

Project-Based Learning applied to a Master in HCI

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ABSTRACT

In this paper, we describe the experience of starting the first HCI master in Spanish language for the wide Spanish speaking context held in the University of Lleida (Catalonia).

It combines the semi-distance educational paradigm with the Project-Based Learning educational methodology. The paper also describes how this first experience has reached from previous HCI teaching experiences and how all the subjects has been restructured in order to offer a complete HCI program for the Spanish speaking students.

Keywords

Human Computer Interaction, Teaching, Master, European Higher Education Area.

1. INTRODUCTION

Human-Computer Interaction (HCI) is a recent area of development with a strong interdisciplinary character and which has experienced a spectacular growth over recent years. This growth has occurred as a result of the generalization of computer use and of problems which originate from use by people who are not specifically trained in these appliances. Despite this growth, presence of HCI in Spanish universities is growing, but still scarce. This is especially true at undergraduate level, owing, in part, to the difficulty of introducing new subjects into university study schemes. It performs a scenario with shortage of competent people prepared to assume the HCI real industry needs.

This scenario presents us, as university tutors, a situation of poor consolidation, shortage of material, little methodological development, and also with the dilemma of situating the educational paradigm in a formal academic model similar to that of other disciplines, or that used in the area of courses given in the industry for HCI professionals. Moreover, in many universities

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the HCI contents are placed inside programming courses, this could instigate problems of credibility and confusion in the students.

This situation was analyzed for first time in July 2005 by professional and academic people belonging to the most important HCI Spanish speaking society AIPO in the 1st workshop about teaching HCI in those countries, later in the HCIED 2006 and, more recently, in the "Trends in HCI" IFIP TC 13 seminar held in Salamanca.

This paper summarizes the main contributions and conclusions from these experiences and explains how the HCI educational program has been redesigned in the University of Lleida.

2. Teaching HCI: Justification and Context

For many years major scientific societies have emphasized the importance of HCI training for engineers, incorporating it into programmer's studies. The report by ACM/IEEE-CS Joint Curriculum Task Force Computing Curricula of 1992 [1] establishes new thematic areas to cover subject matter from the discipline of computer science.

HCI is one of the nine thematic areas defined in the ACM curricula, an important aspect when situating its education in university study programs. In 1988 the Special Interest in Human-Computer Interaction Group (ACM-SIGCHI) put into practice a group with the objective of composing a curricular proposal. The committee's task was to draw up a series of recommendations for education in HCI. This committee drafted the document ACM SIGCHI Curricula for Human-Computer Interaction in 1992 [2], which contain a series of recommendations for the realization of HCI courses. To be able to cover all aspects of definition and the objectives, HCI must be comprised of a large number of different areas, which include different aspects of human beings and computers: computer science, psychology, sociology, anthropology, industrial design and fine arts.

In Spain, HCI have been introduced for the first time in the "white book" for the Computer Engineering Grade, a recommendation for all the Spanish universities [4].

One of the conclusions of the 5th HCI Spanish annual conference, Interacción [12], was the maturity of HCI discipline at scientific level in Spanish speaking countries. Nevertheless, the situation was not the same when talking about the teaching of this

discipline. Therefore, actions such as a specific workshop about teaching HCI in our context and the establishment of a commission to structure the curricula for an HCI master have improved the situation.

2.1 Chijote workshop

With the European Higher Education area (also known as Bologna process) [23] as a main goal, it is necessary to assure that the curricular contents that in the HCI subject are taught in the university centres, also the pedagogical methods and the educational paradigms that are used fit to the demand that is observed in the society in general, and the company in individual.

Having this objective in mind, the AIPO society organized (in July 2005) the 1st workshop about teaching HCI in our country [6]. Assistants tried to take advantage of the maturity –in the investigating plane– of the Spanish groups to constitute a point of contact and discussion where educators from different knowledge areas could share their experiences in the matter of HCI teaching.

The main goal of the workshop was to have the opportunity, in a multidisciplinary context, to discuss, to determine, to share and, mainly, to underline the future curricula of the discipline (the fundamental formative lines in degree, post-degree and doctorate in matter of HCI teaching) [7].

