



**USERS' REQUIREMENTS
RESEARCH ANALYSIS**



LARGE PROJECT

**Learning Augmented Reality Global Environment
LIFE LONG LEARNING PROGRAMME – KEY ACTIVITY 3 ICT**

[DURATION: November 2011 – October 2013]

USERS' REQUIREMENTS RESEARCH ANALYSIS

**[WORK PACKAGE 2: Users' requirements analysis according to the type and level
of education/ Deliverable 2]**

PREPARED BY THE LEAD PARTNER FOR WP2: ISMB (P5)

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

January 2012

LARGE 519195-LLP-1-2011-1-BG-KA3-KA3MP



**USERS' REQUIREMENTS
RESEARCH ANALYSIS**



Revision History

Revision Number	Date	Comment
1.0	January 30th, 2012	Users' requirements research analysis - Deliverable 2 of WP 2



CONTENTS

INTRODUCTION	4
I. STATISTICAL DATA.....	5
II. TECHNOLOGY "AUGMENTED REALITY" IN SCHOOL EDUCATION	6
III. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF VOCATIONAL EDUCATION AND TRAINING	11
IV. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF HIGHER EDUCATION.....	14
V. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF ADULT EDUCATION.....	17
VI. GENERAL CONCLUSIONS.....	20

Introduction

The Learning Augmented Reality Global Environment (LARGE) Project is aimed at enabling the creation of Augmented Reality (AR) content by educational and training institutions to enhance learning experiences.

Augmented Reality is augmenting the real world environment with virtual information by improving people's senses and skills. AR mixes virtual characters with the actual world. There are three common characteristics of AR scenes: the combination of real world environment with computer characters, interactive scenes, and scenes in 3D (Azuma, 1997; Azuma et al., 2001).

Augmented Reality, as a variation of *Virtual Environments* or Virtual Reality, is perceived as "a useful tool in understanding the mechanisms, components and their function within the systems" but it is needed to take into account the recommendation "to develop predictive software, forecasting the dynamics of components and systems that integrate them" (Professor in Ecology - Romania).

Work Package 2

Partner 5 – The School Inspectorate of Bucharest (ISMB), Romania, was the lead partner for the realisation of Work Package 2. Under Work Package 2, the Deliverable no 1 was a set of research instruments. Thus, there were designed 8 questionnaires, a set of two – one for trainers and one for learners, for each education sector: pre-university level, vocational education, adult education and university level. The questionnaires were designed with closed questions (Yes/No or tick boxes) in order to ensure a standardized approach of all researchers involved in the work under this WP and, as a consequence, comparable results of the research and possibility to summarize them.

The Deliverable no 2 was a study - Users' requirements research analysis. On the basis of the developed set of tool, every partner conducted a users' requirements research analysis according to the level and type of education (secondary, higher, vocational and adult education) in its country. The results from the research have been presented to the lead partner of the WP – Partner 5, who has prepared this summarized draft analysis, containing information about the platform functionality for the new type of education/learning methods developed by the project, which has to be able to combine the educational institution requirements and the learner's expectations for more effective teaching/learning.

This report summarizes the reports on Users' requirements research analysis which were realized in the partner countries:

Partner 1 – Magic Solutions Ltd, Bulgaria

Partner 2 – Institute for Training of Personnel in International Organizations, Bulgaria

Partner 3 – Empolese Valdelsa Development Agency (ASEV), Italy

Partner 4 – Vilnius Gediminas Technical University (VGTU), Lithuania

Partner 5 – The School Inspectorate of Bucharest (ISMB), Romania

Partner 6 – Tallinn University of Technology (TUT), Estonia

I. STATISTICAL DATA

1. Number of completed questionnaires on educational sectors

Partner country	Pre-university education		Vocational Education		Adult education		University education		Total
	Teachers	Learners	Teachers	Learners	Trainers	Trainees	Lecturers	Students	
Bulgaria	46	59	48	51	39	42	41	52	378
Italy	10	10	10	10	10	10	10	10	80
Lithuania	38	84	11	10	10	11	10	39	213
Romania	50	50	50	50	30	30	50	50	320
Estonia	10	10	10	10	10	10	10	10	80

There were applied questionnaires both in electronic and paper format. The respondent teachers/trainers/professors covered many specializations and school subjects.

In the Estonian context, previous experiences with internet-based questionnaires indicated low response rates (less than 10%) where respondents were contacted via a single, generic e-mail sent to a distribution list of potential respondent addresses. Since the relatively small population of Estonia barely has an adequately large population of potential respondents for some of the survey groups (e.g. adult education teachers) if such low response rates are taken into account, alternative contact strategies were adopted. These included direct contact ('face to face'), telephone and personalized e-mail approaches to potential respondents. An internet-based questionnaire format was chosen as this enabled convenient access to the AR introduction video for respondents (through a link embedded in the questionnaire) and it also provided automatic data compilation.

