt to push aside traditional ways of learning and transmission and substitute human connection and interaction with man-machine interfaces. Most of the experts, especially those closely involved with our research and development activities, overcame these fears when they actually used the developed technologies and realized that the objective of the project was to offer novel tools and methodologies that will further facilitate and advance capturing, analysis and education of ICH without a) tampering its authenticity during the capture phase, b) overriding the traditional approach of transmitting ICH from experts to new apprentices through human interaction and observation, but rather acting complementary or additionally to it, or c) diminishing the value of a live human expression to a set of modern tools or data stored in some online database.

- Following the previous observation, we have seen that reaching out to local people through our experts and reassuring them that the living elements of their tradition were not threatened or underestimated was a very important step in convincing older users for the advantages of the developed technologies and methodologies. Older people, and especially people that do not live in large cities and have limited experience with new technologies, have experience a certain way of transmitting their tradition their whole lives. That of transmitting the knowledge from the human living treasure to the apprentice by observation and imitation either within a local workshop (e.g. for handicrafts) or in social events and festivals within their community (for dance and singing). They are cautious or negative with tools that may interfere with this process, since they believe that face-to-face contact and live practice within communities is what keeps their tradition alive, which is of course true. At the same time, they realize that technology has changed the way that people communicate or transmit knowledge and they experience first hand how younger generations, their children or grandchildren, are gradually becoming less interested or practice less these valuable ICH expressions. So while they are cautious about new technologies for ICH safeguarding, they also admit and understand how they can be useful to attract younger generations, for whom new technologies are an integral part of their everyday life.

  The experts we have cooperated with, who are usually respectable and well-known practitioners in local communities or members of ICH associations,

have played a crucial role in introducing and explaining the potential of our technologies to local people: first, by highlighting the aspect of ICH capture and analysis, which allows for the better understanding of ICH and also its documentation in a more effective way, and second, by underlining the advantages of modern tools for ICH education that are more appealing to younger people and also attract possible interest from around the world, making their culture known to and appreciated by a much wider audience, which would not be reached otherwise. If the experts incorporate new technologies in their everyday practice, then they will much more easily convince other practitioners to accept them and use them.

- As already mentioned several times, younger generations and, especially, children were much more receptive to our technologies and also used them in a much more effective way. This is especially true for the developed educational tools, since they provided a modern and enjoyable way to get acquainted with an ICH, more suitable to their age or their way of life. Moreover, younger people are already introduced to such tools as part of their work or education from an early age so to them these tools feel more 'natural' and, thus, can be used in a more efficient way.
- Since ICH is closely related to local communities and their way of life, it is important to not isolate the developed tools from this reality. For example, when it comes to ICH education, the LMS courses and the game-like applications may allow users to learn and practice the basics of an ICH, but this experience on its own has less impact in our effort to transmit and safeguard ICH, if it is cut off from its social or historical aspects. Ideally, these tools should be used within a community along with more traditional approaches or, if used by people outside the community, it is important to also highlight these aspects or provide a multidisciplinary educational approach that incorporates such aspects as well.
- Regarding the proposed capture and analysis tools, almost all of the experts found them to be very useful and thought that they significantly advance ICH research. The experts agreed that the multi-sensory approach adopted allowed us to a) capture dimensions of an ICH that have not been captured or examined before (e.g. vocal tract capturing during singing using the various sensors of the hyper-helmet), b) use different alternatives depending on the available resources or the precision required (use of Kinect or multi-Kinect or

mocap setups for dance), c) capture more complex and precise motions (e.g. in the case of pottery).

Moreover, the developed algorithms for the analysis of the captured data allowed the extraction of useful features that can be used for documenting the ICH and its variations, for annotating ICH performances that can then be archived and retrieved, or for comparing and evaluating performances. They were particularly impressed by the semantic search functionality, which allowed them to use medium-level features to retrieve ICH performances. They thought that this functionality can be of great use for research purposes and agreed that it offers increased possibilities for more meaningful searches that go on a deeper level than, for example, similar functionalities offered by Europeana, which are limited to high-level features like place or date or name of the performer.

- The stylistic analysis tools were also found to be quite innovative and useful. The experts pointed out that these tools allowed them to evaluate, analyse and visualize an ICH performance or performer in ways that they have not imagined before and were impressed by the number of functionalities offered and by the richness of features they could explore.
- Regarding the educational aspect of i-Treasures technologies, it was agreed by experts and teachers that the developed tools can successfully and effectively support a wide range of learning activities targeting different audiences in various learning environments. Educational tools like the LMS courses and the game-like applications were received very positively by the users as well, especially younger users who were very enthusiastic about them. In general, both users and experts found our educational tools to be attractive, easy to use and effective in achieving the learning goals. Moreover, they agreed that they offered a fresher and novel educational experience compared to traditional techniques, while also allowing them to get acquainted with or practice a specific ICH on their own space and time and according to their own competencies.
- The game-like applications were considered to be the highlight of the learning process, especially by children and younger people, since the use of serious games in education was something they had not experienced before. The users thought that the games provided them a simple, attractive, easy, effective but also enjoyable way of practicing an ICH. They particularly