Different academic people from Spain exposed and shared the situation with international teachers that came from Netherlands (representing Europe) [24], Chile [5] and Colombia [8] (in representation of South America) and US [20]. Also an important group of professionals were worried about their HCI-specialized people needs.

2.2 AIPO master HCI commissions

One of the most important topics discussed during the above mentioned Chijote workshop was about the lack, in Spanish Universities, of studies in the HCI field. At that time, most of universities that offered these matters (only a few) did it at an introductory level and, usually, such as a non mandatory subject within other subject in the curriculum degree.

During the last session of these days, the creation of a curricular proposal of a HCI Master was decided. The objective was to serve as orientative model for those universities and centers that wish to offer this type of formation. With that goal two commissions were created. One, formed by four people from academia and four from HCI industry, to be in charge of the curricular contents and, other, to be in charge to the legal, administrative and academic aspects necessary to start inter-university HCI masters in the Spanish university [11].

The curricular commission started the activities in a meeting held in Granada during the 6º Congreso Interacción Persona Ordenador (September 05) and in December 2006 delivered the final document [3]. It is an open and free, and serves as curricula for the universities that desire to develop an HCI Master. Figure 1 shows the general schema that defines the curricula.

It was more than one year of hard work where international HCI masters were analyzed, people to get the student profile were interviewed, and several meetings with HCI companies responsible were hold.

2.3 Trends in HCI: HCI in Spanish speaking countries study

Recently, a deep study has been performed to describe the current situation associated with HCI in Ibero-America context [9]. The study deals with different topics beyond the academic environment, being the state of the art concerning the teaching of HCI in under and post graduated studies in Ibero-America one of these topics.

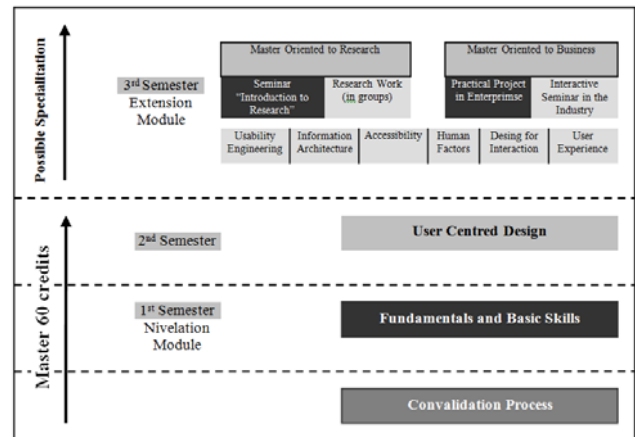


Figure 1: Structure of the curricular HCI Master defined by AIPO society.

It concludes that the presence of HCI-related courses in Ibero-America is still scarce. However, a considerable number of HCI-related courses and the first Master (later explained in this paper) completely devoted to HCI in Spanish language can be observed when regarding the situation in Spain during the last five years.

Taking into account that many of those courses are semi-distance and that many Latin-American students use to move from America to Spain and Portugal to take postgraduate courses, the consolidation and expansion of HCI-related teaching can be predicted for the next years. Indeed, an important demand of well university HCI-formed professionals can be currently detected in many Ibero-American companies related to software development

3. HCI scope in grade studies at University of Lleida

HCI teaching history in University of Lleida has its beginnings with the introduction of some aspects related to the discipline into a programming techniques theory subject in the degree of Technical Engineering of Computer Science.

Later, 2001 plan study introduces two HCI subjects:

- **InIPO** (Introduction to Human-Computer Interaction in Spanish) [14], mandatory subject given in the fourth semester of the degree course. The objective of this course is to introduce the future engineer to methodological teaching and basic concept knowledge of the discipline. Development of the subject InIPO combines the realization of theoretical and practical classes. In the two hours of theory, master

classes are given combined with the realization of examples taken from the real world that serve to reinforce the student's education.