II. TECHNOLOGY "AUGMENTED REALITY" IN SCHOOL EDUCATION

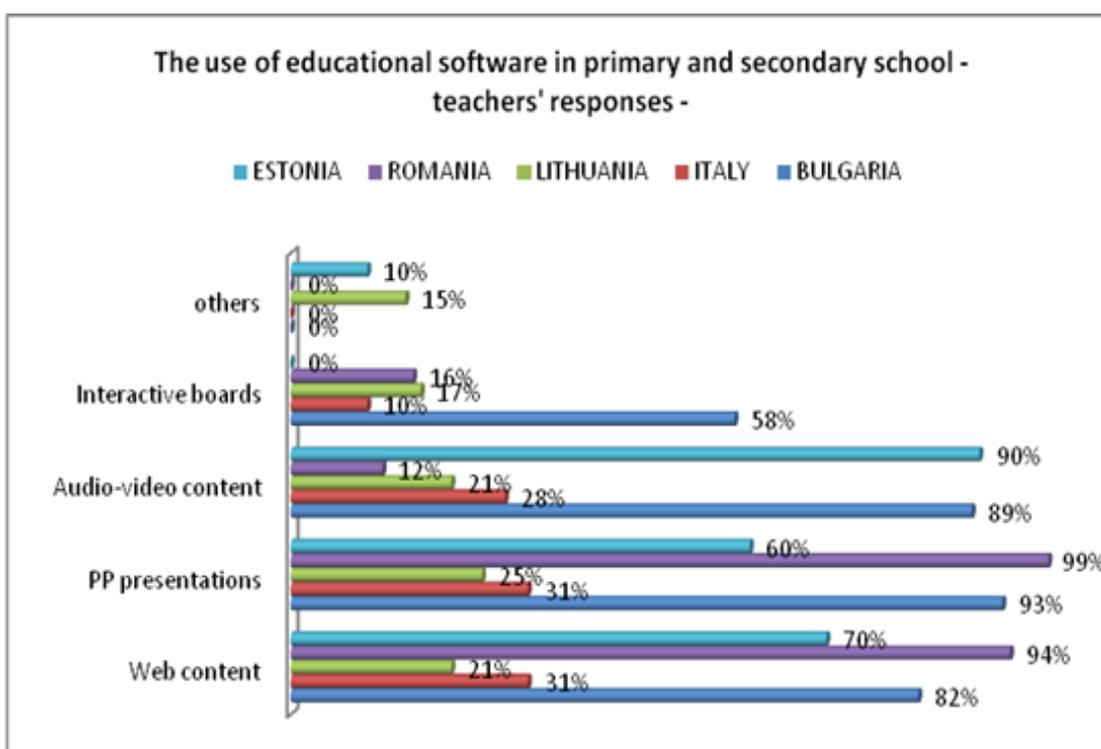
1. The use of educational software in primary and secondary school

Summary of the teachers' answers:

Partner country	Web content	PP presentations	Audio-video content	Interactive boards	others
BULGARIA	82%	93%	89%	58%	0%
ITALY	31%	31%	28%	10%	0%
LITHUANIA	21%	25%	21%	17%	15%
ROMANIA	94%	99%	12%	16%	0%
ESTONIA	70%	60%	90%	0%	10%

The attitudes of both teachers and students were positive, even though especially the teachers were worried about their capacity of working with such modern technology.

In some countries (Italy, Romania), the use of educational software by the schools is still quite limited. During the last years most of the Italian and Romanian schools have been provided with Interactive boards, unfortunately those are still used only by 10% of the teachers because they are not very familiar with the way they work. In Romania and Bulgaria, teachers in pre-university education do not use Moodle or Intelligent tutoring systems. The table shows that the use of educational software by the teachers is still quite limited, but also indicates the raising uses and awareness in Bulgaria and Romania of the opportunities provided through educational software.



2. Application of technology "Augmented Reality" in the learning process

2.1. The attitudes of learners and teachers to the possibilities of technology

The AR introduction video showed 3 different examples of Augmented Reality use in education:

- Option 1 - Interactive modelling
- Option 2 - Interactive storytelling and visualization
- Option 3 - Interactive discovery-based education

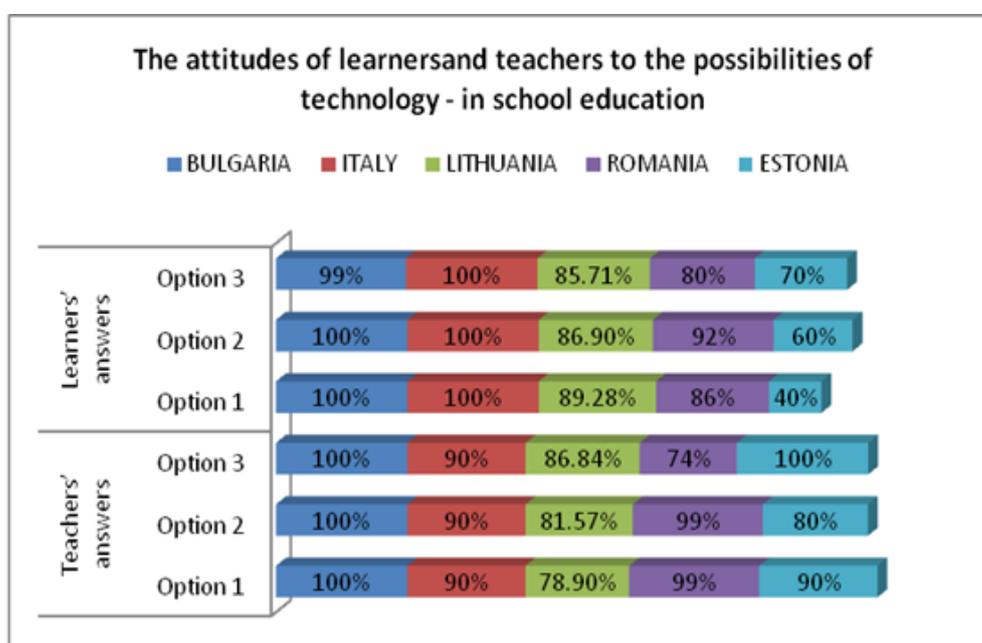
Both teachers and learners in pre-university education can be considered target group as they are interested in lessons that use AR technologies, they selected all three options as being interesting and useful.

