



## Application Information (Application ID# 11446121)

### Institutional Environment

#### 1. Technology vision

The University of Minho's vision and guiding lines concerning the role of technology for teaching, learning and communication can be summed up as:

- All staff members have a net presence;
- Everywhere within the university campus there is a net point-of-access;
- All students, teachers, and staff should be provided with a laptop computer;
- All official communications is digital;
- All information is digitally archived;
- All staff belong to a knowledge-sharing community;
- All campuses are focal points for the development and dissemination of knowledge within the local region.

Based on these principles the University implemented the infrastructure, services and content to support this vision by:

- Setting up a secure Wi-Fi network accessible within both university campuses;
- Implementing an e-learning platform and assisting the development of content;
- Developing and implementing a diversity of electronic services for the academic community accessible through the University portal.

### Project Details

#### 2. Project title

Development of a sketch-based instructional laboratory for Digital Arts and Computer Graphics

#### 3. Project executive summary

Nowadays in University of Minho students already use laptops during the classes. Despite their use, laptops are still not integrated within the pedagogical process. Laptops are limited to the learning of a software tool or to browse for information but are not used as a platform to inquire, annotate materials, share knowledge and discuss ideas. This project intends to evaluate the use of wireless Tablet PCs, as an enabler of these activities initially in the context of the Masters programs in digital arts and computer graphics. Due to its form factor, Tablet PCs are appealing devices to support students during and after classes, if activities based on free sketching are considered. Within the classroom they support discussion and an effective communication with the professor and colleagues through annotation and sharing enabled by a Wi-Fi shared video projector system. At the same time they provide a full feature computing platform for the execution of software tools used in the lab classes. Outside the classroom Tablet PCs provide an unique platform to support the creative and artistic work expected in such Masters programs, thus allowing students to quickly draft, develop concepts and ideas and rapidly upload them to the e-learning platforms.

#### 4. Teaching and learning issues

Laptops are essential mobile devices supporting work inside and outside the class environment. Nevertheless the paradigm of teaching and learning was not altered significantly. Laptops are currently used by the students in the class to browse for information or to use a piece of the software. These activities, while still related to the course curriculum, isolate each student behind the screen: they do not contribute to sharing of ideas, parallel editing of the material presented, collective problem solving, or doing and sharing. Collective participation and doing are some of the best strategies for effective learning, especially in challenging courses such as the ones affected by this project: Mathematical Methods and Algorithms for Computer Graphics, Computer Graphics Fundamentals, Fundamentals of Applied Mathematics and especially the Integrated Project of Digital Arts I and II. These last courses involve intensive experimental laboratory work where students expected to develop their projects by exploring visual and auditory plastic materials, where wireless information sharing, annotations, communication and sketch-based free design are important activities for establishing collaboration among students, tutors and professors. Furthermore, outside the classroom in group projects, students also find the need to create edit and share content among their peers. Within the context of a Masters program in Digital Arts these activities rely heavily on storyboarding, sketching, modeling and illustrating. Traditional paper-based sketchpads provide a medium for these activities that is undeniably useful: the drawback is that they do not benefit from all the online platforms and Wi-Fi infrastructure available on campus. Tablet PCs in form and function provide the next generation of sketchpads being a better tool than standard laptops for supporting student activities with the advantage over traditional paper sketches of dealing with pixels instead of ink. Here then tablet PCs will play a central role in supporting the overall instructional process.

## **5. Goals, objectives and outcomes**

There are two main goals for this project. The first aims at removing the obstacles to class participation and discussion that often occur when computers stand between the students and the professor. Namely to increase the interactivity and facilitate the students creativity and experimentation based on free sketching within the areas of applied mathematics, computer graphics and digital arts. The specific objectives to be accomplished in terms of learning outcomes are an increase in student participation, transformation of the student learning experience from one of passive receptor to active participant, increased mental activity and peer interaction to strengthen thinking skills and reinforce learning. To evaluate these objectives, tutors and professors will be surveyed about classroom techniques and technology before and after the implementation of this technology. The changes concerning the satisfactory completion of the following outcomes will be measured:

- 1) Students have increased participation in the course;
- 2) Instant feedback during class allows immediate instructional adjustments;
- 3) Faculty staff would recommend this to peers;
- 4) Support from other departments was influential for smooth adoption into their courses;
- 5) Academic faculty would like to use this technology in future courses.

Students will be surveyed to find out their attitudes toward these techniques and technology at the end of the course for evidence of desired outcomes such as:

- 100% feel that their active participation in the course increased;
- 75% report that interactive classroom techniques enhanced their learning;
- 75% would like to be in future courses where this technology is used;
- 30% feel that this technology has helped them to be better prepared for their future careers.

The second goal of the project is to increase student habits for documenting their creative process by introducing the notion of a digital sketch pad that can record the creative process outside the class. In respect of this goal the specific objective is to increase the number of storyboards, sketches and work diaries

created digitally and submitted online to the e-learning platform. Students' feedback and reports of their experience using the Tablet PCs to document their creative process will be collected through questionnaires that assess their preference for this approach in comparison to traditional paper sketchpads and work diaries. The lessons learned in this project will be used to assess the usability of Table PCs for teaching other courses and supporting the execution of assignments and projects requiring the elaboration of models and sketching.