- **Human-Computer Interaction (IPO)**, optional specialization subject given during the 5th and 6th semesters (last course) of the degree. The course, as a specialization training course to which the student accedes as its responsibility –optional–, deepens the knowledge acquired in InIPO together with technological skills related to the development of interactive systems, which are necessary for those wishing to acquire greater skills in the discipline.

The lack of theory and poor consolidation of the discipline were the first handicaps that we should deal with. Both, InIPO and IPO contents were changing more or less every academic course. But, at the same time, experience joined with research and teaching improvements provided us with enough know-how and knowledge to structure the master and both subjects in order to provide complete HCI curricula.

4. Interdisciplinary Master in HCI

Since current 2007-08 academic course the University of Lleida offers the first edition of the Master in HCI (MHCI). The master starts as consequence of the above mentioned large HCI teaching history and as response to the society demands. Certainly, the study plan takes the curricula proposed by AIPO as main reference but adapting to the particularities and teaching specificities.

The master is offered, with a virtual online campus as support, in semi-distance mode, using Spanish as main language and with a large participation from other reference universities and HCI related companies.

The adaptation to the European Higher Education Area (EHEA) and Project Based Learning (PBL) approach are two more important characteristics that must be taken into account.

Next sections detail the study plan and the how PBL has been structured to offer a real EHEA adaptation and the best base of knowledge to the students.

4.1 The study plan

Following the structure of the curricular HCI Master defined by AIPO society, the structure of the HCI Master taught at the University of Lleida [15] corresponds with the structure showed at Figure 2.

The figure shows four main sections:

- **Levelling block:** composed of a single module of 20 ECTS called Foundations. The purpose of this module is to achieve a levelling of the basic skills needed to pursue the remaining modules. Depending on the degree of provenance, or previous training, some of the credits for this module may be considered completed.
- **Specificity block:** composed of a single module of 25 ECTS where it is included the specific content for certification, which is necessary for any of the specializations you want to extend.
- **Elective subjects block:** composed of several modules of 15 ECTS which are offering elective subjects of the diploma.

Students who enrol in one entire module be specialized in a particular theme of the various existing in the discipline.

- **Itinerary block:** composed of four modules, two for the research itinerary and two for the professional mode. The set of two modules is, in both cases, 45 ECTS. The proposal by the professional mode is carried out to meet the demand expressed by industry participants. In addition, a research itinerary is considered essential in order to continue working on the acquisition of new tools and methodologies that are beneficial to the human computer interaction.

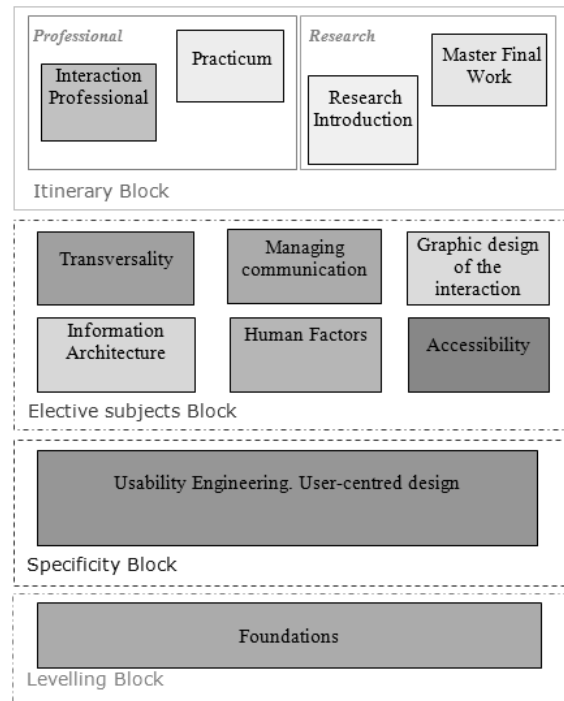


Figure 2: Structure of the HCI Master taught at the University of Lleida.

To recognize a student on professional mode, it must approach the company and know the profile of the HCI professional through a block for this specific purpose, and must also overcome, on a mandatory basis, a practicum at any of the companies of the sector. The research itinerary will be recognized to students within the master when attending the module of research introduction and perform a Master final work related to any of the lines of research in the discipline.