Partner country	Teachers' answers			Learners' answers		
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
BULGARIA	100%	100%	100%	100%	100%	99%
ITALY	90%	90%	90%	100%	100%	100%
LITHUANIA	78.9%	81.57%	86.84%	89.28%	86.90%	85.71%
ROMANIA	99%	99%	74%	86%	92%	80%
ESTONIA	90%	80%	10%	40%	60%	70%

The percentages in this table refer only to the number of positive responses to the question for each option. The questionnaires, however, elicited both positive and negative responses and this led to unexpected response logic in some cases. Specifically, with reference to each particular AR option respondents were asked "do they already use it?" (yes / no) and "would they be interested in using it" (yes / no). Some respondents provided only one response to both questions: for example, if an AR option is already being used, then the question "would you be interested in using the same option?" is redundant. Alternatively, if a respondent answers "yes" to the question "would you be interested in using a particular AR option?" then it is reasonable to assume that they are not currently using it. Thus only the "yes" or positive answers in each case are of interest and they were taken into consideration.

In some countries, teachers and learners are familiar with some of these options and they already use them.

Partner country	Teachers' answers			Learners' answers		
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
LITHUANIA		13.16%	7.9%	7.2%	10.72%	9.5%
ESTONIA		10%		10%	20%	10%



3. Benefits to the educational process of the introduction of technology "Augmented Reality"

3.1. Increasing the students' interest to the educational material according to themselves

The Bulgarian report states that from the survey it is clear that 100 % of students find interesting to learn school subjects from three-dimensional tutoring images. This shows that the students are very interested in innovative practices and application of high technologies in the learning process.

The conclusion of the Italian report with reference to this point is that it cannot be denied that AR applications have tremendous potential for all fields where rapid information transfer is critical. This is especially true for education. AR technology has great potential to offer students 3D presentations and interactive experiences, and especially the AR books and the AR gaming. It is one of the objectives of LARGE to disseminate as much information about this new and exciting technology among all the potential stakeholders. AR games can potentially teach 21st century skills, such as interpretation, multimodal thinking, problem-solving, information management, flexibility, civic engagement and the acceptance of different perspectives.

In Lithuania, 94 % of students find interesting to learn subjects from three-dimensional tutoring images. Only 6 % of all respondents' students are not interested in three-dimensional tutoring images. So, we can see that a major part of them are interested to the educational materials.

In Romania, 96% of pre-university learners consider that learning school subjects with the help of three-dimensional tutoring images is interesting.

In Estonia, 80% of learners consider 3D images attractive for learning.

3.2. Efficiency in assimilation of the educational material through the eyes of students

In Bulgaria, all learners find using computer-based classes more useful in understanding of the learning contents. This shows that the students are ready for innovations as the technology "Augment Reality" and it will find its place and use in the system of elementary and secondary schools.

In Lithuania, 86 % of students find using computer-based classes more useful in understanding the learning contents. Only 14 % of all respondents' students do not find it useful. So, we can see, that a major part of them think, that computer-based classes help to understand learning content more efficient.

In Romania, 96% of learners find computer-based classes more useful in understanding the learning contents.

In Estonia, 70% of learners think that learning with computers aid understanding.

3.3. Increasing motivation for learning of students according to teachers

Majority of responding students and teachers in schools agreed that the use of AR technology in their teaching / learning process would be beneficial in terms of student motivation and making classes more attractive.

In Bulgaria and Romania, all teachers think that educational software that uses very similar to reality virtual objects would help students to increase their learning motivation. This shows that the educational standards will determine the change in the way of teaching and learning with technology "Augment Reality".

In Lithuania, 95 % of teachers think that educational software that uses virtual objects that are very similar to reality would help students to increase their learning motivation. Only 5 % do not agree with it.

3.4. Areas of agreement between the attitudes of students and teachers in elementary and secondary schools

Firstly, both teachers and students in pre-university education consider that there is an increasing need and interest in using technologies during the teaching process and also both categories attest a limited use of these technologies due to different factors.

Secondly, both categories agree upon the positive results of the use of educational software/computer-aided lessons in the area of students' motivation, increase interest, easy understanding and access to learning resources.

