

027607

mGBL

mobile Game Based Learning

Specific Targeted Research Project

Information Society Technologies

D 7.4 – Report on evaluation of 1st platform user trials

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Trieste

Version 1.2

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1 General Deliverable information

This section provides general information about the deliverable.

They are:

- General Deliverable Description
- Revision history
- External peer-review (internal, not part of the public deliverable)
- Executive Summary of the Deliverable

1.1 General Deliverable Description

WP number:	WP7
WP name:	Evaluation and Validation
Deliverable number:	D7.4
Deliverable name:	Report on evaluation of 1st platform user trials
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Involved project partners:	ARC-sr, PFRI, TRIESTE, Aster, UM

Table 1: General Deliverable Description

1.2 Revision history of this document

Date	Version	Description	Author
20/12/2007	1.0	Base version	Mininel, Gaion
30/3/2008	1.1	Revisions according to 1 st reviewer	Mininel, Gaion
30/4/2008	1.2	Revisions according to 2 st reviewer	Mininel, Gaion

1.3 External peer-review (internal chapter, not part of the public deliverable)

This section contains a description and an overview of the results of the external peer-review of the deliverable. This is an internal chapter (consortium, Project Officer and reviewers) and will be removed within the final public version of the deliverable.

1.3.1 General description of the review process

Reviewer 1: Raffaele Pesenti is Full professor of Operations Research. Department of Applied Mathematics, School of Economics and Business, University Ca' Foscari" of Venice. His scientific activity is in the field of management and evaluation of complex systems with application in transportation/logistics and biology. Interests are particularly devoted to:

- Management of distribution networks and systems (robust control of production-distribution systems, consensus problems, polyhedron-zonotope containment),
- Transportation (dynamic routing, air transportation economic models),
- Production planning and control (scheduling and inventory problems),
- Innovation and evaluation problems (data envelopment analysis models, decision support systems),
- System biology (phylogenetic inference problems, relationship between molecular connectivity and biological activity).

Pesenti has been teaching at academic level for 12 years.

Reviewer 2: Paolo Bruno is PhD in Information Engineering, with a major in Bioengineering. His scientific activity and his teaching curriculum are in the fields of Bioengineering, Computer Science, Information System Technologies, Medical Informatics, Bioimaging, Hospital and Clinical Information Systems, Electrotechnics.

1.3.2 Comments and Recommendations of the External Reviewers

Reviewer 1:

This document makes reference to “a data analysis protocol” in Section 2.1.1 that is understood but not formally described. The protocol should state clearly:

- 1 the aim of the trial
- 2 what authors want to assess,
- 3 some key performance indicators (either qualitative or quantitative ones),
- 4 how the authors define success.

In this document, the aim of the trial is a little bit ambiguous (condition 1). It is not always apparent whether the main the authors purpose is to test if the product satisfy the potential customers’ requirements or to gather possible criticisms to improve the product quality (as the Appendix 1 seems to suggested). This ambiguity makes the evaluation process difficult as a product may satisfy the customers’ requirements even if there is still space for improving its characteristics. The heuristics introduced in Section 2.1 clearly identify what the authors want to assess (condition 2). On the other hand, neither key performance indicators (condition 3) nor any definition of success (condition 4) are provided. Using the focus group approach, condition 3 may be disregarded, provided that the members of the focus group know the aim of the trail so that they can specify how to interpret their comments. Differently, the satisfaction of condition 4 is necessary.

Reviewer 2:

1) The project approach follows the “Waterfall model”, with a test phase at the end of each project step. But the final user trials, which will verify the final integration of platform and games in the didactic context, will take place at the end of the project, with no time for possible corrections of problems. This is risky. A “Spiral model” in project approach would have been maybe preferable.

2) Methodology used is particularly interesting for younger users (high- schools students would be ideal target).

3) A better explanation of how heuristic data collected will be used afterwards would be needed. In case they would become project instruments, it would be adequate to order them in groups according to importance and add some method of measurement/evaluation of such importance.

1.3.3 Justification and actions/corrections taken regarding the external peer-review

Comments from 1st reviewer accepted. To avoid these lacks again in Final User Trial, section 5 "Recommendations for Final User Trial" was added at the end of this report.

Regarding comments from 2nd reviewer:

- 1) Comment is correct, but this was beyond scope of WP7. Project Structure and its Steps and Milestones couldn't be changed.
- 2) Comment noted for optimal target users.
- 3) Modifications were made in Appendix 1 to answer to this issue.

1.4 Research Background

This work is based on D7.1, D7.2, D7.3 and D6.3 and will give inputs for organization of Third User Trials and namely for D6.4 and thus D7.5.