Table 1. Distribution of credits.

| COURSE | MANDATORY SUBJECTS | ELECTIVE SUBJECTS | TOTALS |
|---------------|--------------------|-------------------|------------|
| 1 | 45 | 15 | 60 |
| 2 | 45 | 15 | 60 |
| TOTALS | 90 | 30 | 120 |

As it is showed at Table 1, students must take 120 ECTS to obtain the title of the MHCI. MHCI is divided into two courses of 60 ECTS respectively. Each one of them is composed by 45 ECTS in mandatory subjects plus 15 ECTS in elective subjects.

Mandatory subjects in the first course correspond with all subjects belonging to *Foundations* and *Usability Engineering–User-Centred Design* modules.

Table 2. First course, Mandatory Subjects.

| Subject | ECTS | Total Hours |
|---|------|-------------|
| <i>Foundations module</i> | | |
| Psychology and human factors | 3 | 75 |
| Sociology and anthropology | 2 | 50 |
| Graphic design | 3 | 75 |
| Industrial design | 2 | 50 |
| Information systems technology | 3 | 75 |
| Interaction technologies. Styles and paradigms | 2 | 50 |
| Digital edition | 2 | 50 |
| Web systems design from scratch | 3 | 75 |
| <i>Usability Engineering–User-Centred Design module</i> | | |
| Usability engineering and UCD from scratch | 3 | 75 |
| Prototyping techniques | 3 | 75 |
| Interactive systems design | 5 | 125 |
| System evaluation techniques | 6 | 150 |
| User tests | 6 | 150 |
| Multiculturality and internationalisation | 2 | 50 |

Foundations module: attainment of a basic level of the necessary knowledge to process the rest of modules.

- **Psychology and human factors:** human cognitive processes. Cognitive ergonomics.
- **Sociology and anthropology:** sociology and the anthropology foundations. Information and network society. Globalisation.
- **Graphic design:** graphic design foundations. Techniques, uses and tools. Graphic formats.
- **Industrial design:** (interfaces) systems design in industrial environments.
- **Information systems technology:** overview of current information systems.
- **Interaction technologies. Styles and paradigms:** introduction to the interaction theory. Interaction styles and paradigms.
- **Digital edition:** written communication, writing in digital environments and oral communication. Audio-visual communication foundations.
- **Web systems design from scratch:** principles of Web technologies. Web design tools, HTML, CSS, Javascript. Web pages layout.

Usability Engineering and User-Centred Design module: to learn to develop interactive systems following Usability Engineering and principles.

- **Usability engineering and UCD from scratch:** conceptual basis for Usability Engineering and User-Centred Design process model.
- **Prototyping techniques:** the prototype concept in the context of interactive systems design. Prototyping techniques and practical exercises.
- **Interactive systems design:** the interactive systems design processes. Representing conceptual models. Tasks analysis and dialog notations. General design strategies and existing standards.
- **System evaluation techniques:** interactive systems evaluation techniques in the context of UCD. Theoretical and practical aspects, from conception to customer report.
- **User tests:** theoretical and practical aspects of interactive systems evaluation techniques with users, carried out in a usability laboratory with specialized software and techniques such as eye-tracking and remote usability tests.
- **Multiculturality and internationalisation:** culture: concept, cultural demonstrations, cultural standards, elements, differences. Internationalization and localisation. International symbols, the meanings of colours, calendars, icons, numbers, currencies, measures.

By the other hand, each student must to elect, among elective subjects (see Table 3), a total of 15 ECTS.