Next, teachers and students have positive attitudes for the potentialities of technology "Augment Reality".

4. Assessment of the need for application of the technology „Augmented Reality" in schools education

There is an obvious need for the application of technology AR in schools education as it is considered easy to handle, interesting, motivating, resourceful and it could make teaching and learning more reality-connected.

“Augmented Reality” would be very useful for teachers and students. For teachers, it would help to teach and explain learning content. For students, this technology would help to understand and increase learning motivation. Furthermore, a major part of respondents said, that they would be interested in using Augmented Reality options.

In general, the introducing of technology “Augment Reality” will improve the attractiveness cleanness and effectiveness of the educational process.

III. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF VOCATIONAL EDUCATION AND TRAINING

1. The use of educational software in the system of vocational education and training

Partner country	Web content	PP presentations	Educational software	Interactive boards	others
BULGARIA	96%	96%	50%	0%	2%
ITALY	28%	29%	17%	23%	3%
LITHUANIA	15.38%	69.23%	7.69%	0%	7.69%
ROMANIA	100%	76%	44%	48%	0%
ESTONIA	70%	90%	50%	20%	70%

From this result it is clear that all of the asked trainers use technology in the training process. But on the other hand, few of them uses more than two educational technologies.

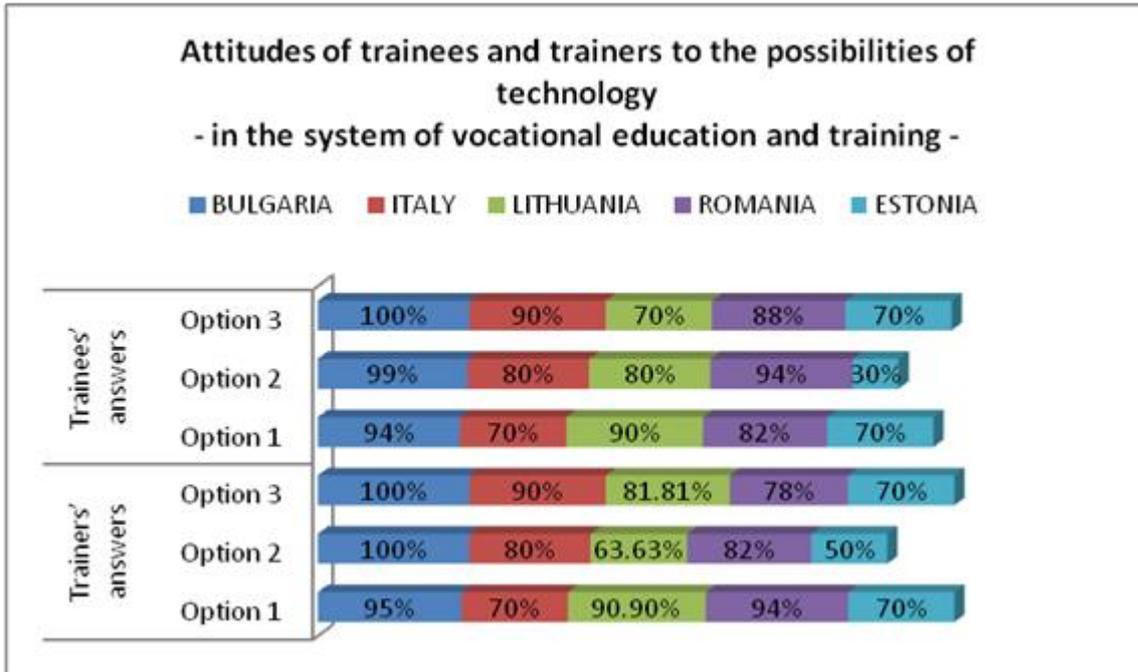
2. Application of technology "Augmented Reality" in the training process

2.1. Attitudes of trainees and trainers to the possibilities of technology

Partner country	Trainers' answers			Trainees' answers		
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
BULGARIA	95%	100%	100%	94%	99%	100%
ITALY	70%	80%	90%	70%	80%	90%
LITHUANIA	90.9%	63.63%	81.81%	90%	80%	70%
ROMANIA	94%	82%	78%	82%	94%	88%
ESTONIA	70%	50%	70%	70%	30%	70%

The percentages in this table refer only to the number of positive responses for each option.

In some countries, trainers and trainees already use some of these options. For example, in Lithuania, the trainees already use option 1 – 9.1%, Option 2 – 9.1% and 10% of trainees already use Option 2. In Estonia, 20% of the trainers already use Option 3.



3. Benefits for the training process of introduction of the technology "Augmented Reality"

3.1. The attractiveness of the material with technical content for the trainees presented by the technology "Augmented Reality"

In Bulgaria, Romania, Lithuania and Estonia an average of 90% of trainees agree that learning with Augmented Reality software makes technical content lessons more attractive and it will increase their interest to attend courses where this technology would be used. Furthermore, the use of Augmented Reality software will increase the students' interest to whole educational material.

In the Italian report, it is mentioned that the interest to Augmented Reality is increasing in education and this is partly due to the fact that camera-equipped and software-downloadable mobile phones are surging in recent years. In education and training, AR has the potential to make ubiquitous learning a reality, allowing learners to gain immediate access to a wide range of location-specific information from various sources.