## **6. Technology integration**

The twenty wireless HP Tablet PCs and accessories will be made available for students as part of the experimental Digital Arts lab equipment. The professor/tutor will also be provided with a wireless HP Tablet PC. The Tablet PC functions will allow students to augment, annotate or sketch the material presented directly onto the digital files. Students can access the presentation content through the existing e-learning platforms. All Tablet PCs will be able to connect with the Wi-Fi enabled projectors currently existing in the classroom. Students wanting to clarify a particular topic or engaged in discussion of the material can connect to the projection system and present their version of the content. To support their work outside the classroom students will also be able to use the equipment. Here once again the functionality of the Tablet PC will allow for a sketchlike activity quite familiar to the designer and artist students engaged in a creative process. The existing Wi-Fi infrastructure will enable them to post the material online in e-learning platforms. The nature of the courses and the typical student tasks - 3D modeling, storyboard creation, sketching - fit quite well with the functions provided by the Tablet PCs.

## **7. Project timeline**

September 2007, which coincides with the beginning of the Masters Courses in Technology and Digital Arts and in Computer Graphics and Virtual Environments;

Sept 2007 – Nov. 2007: Set up of the sketch-based instructional laboratory for Digital Arts and Computer Graphics;

Oct 2007 – Jul. 2008: Official opening of the Lab to support the following disciplines: Mathematical Methods and Algorithms for Computer Graphics; Computer Graphics Fundamentals; Fundamentals of Applied Mathematics and Integrated Project of Digital Arts I and II of the above-mentioned master courses;

Mar. 2008 – Sept. 2008: Assessment and Evaluation - Phase 1;

Sept. – Nov. 2008: Updating and improvement of the project regarding the Assessment and Evaluation results;

Oct. 2008 – Sept.2009: Running of the Lab to support the above-mentioned courses as well also embracing other courses and Masters Thesis preparation. Other courses foreseen to be considered in the project are from master programs in Mobile Systems, Informatics and Information Systems;

Mar. 2009 – Sept. 2009: Assessment and Evaluation - Phase 2;

Sept. 2009: Public presentation of the Assessment and Evaluation reports and a plan for project next phases (post-project phase).

Sept. 2007 – Sept. 2009: Management of the project; Dissemination actions; Documentation production (reports, manuals, web site, papers).

# Project Context

## 8. Course impacted

The following courses will be targeted in the initial stage: Mathematical Methods and Algorithms for Computer Graphics; Computer Graphics Fundamentals; Fundamentals of Applied Mathematics; Integrated Project of Digital Arts I and II from the Masters Program in Technology and Digital Arts and Masters Program in Computer Graphics and Virtual Environments hosted by the Department of Information Systems in collaboration with the Departments of Informatics and of Electronics, which are all from the University of Minho School of Engineering. The instructional methods developed by this project are expected to be used in other Masters programs offered by the School of Engineering.

## 9. Course redesign

The twenty wireless HP Tablet PCs and accessories will be made available for students as part of the experimental Digital Arts lab equipment. The professor/tutor will also be provided with a wireless HP Tablet PC. Courses considered in this project will be altered in terms of their teaching by adopting new instructional methodologies based on collaborative learning and greater involvement of students and tutors/professors, as the Tablet PCs functions will allow students to augment, annotate and/or sketch the material presented directly onto digital files, while communicating and sharing their works, information, etc amongst each other. Courses will be redesigned to be less oriented to oral presentations and more towards incorporating individual and group work with high levels of collaborative activity. Workshops, best work and creativity contests, open forum and brainstorming sessions involving students, professors and outside experts will become part of the daily learning process of each course. In fact, the Tablet PC will allow for a sketch-like functionality rather familiar to designer and artist students engaged in a creative process. The existing Wi-Fi infrastructure will enable them to post the material online in e-learning platforms for sharing and joint alteration.

## 10. Course discipline

Mathematics, Science, Engineering, Digital Arts

## 11. Faculty

6 professors from the initial set of courses embraced; extendable to 25 professors at second phase. At post-project phase: up to 50 professors (indirectly).

## 12. Students

40 students from the initial set of courses from which 5% are from developing Portuguese speaking countries (Cape Verde/East-Timor/Mozambique) and 30% are women.

## 13. Project visibility

Results of this project will be disseminated as widely as possible. They will be presented to Hewlett Packard, publicized on the University of Minho website, in newsletters and annual reports, as well as being shared internationally within our current international networks such is the INI-GraphicsNet ([www.inigraphics.net](http://www.inigraphics.net)) network for Higher Education and Research & Development in Computer Graphics that is headquartered in Darmstadt, Germany. The project will be also disseminated via the International Symposia of Artech ([artech2006.ccg.pt](http://artech2006.ccg.pt)), which was founded by the principal investigator and is organized bi-annually in Spain and Portugal. The principal investigator will submit a paper to Artech 2008, to print journals and online. Members of the project team will submit similar articles to their respective professional journals. Additional project visibility will be

accomplished through an institutional web site, educational workshops, on-going communication with media (local, regional and national), professional organizations and the general community. The project will be also object of an usability study to be carried on by the research group of graphic and multimodal systems, a research group of the University of Minho that is doing work in the field of interface design in educational contexts.

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## Administrative Support and Approval (continued)

### **16. Statement of support from key administrator**

This project is of an high interest for the institution so that it will receive priority support in terms of administrative, technical and academic means. I will be personally involved in the overall coordination of the project in order to ensure a smooth linking between the university administrative board and the project implementation itself, as also the integration of the project results in the overall instructional policies of the university. The internal dissemination in terms of the reutilization and application of the best and improved teaching practices learned from the project will be specially supported by the Assessment and Quality of Teaching Office that will fully support the project implementation. The project will also receive speciall technical support from the Communications Services, a board responsible for the overall management and implementation of the university's overall information and communication systems.