appreciated the performance evaluation functionality, which allowed them to improve their performance without requiring the presence of a teacher, which is a feature they do not find in other similar applications. However, it was pointed out that the feedback to the user could be significantly improved by providing information about the specific mistakes committed, rather than a simple evaluation score. Although, most of them agreed that practicing with a teacher or in groups with other practitioners is an essential and irreplaceable step of the learning process and that practicing with a game cannot replace this step, they also agreed that the game-like applications can be very useful for individual practice before the real practice (especially since they allow practice at home and at their own pace) or complementary to traditional tools within the classroom. The visualization of their movements by the avatars was considered to be smooth, accurate and realistic, while they also appreciated the fact that the 3D environment of the games incorporated recognizable elements of the ICH (costumes, landscapes, symbols, etc). At the same time, they proposed interesting ideas on how these games could be better incorporated in the learning process, e.g. by supporting competition between two or more players for the best performance.

- The generic game framework was also another tool for which the experts were very positive because it provides a very simple, quick and effective way to create an attractive and easy to use game-like application for practicing any kind of dance. Moreover, all the people that used this tool pointed out how it can be also used as is for any kind of physical activity, e.g. for practicing martial arts or gymnastics, and appreciated the fact that it could be even used at home since it only requires the user's PC and a Kinect, which is a low-cost sensor already widely used in gaming applications.
- The users were also very positive about the pedagogical planner, which they thought provided a simple and easy way to design and plan educational interventions for any kind of ICH and they found extremely useful the automatic reification of these plans into educational scenarios in the i-Treasures LMS. They also thought that it was very important that this tool offered the possibility to design educational interventions including different kinds of learning activities: theoretical and practical, individual and in the classroom, sensorimotor learning or learning through observation of audiovisual material. Finally, they found very useful the storage and access of

LMS and game analytics for assessing the progress of each learner or the class as a whole.

- In many cases, the proposed learning paths of the LMS courses constituted the first attempt ever to provide a structured educational path for a specific ICH, which was something that was greatly appreciated by the users that thought that this was very important for providing a basic introduction to this kind of ICH and raise awareness with regard to it. Moreover, most of the users agreed that the proposed LMS courses succeeded in teaching them the basics of the corresponding ICH in a meaningful and innovative way. They appreciated the fact that there was a variety of learning activities (theoretical activities that required self-study and exploration of audiovisual material or papers, self-practice activities that were realized by using the game-like applications, practice sessions with other learners in real settings, use of additional tools like the TTS), which succeeded to keep them interested and engaged and made the whole process more enjoyable than they initially thought it was possible. They pointed out that such an approach is very attractive for younger learners, especially young children that are easily bored or get restless. They also viewed as very important and helpful the fact that in every step of the learning process they had the opportunity to assess their performance either through online tests/quizzes in the LMS or through the sensorimotor learning approach adopted in the games.
- The intangible musical instrument was welcomed very positively by the learners and music experts. The learners were especially fascinated by the concept of exploring and synthesizing sounds by performing gestures in a simple interface and without any previous musical knowledge and without using any kind of traditional musical instrument. The experts, on the other hand, found the IMI very easy to use and felt that it increased their freedom in terms of artistic creation and expression. In general, it was shown that the IMI can be used in several scenarios varying from music education to contemporary music composition.
- Technical infrastructure plays an important role in the success of the demonstration. It is important to make sure that the equipment is configured properly and that the software tools work without problems to allow for a smooth demonstration of the i-Treasures Web-platform and all its functionalities. Technical problems may tire or frustrate the users or make them negative towards our technologies, especially given the fact that our

research is about the use of new ICT technologies for boosting ICH safeguarding.

- Computer literacy is an important factor for effectively using the developed tools. The lack of experience in the use of ICT technologies has created problems for many users and experts. Training the ICH experts and providing as much as possible clearer instructions and well-written user guides/manual is extremely important in our effort to persuade ICH experts to use and promote the use of ICT tools for ICH transmission. The more in control and skilled and adequate they feel, the easier they will adopt such tools and make them part of their every-day work routine and, thus, change the way ICH is analyse, taught and learnt, and ultimately, safeguarded. Initial training sessions for learners that are not very familiar with computers are also important so that they can be smoothly introduced to these technologies and learn how to use them. This greatly facilitates and advances the learning experience and allows people to focus on the educational activities without obstacles. It was also made clear that this task becomes easier when the experts and learners are younger people who already use ICT technologies in other aspects of their everyday life, since they are more ager to learn and adopt new tools.