3.2. Increasing the confidence of trainees to attending courses where technology "Augmented Reality" is used

The survey's result in Bulgaria, Romania and Estonia shows that 100 % of trainees feel confident about attending a class where this software is used. This high level of confidence may show also that they feel ready for innovative technology as "Augment Reality". In Lithuania, the percentage of trainees who feel confident about attending class where this software is used is 70 %. On the other hand, only 30 % do not feel confident.

4. Areas of agreement between the attitudes of trainers and trainees

Both trainers and trainees consider it necessary the use of technologies during the teaching process as it can increase the trainees' motivation, interest and confidence to attending courses. Both, trainers and trainees have

positive attitudes for the potentialities of technology “Augment Reality”. Furthermore, they have high level of interest and confidence to the possibilities of the technology.

5. Assessment of the need for application of the technology “Augmented Reality” in the system of vocational education and training

A large number of trainers and trainees (an average of 85%) have chosen all three options of AR shown in the video as necessary and useful to be integrated in the teaching/learning process. Augmented Reality would be very useful for trainers and trainees. For trainers, it helps to teach and explain learning content. For students, this technology would help to understand and increase learning motivation. Furthermore, a major part of respondents said, that they would be interested in using Augmented Reality options.

IV. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF HIGHER EDUCATION

1. The use of educational software in higher education

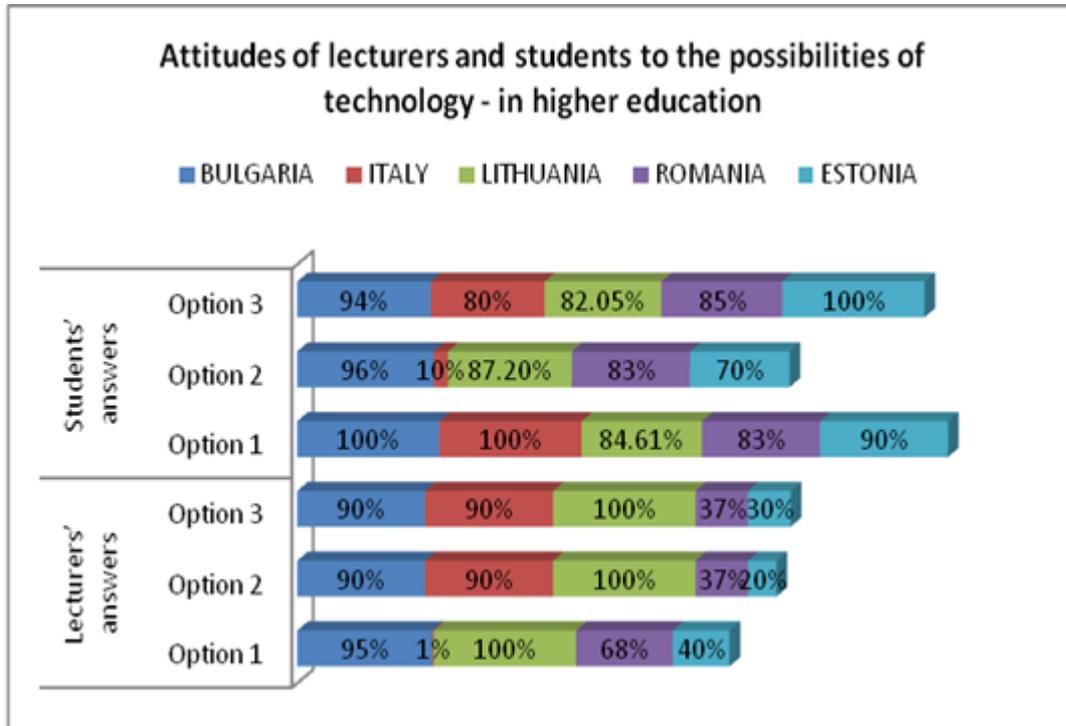
Partner country	Web content	PP presentations	Audio-video content	Interactive boards	Moodle	others
BULGARIA	100%	100%	80%	24%	36%	26%
ITALY	32%	31%	19%	9%	9%	0%
LITHUANIA	6.25%	62.5%	6.25%	6.25%	18.75%	0%
ROMANIA	24%	40%	19%	9%	0%	8%
ESTONIA	50%	90%	60%	10%	20%	0%

2. Application of technology "Augmented Reality" in the learning process

2.1. Attitudes of lecturers and students to the possibilities of technology

Partner country	Lecturers' answers			Students' answers		
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
BULGARIA	95%	90%	90%	100%	96%	94%
ITALY	1%	90%	90%	100%	10%	80%
LITHUANIA	100%	100%	100%	84.61%	87.2%	82.05%
ROMANIA	68%	37%	37%	83%	83%	85%
ESTONIA	40%	20%	30%	90%	70%	100%

The percentages in this table refer only to the number of positive responses for each option.



In some countries, lecturers and students already use some of these options.

For example, in Italy, 90% of lecturers and 50% of students already use Option 3.