1.5 Executive Summary of the Deliverable

D7.4 "Report on evaluation of 1st platform user trials." has as input results from Second User Trials as collected and analyzed in D6.3.

Analysis of Methodology and reasons that led to a qualitative approach in such User Trials is done. Results from D6.3 have been transformed into groups of heuristics (*Gameplay, Mobility, and Game Usability*) in order to transform into useful inputs for software improvement. In Appendix 1 suggestions are given to use the evolaris "Jira" bug tracking tool as a precious instrument to collect and evaluate not only bugs but also possible improvements for the software.

2 mGBL 2nd User Trials

Using the Mobile Learning Game Models and content developed in Work Package 3, 3 mobile games were developed for the user trials. These incorporated aspects of the 3 pre-selected content areas (e-health, e-commerce, educational advice information) with 2 types of games: one for single users and one multi-player game. Additional maritime distress content was also prepared. These games were tested in the transnational environment and finally, mGBL platform was demonstrated to participants.

2.1 Methodology assessment

As first user trial has been undertaken using quantitative research technologies, according recommendations carried out by other partners and in Working Package 7, it was decided that for this 2nd user trials we need different insight, using qualitative paradigm. Trialling tools were based on a set of tools used for Focus Group work in WP3, which in turn were developed from tools used in an earlier EC-supported project, m-learning. This methodology itself is well validated, it has been carefully worked out on the basis of research and has been tried and tested on a number of occasions.

These Focus Group researches were a precious instrument to ensure that end users and their requests, emerged during WP2 User Requirement investigation work and during 1st User Trial, are sufficiently understood and transferred into the game templates and the platform prototype.

At this stage of development game templates are more than high-fidelity prototypes: they provide exacting design and behaviour previews of the final template. The fundamental evaluation issues were *fun and playability, navigation, presentation (style and design), content, game purpose, and feedback about the game platform and authoring interface.*

Even if the elaborated m-learning games and educational contents were carefully elaborated and validated by educational and advice services, it was not sufficiently investigated how far games help students reflect on their behaviour and understand better what is going on. The FG methodology hardly can measure

this kind of goal. The perceiving that these m-learning games could be an effective and efficient learning instrument, doesn't give a dimension of what and how much users received from playing the games. Appropriate tools should be design to assessment of what and how users learned efficiently and effectively and how far games help students understand how behave in critical situation.

2.1.1 Data analysis protocol

A data analysis protocol was developed to identify emerging patterns and to interpret data collected during Focus Group, based on a relevant study of literature in particular on Glaser's grounded theory.

A serious issue is the lack of a protocol to reporting data analysis. It might have been better if it had provided also concrete guidelines on how to report comments and observations emerged during Focus Group and to present homogeneously key findings.

3 2nd User trial results evaluation

Deliverable 6.3 contains several useful findings.

Overall results show that all focus groups are favourable to the project; teachers thought that the game with multiple possible scenarios and open-end game would give them an insight on how the students think, how they make decisions, how they could apply that thinking into "real life" situations. That way the game would tackle the collaborating part and team work in education and real life. Young participants seemed to accepted positively these kinds of educational mobile games, and some enjoyed themselves very much too. Main problems stressed were about graphical representation of the games, and consortium has to try to identify possibilities to create advanced graphical design in games. Although some respondents have said that educational games do not need to have brilliant graphics, this feature should receive close attention.

This second user trial let understand if 1st User Trial findings were correctly processed and transferred into the reviewing and developing processes internal to project.

Some issues regarding game templates raised by users during Focus Group, were found also in the First User Trial.

For Game 1, it was remarked that the male boss was not considered to be someone that would be a CEO in a company and more space on the screen could be used for questions and answers. For both game 1 and 2, it was suggested less textual content screens, to improve playability and enjoyment of the game.

Evaluation is an essential activity in user-centred design as we adopted and if an iterative process is used, then the evaluation of each of the prototypes will be fed forward into the design of the next. Results emerged from Second User Trail should inform the final cycle of development that began in September 2007.

To help an efficient iterative evaluation, we worked out a protocol to translate user feedback into concrete recommendations and issues that can be tracked and monitored by all mGBL partners.

4 Suggestion for Final User Trial

4.1 Testing games

In the following trials game templates will be almost completed. They can be formally tested for usability in benchmark usability test. A benchmark usability test is a formal usability test on a real product that provide quantitative, benchmarking metrics. A standard benchmark usability test is required to provide valid usability metrics. Tasks should be selected that represent the product's functionality, typically matching the corresponding use cases. A set of representative users from the identified user population should be tested. Interaction with users and probing for "improving the product" feedback may still be done, but it is limited.