In Lithuania, 5.16% of students already use Option 1, 5.16% of students – Option 2 and 7.7% of students already use Option 3.

In Romania, 38% of students and 16% of lecturers already use Option 1, 10% of students and 16% of lecturers already use Option 2, 6% of students and 3% of lecturers already use Option 3.

In Estonia, 20% of lecturers already use Option 2 and 10% of lecturers already use Option 3.

3. Benefits to the educational process of the introduction of technology "Augmented Reality"

3.1. Promoting the learning "by opening" according to students

Even though all respondents believe that AR encourages discovery – based learning, it is necessary to keep in mind that *"much of the learning processes based on the skills professor, not only the course materials; a skilled teacher can make any progress to be clear and understandable"* (student under graduated in architecture - Romania).

From the survey's result it is clear that an average of 90% of the questioned students do believe that new technologies can improve this kind of learning. This shows that the students are interested in innovative practices and application of high technologies in the learning process.

The Estonian report states that all higher education students considered that AR could encourage discovery-based learning and make difficult themes easier to understand.

3.2. Effectiveness of the technology to learning difficult academic material through the eyes of students

AR “could be a very useful learning that could help improve the results for students which are achieved in their learning process” (student, master in political sciences-Romania). This assessment should be seen in conditions in which current education (in all grades) in Romania is based on the classic predominant learning using written support, so is aimed at people with visual learning capacity.

In Bulgaria and Lithuania, the major part of respondents has positive attitudes in this regard. An average of 87% of the asked students agree with the idea that the use of technology “Augment Reality” can make hardly understandable themes, subjects and materials more clear and comprehensible.

3.3. The advantages of the technology "Augmented Reality" compared to traditional teaching methods according to lecturers

In Bulgaria and Lithuania, the university lecturers' attitudes regarding the advantages of technology “Augmented Reality” over traditional models in training and learning applications are positive. The major part of the asked lecturers (average of 92%) considered that there are advantages.

One of the “Augmented Reality” advantages is reviewed mostly from the possibility for lowering the complexity of the learning resources, making hardly understandable themes, subjects and materials more clear and comprehensible through this new approach, which at the end improves the quality of higher education.

In the Romanian report it is stated that although 95% of the respondent Professors believe that AR has advantages over traditional methods, it is necessary to take into account the fact that: “*although the methods are attractive, they are not suitable for higher education*” (Professor in architecture).

In the Estonian report it is mentioned that higher education lecturers were least positive about the potential for AR in their teaching, but even among these respondents, the majority (60%) agreed that AR offers advantages over other educational tools.

4. Areas of agreement between the attitudes of students and lecturers in the system of higher education

Both students and lecturers have agreed upon the necessity of using new technologies in the teaching/learning process as they are useful in improving learning results, although the predominant system is still the classic one. Furthermore, the major part of respondents founded benefit for educational process of introducing of this technology.

5. Assessment of the need for application of the technology "Augmented Reality" in the system of higher education

The technology “Augmented Reality” would be very useful for lecturers and students in higher education. For lecturers, it would help to explain hardly understandable themes, subjects and materials more clear and comprehensible. For students, this technology would help for better understanding of academic material and to encourage them to discovery-based learning. Thus, the advantages of technology “Augmented Reality” could help to students to improve their results which are achieved in their learning process.

V. TECHNOLOGY "AUGMENTED REALITY" IN THE SYSTEM OF ADULT EDUCATION

1. The use of educational software in the system of adult education

Partner country	Web content	PP presentations	Audio-video content	Interactive boards	Moodle	others
BULGARIA	79%	100%	79%	15%	0%	0%
ITALY	30%	40%	26%	4%	0%	0%
LITHUANIA	33.33%	66.67%	0%	0%	0%	0%
ROMANIA	86%	93%	63%	30%	0%	0%
ESTONIA	80%	100%	90%	20%	40%	0%

The Italian report states that the educational process of adults differs from educating children in several ways. One of the most important differences is that adults have accumulated knowledge, work experience or military service that can add to the learning experience. Another difference is that most adult education is voluntary, therefore, the participants are generally better motivated. Adults frequently apply their knowledge in a practical fashion to learn effectively. They must have a reasonable expectation that the knowledge recently gained will help them further their goals.

2. Attendance of trainees in training courses where there is used educational software

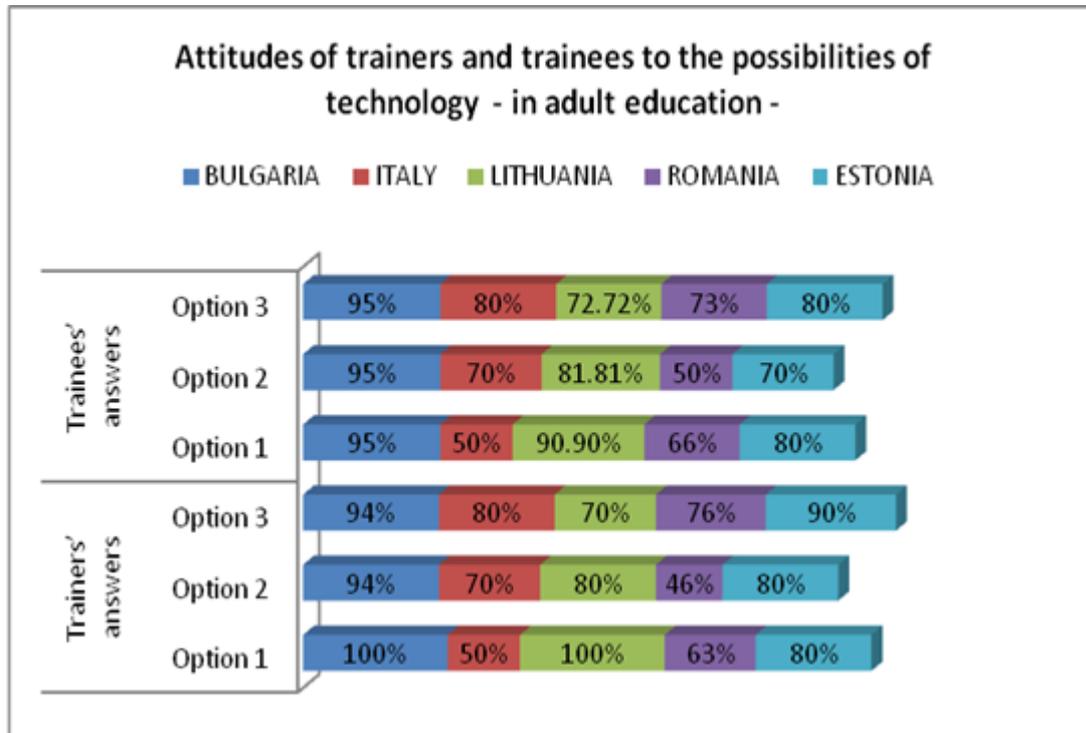
In all partner countries, an average of 85% of the questioned trainees attends classes where educational software is used.

3. Application of technology "Augmented Reality" in the training process

3.1. Attitudes of trainers and trainees to the possibilities of technology

Partner country	Trainers' answers			Trainees' answers		
	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
BULGARIA	100%	94%	94%	95%	95%	95%
ITALY	50%	70%	80%	50%	70%	80%
LITHUANIA	100%	80%	70%	90.9%	81.81%	72.72%
ROMANIA	63%	46%	76%	66%	50%	73%
ESTONIA	80%	80%	90%	80%	70%	80%

The percentages in this table refer only to the number of positive responses for each option.



In some countries, trainers and trainees already use some of these options.

For example, in Romania, 10% of trainees and 13% of trainers already use Option 1, 16% of trainees and 20% of trainers already use Option 2 and 6% of trainees and 10% of trainers already use Option 3. In Estonia, 10% of trainers already use Option 1.

The advanced technologies such as AR offers the learners a visual experience that is enriched with relevant information, but, what is more, it allows learners to interact dynamically with mini-exhibits. It is an integrated pedagogically approach through the innovative learning with ICT help. It is important that the trainers would like to use these options and that they are motivated to use them.

4. Benefits for the training process of introduction of the technology "Augmented Reality"

4.1. Development the competences of trainees through technology "Augmented Reality" for their better implementation to the labor market

The Romanian report states that the use of these new technologies in the teaching process has some advantages such as: direct contact with the information sources which leads to personalizing the time for the access to information, a set of experiences which facilitate learning and retaining of information, enhancing the degree of realism of the examples and situations used as examples, offering information in an extensive way, increasing the flexibility of the data presentation, which leads to the immediate organization and selection of information based on various criteria.

An average of 95% of respondent trainees has answered affirmatively at this question. Using a virtual system in the teaching process offers the learners a sort of freedom to explore the world created by the computer and to interact directly with it. The systems of enriched reality (AR) combine the computer-generated information with that of a real environment. Unlike the immersive systems, in the AR the user can perceive the real world, with virtual objects overlapped on this image. Lifelong learning means a

process that transcends the classroom area through the direct relationship with life experiences. Computer-aided learning and its importance in sustaining a modern education through interactive multimedia educational applications with AR represents an extraordinary support which is complementary in the learning process. Regarding their own inclusion and placement on the labor market, the same number of trainees considered that computer-aided courses offer better competences. This shows that the trainees are interested in innovative practices and application of high technologies in the educational process. Regarding this, it would surely be possible to produce a better inclusion of the learners on the labor market because their competences would be more solid.

4.2. Improving the quality of training process for trainees through technology "Augmented Reality"

An average of 98% of the respondent trainees consider that using AR would bring a supplementary value to education as it leads to their active involvement in the learning process through effective manipulation of experiments, through the integration of modern technologies (as AR), through the combination of experiences of understanding and conscious learning. This shows that the innovative thinking of the trainees expected the quality to be achieved by new practices and application of high technologies rather than traditional educational methods. Furthermore, the use of "Augmented Reality" in the educational process makes possible the experiential learning, which leads to sustainable effects and higher educational quality.

5. Areas of agreement between the attitudes of trainers and trainees

By questionnaire data, a major part of trainees and trainers agree that computer-aided education offer competences for better inclusion and placement of learners on the labor market. Trainers also agree that Augmented Reality brings higher quality of education.