In usability evaluations software is evaluated against general usability heuristics. An example of such a list is Nielsen's 10 Usability Heuristics. Usability of utility software is often understood as effectiveness, efficiency, and satisfaction.

Games differ from utility software in some key characteristics. In games, the purpose is to have fun and enjoy playing the game. Learning to play the game, solving problems, or discovering new things is part of that experience. Moreover, in a game, the players do not know what to expect in advance. Game designers have created the game content and defined goals that the players must achieve. Playing a game is not straightforward either, but it is challenging, and the player needs to use effort to achieve goals. Therefore, applying general usability heuristics in game evaluations is not sufficient and using only them would leave many important aspects of the game unprocessed.

There are other playability heuristics already available. Malone created the first heuristics for evaluating educational games. More recently, Federoff has created a list of heuristics as a result of a case study at a game development company. Desurvire *et al* have created heuristics that are best suited for evaluating general issues in early development phase with a prototype or mock-up. We must consider using these heuristics in our evaluations, but they were not feasible enough.

Our heuristic model for mobile games should be modular and consists of three core modules: *Gameplay*, *Mobility*, and *Game Usability*.

However, there are specific mobile game types, for instance, multi-player games or pervasive games that have characteristics that are not covered in these modules. Therefore, new modules need to be added to the model. The tables below describe proposed playability heuristics for mobile games.

No.	Game Usability Heuristics
GU1	Audio-visual representation supports the game
GU2	Screen layout is efficient and visually pleasing
GU3	Device UI and game UI are used for their own purposes
GU4	Indicators are visible
GU5	The player understands the terminology

GU6	Navigation is consistent, logical, and minimalist
GU7	Control keys are consistent and follow standard conventions
GU8	Game controls are convenient and flexible
GU9	The game gives feedback on the player's actions
GU10	The player cannot make irreversible errors
GU11	The player does not have to memorize things unnecessarily
GU12	The game contains help

No.	Mobility Heuristics
MO1	The game and play sessions can be started quickly
MO2	The game accommodates with the surroundings
MO3	Interruptions are handled reasonably

No.	Gameplay Heuristics
GP1	The game provides clear goals or supports player-created goals
GP2	The player sees the progress in the game and can compare the results
GP3	The players are rewarded and rewards are meaningful
GP4	The player is in control
GP5	Challenge, strategy, and pace are in balance
GP6	The first-time experience is encouraging
GP7	The game story supports the gameplay and is meaningful
GP8	There are no repetitive or boring tasks
GP9	The players can express themselves
GP10	The game supports different playing styles
GP11	The game does not stagnate
GP12	The game is consistent

GP13	The game uses orthogonal unit differentiation
GP 14	The player does not lose any hard-won possessions

No.	Multi-player Heuristics
MP1	The game supports communication
MP2	There are reasons to communicate
MP3	The game helps the player to find other players and game instances
MP4	The game supports groups and communities
MP5	The design minimizes deviant behaviour
MP6	The design hides the effects of network

Beside usability test, we should interview users about acceptance, enjoyment, changing in attitude to learning and improvements in critical decisions. These issues are fundamental measures of project success and must be carefully analysed in this evaluation task. Effective research tools must be developed to achieve these goals.

4.2 Testing platform

Platform and authoring tools can be tested with different research methodology: qualitative research involving small groups of persons in focus group like at this 2nd user trials. We should interview only professors, or IT-staff who will work with the platform in the future, following question scripts that probe current roles, responsibilities and tasks, existing e-learning platform feedback and desired enhancements and functionality.

A possibility for testing authoring tools would be to define brief and easy authoring tasks, let the users create their small quizzes or simulation and build up the games, and afterwards submit them short questionnaires.

We can also solicit feedback from this kind of users for a rapid, iterative evaluation of UI (User Interface) design.

5 Appendix 1 – Bug tracking tool

As Evolaris put at disposal of mGBL group the powerful cooperative bug tracking tool “Jira”, it will be opportune that all project members use it, so that it will become the “centralized” monitoring tool for refinement / improvement of all the project applications.

In particular all project members who recognize or receive or have received news of some issues should report the issue.

Web address is: <https://evosource.evolaris.net/jira>

Typically, issues come out from users’ feedback (user trials, reviewers, etc ...) and are in “unstructured” form. Project members reporting the issue should first “pre-process” it to give a more structured form that helps the technical partners in solving the problem. This is done by “tagging” the report with regard to several categorizations.

The Jira tool already contains structures to help this tagging, but some things should be added.

The following description aims to be both a user guide to project members willing to report an issue and a list of suggestions for Evolaris to improve (if possible) the structuring of information in the Jira tool.