Both trainers and trainees have agreed upon the necessity of using technologies in the teaching process. Modern technologies can enrich the perception of the one who experiments so that there can be noticed phenomena which cannot usually be emphasized.

An average of 90% of the respondent trainers has given the answer YES for this question. The use of this concept of "Augmented Reality" (AR) in the teaching process makes possible the experiential learning, which leads to sustainable effects at the level of cognitive, behavioural and attitudinal acquisitions. In this context, it would surely be possible to produce a better inclusion of the learners on the labour market because their competences would be more solid.

6. Assessment of the need for application of the technology "Augmented Reality" in the system of adult education

Both trainers and trainees consider that the use of AR in the teaching system would make learners better prepared for a world dominated by science and technologies. It is well known that learning based on investigation and experiments leads to the development of a personality that can adjust to different environments and situations successfully. In the system of adult education technology "Augmented Reality" would be very useful, both for trainers and trainees. For the first one, it would help to show and explain educational content on a better and more attractive way. For trainees, this technology would increase the educational quality and would help for their better implementation to the labor market.

VI. GENERAL CONCLUSIONS

Bulgaria: The need for application of the technology "Augmented Reality" in the survived educational sectors is reviewed by the indicated benefits and advantages, that could help to trainers/trainers and learners/trainees to improve different aspects of the respective educational system.

In general, the technology "Augmented Reality" will improve the current education and training processes by establishment of an appropriate environment for multi-dimensional learning. It will increase the effectiveness of the educational and training process and will improve the communication an interaction between learners and educators.

Italy: Augmented reality is only beginning to emerge in education, and its use is projected to become widespread over the course of the next few years. The true benefit of utilizing AR in education lies with its ability to facilitate a truly interactive learning environment.

It has long been recognized that the rapidly changing nature of modern information technologies are dramatically altering the situation of both teachers and learners.

Outside the laboratories, however, uptake of advanced techniques remains low and the majority of e-learning programs are still based on video lessons and page-turning websites. Besides economic factors, one of the key problems of technology enhanced learning is that the huge majority of teachers receive very little training in how to use advanced educational technologies in Learning Environment.

Lithuania: Augmented Reality has a lot of advantages to educational sector. It not only helps to explain learning content more efficient, but also helps to increase students'/trainees' learning motivation. For adult trainees, it makes an opportunity to better inclusion and placement on labor market. Furthermore, a major part of respondents said, that they do not already use Augmented Reality options (Interactive Modeling, Interactive Storytelling and visualization, Interactive Discovery Based Education), but they would be interested in using this technology.

All in all, Augmented Reality makes an opportunity for students and trainees to take control of their own learning, and interact with the real and virtual environments. Students/trainees can manipulate objects that are not real, and learn tasks and skills. So this type of training provides opportunities for more authentic learning and appeal to multiple learning styles.

Romania: The use of new technologies, in general, and the use of AR system, as a particular case, in the teaching/learning system represent an area of great interest for both teachers and students at different levels as it implies many benefits such as increasing motivation, learning "by opening" – a more practical and reality-connected approach, making contents more understandable, relating students to real life situations and objects, sustainable positive effects at the level of cognitive, behavioural and attitudinal acquisitions.

This report offers a significant proof that there is a need of the technology "Augmented Reality" in the system of education in Romania with focus on adjusting its options on the learners' age characteristics and learning needs.

Estonia: The Estonian report mentions that, in general, both teachers and students reported low levels of current use of AR technology in learning and high levels of interest in using it. The exception to this general finding were higher education teachers who reported relatively low levels of interest in using AR for their teaching. There is a suggestion of a trend in the responses to the effect that the interest in applying AR decreases among teachers as the level of education increases whereas the interest among students increases from lowest amongst school students to highest among higher education students but the data is insufficiently detailed to meaningfully establish the significance of this apparent relationship.

It is worth noting, however, that the AR examples shown in the video which accompanied the questionnaires gave examples which were relevant only to young school students. Thus, the majority of respondents were expected to apply their own imagination in order to generate a conception of how they would use AR in their teaching and learning. Perhaps this helps to explain the relatively higher interest expressed by school teachers compared with higher education lecturers in using AR. If this factor is considered with regard to student responses, however, then it is of interest that school students (to whom the examples in the video were most relevant) expressed less interest in using AR than did any other student respondent group.

With consideration of the small sample size and consequent sensitivity of the survey responses to individual and institutional variations as well as the lack of direct applicability of the option examples shown in the video to the majority of the survey respondents, only very general conclusions may reasonably be drawn on the basis of the gathered data. These include:

- The majority of respondents use computer-based technology in their teaching / learning. Technology use differs according to educational level.
- There is currently little AR use in Estonian education and most respondents would be interested to use AR technology in their teaching / learning.
- Using AR is considered by most respondents to be potentially beneficial.

There is clearly desire for educational use of AR technology among both teachers and students. From the point of view of the LARGE project – the demand for the development of AR tools for educators has been established by this survey but the detailed functionality requirements for the LARGE platform and CTM have not – these require further investigation. The forthcoming stakeholder workshops provide a suitable opportunity to capture these functionality requirements.