5.1 Step 1: Create a new issue

First choice is definition of Issue Type. Choices are:

- **Bug**: anything that constitutes a problem with current implementation of the applications
- **New feature**: a suggestion for inclusion in the applications of something currently not present and not yet planned
- **Task**: inclusion in the applications of something currently not present but planned already

- **Improvement:** a suggestion for improving an existing feature/aspect of current implementation. Distinct from “Bug” if not pointing to a possible problem

5.2 Step 2: Enter the details of the issue

5.2.1 Summary

Enter brief but explicative title for the issue.

Bad practice example: “*Problem!!!*”.

Good practice example: “*Game1 authoring tool: database communication issue*”.

5.2.2 Priority

From the Jira local help:

Priority Levels

An issue has a priority level which indicates its importance. The currently defined priorities are listed below. In addition, you can add more priority levels at the administration section.

- Blocker: *Blocks development and/or testing work, production could not run.*
- Critical: *Crashes, loss of data, severe memory leak.*
- Major: *Major loss of function.*
- Minor: *Minor loss of function, or other problem where easy workaround is present.*
- Trivial: *Cosmetic problem like misspelled words or misaligned text.*

5.2.3 Due Date

Insert it if you know of precise deadline.

5.2.4 Components

This indicates the application which presented the issue.

Current choice provides:

- Unknown
- gametemplate1 – ahead of the game
- gametemplate2 – mogabal
- gametemplate3 – get real

Notes to Evolaris for improvement of Jira tool: this list should be extended to account for all the different separate applications, with at least the following additions:

- platform
- authoring tools for gametemplate1 – ahead of the game
- authoring tools for gametemplate2 – mogabal
- authoring tools for gametemplate3 – get real

and maybe also:

- specific implementation of gametemplate1 – ahead of the game
- specific implementation of gametemplate2 – mogabal
- specific implementation of gametemplate3 – get real

5.2.5 Assign to

Insert if you know who is the technical partner responsible for the component.

5.2.6 Environment

Can be left blank.

5.2.7 Description

Describe with free text, very clearly, the issue.

5.3 Suggestions for improvement

5.3.1 Further tagging/categorization

It will be useful to be able to “tag” the issue as pertaining to one or more of the following categories (with check boxes):

- Database: *typically for platform component*
- Graphic User Interface: *for game templates or platform elements*
- Graphics: *purely graphic aspects for game templates or specific game implementations*
- Usability: *issues regarding usability problems of any component*
- Communication: *issues regarding communications, e.g. use of Bluetooth in games*
- Hardware Specific issues: *problems related to a particular hardware, e.g.: “game X not running on cellular phone of brand XX, model XXX”*
- Help functions: *suggestions or problems related to instructions for use of any component*
- Playability: *issues related strictly to game experience, e.g.: “game XX lock at end of level 2”, “in game YY the dragon doesn’t drop the key to open the door to treasure room”*
- XML or other standard formats: *problems related to XML structures for contents, and/or any other standards-related issue*

5.3.2 Wider access (or input possibility) to Jira tool

The Jira tool is a precious internal tool for cooperative issues resolution in a multiple partners project as mGBL. It is currently open to all the project technical partners.

This opens the issue of missing input.

Typically issues, problems and bugs are not easily seen/recognized by developers themselves but emerge from user trials, reviews, common users.

Although the Jira is an internal tool and correctly only technical partners should have full access, it should be made possible to allow at least the input of new issues to all project partners.

Also there should be an adequate “issues/problems/bugs form” in the project public webpage and in the platform, so that also “common” users of the project applications should have possibility to give their feedback.

The “controlled environment” of User Trials gives already useful feedback, but the feedback coming from platform users, of from the internet navigator who downloaded the game from the public website, is precious too!

Of course this wider access to input to the Jira tool should have different levels. If technically possible:

- technical partners in mGBL project should continue to have “full view” of the bug tracking tool
- the other project partners should have limited privileges, e.g. possibility for input of new issues and visibility of their resolution
- external users should have the possibility to signal issues by web, in a form following the same “structuring/categorization” seen above. Their “input” shouldn’t of course be entered automatically into the Jira tool but should be “filtered” by the administrators of the mGBL platform and public web-site, who should add into the Jira tool all the useful feedback received by these channels.

6 References

Nielsen, J. *Usability Engineering*. Academic Press, London, 1994.

Malone, T.W., Heuristics for Designing Enjoyable User Interfaces: Lessons from Computer Games. *Proceedings of the 3rd ACM SIGSMALL Symposium and the first SIGPC Symposium* 1980, pp. 162-169.

Desurvire H., Caplan M., Toth J.A. Using Heuristics to Evaluate the Playability of Games. *Proceedings of Computer-Human Interaction* 2004, pp. 1509-1512.