Table 3. Elective Subjects.

| Subject | ECTS | Total Hours |
|--|------|-------------|
| <i>Information architecture module</i> | | |
| Information architecture foundations | 5 | 125 |
| Information architecture specialization | 10 | 250 |
| <i>Accessibility module</i> | | |
| Accessibility foundations | 5 | 125 |
| Accessibility specialization | 10 | 250 |
| <i>Human factors module</i> | | |
| Human factors foundations | 5 | 125 |
| Human factors specialization | 10 | 250 |
| <i>Managing communication module</i> | | |
| Managing communication foundations | 5 | 125 |
| Managing communication specialization | 10 | 250 |
| <i>Graphic design of the interaction module</i> | | |
| Graphic design of the interaction foundations | 5 | 125 |
| Graphic design of the interaction specialization | 10 | 250 |
| <i>Transversality module</i> | | |
| | 6 | 150 |

The structure of these elective subjects enables two main goals for the students: by one hand, they can choose “to be experts” in some specialization (for example, taking *Accessibility foundations* and *Accessibility specialization* subjects from Accessibility module, 15 ECTS, the student become specialist in accessibility) or, by other, they can choose a wider knowledge of three different subjects (for example, knowledge of Information architecture,

Accessibility and Managing communication, that also summarizes 15 ECTS).

In the second course (see Table 4), mandatory subjects depend on the itinerary (professional or research) chosen by each student and correspond with the subjects in the itinerary modules. Additionally, each student also must elect others 15 ECTS among elective subjects from Table 3. So, when students finish the master they be experts in two different modules (among five) or they be experts in only one module but having additional knowledge (the foundations) about other three modules.

Table 4. Second course mandatory subjects.

| Professional itinerary | | |
|--|------|-------------|
| Subject | ECTS | Total Hours |
| <i>Interaction professional module</i> | | |
| HCI in enterprise network | 3 | 75 |
| Web classroom + company | 4 | 100 |
| Mobile devices classroom + company | 4 | 100 |
| Laboratory classroom + company | 4 | 100 |
| <i>Practicum module</i> | 30 | 750 |

| Research itinerary | | |
|-------------------------------------|------|-------------|
| Subject | ECTS | Total Hours |
| <i>Research introduction module</i> | 18 | 450 |
| <i>Master final work module</i> | 27 | 675 |

4.2 Interuniversity, Interdisciplinary & companies participation

Since early beginnings, the master [15] was conceived to be offered in an **interuniversity** context. The first idea was that students from other universities could follow it, not only from University of Lleida. This idea was unsuccessful because administrative reasons. Nevertheless, about teaching, the master is really interuniversity. So, there are 8 universities, 7 from Spain (Basque Country Univ, Miguel Hernández Univ., Granada Univ., Technical University of Catalonia, Castilla-La Mancha Univ. – Albacete campus–, Pompeu Fabra Univ., Barcelona Univ. and, obviously, University of Lleida) and one from Colombia (University of Cauca).

By other hand, being HCI a discipline that involves a large number of different disciplines, the master also should be like this, **multidisciplinary**. This aspect was also achieved with the participation of departments and knowledge areas such as Experimental Psychology, Lecture Accessibility, Library Science, Documentation, Audio-Visual Communication, Sociology (ethnography) and, not to say, Computer Science.

Other important challenge was to offer a master, mainly for professional line, as much close to the real HCI marketplace as possible. This was achieved with the participation of experienced people coming from **HCI related companies** (four people from

the most important in Spanish market). Other came by their own (two teachers that develop interactive systems following HCI aspects since about ten years).

At the moment of writing this paper we have surpassed the middle of first course and we can provide some important features that we encountered and would like to highlight:

- Teachers or professionals that reside far from Lleida used voice and video conference systems that enabled the classes following and participation.
- Such amount of different involved people requires a coordination effort bigger that we thought at the beginning and sometimes the result was not good as we expected.
- By other hand, the professional's participation is especially appreciated for the students, so they can hear, talk and discuss with people that works everyday in HCI related aspects. Their view enhances and gives more sense to the most theoretical parts.

4.3 Semi-distance modality supported by an online virtual campus

The master was conceived to be followed by students who, probably, at the same time have their own occupation (because they work). Additionally, we are aware about that, in Spain, the most important professional HCI jobs are offered in Madrid and Barcelona. So it was very clear that the students of the master need different manners for studying it. People from different Spain localisations, as well as people who have full-time or part-time jobs do not have enough time to assist to classical class sessions.

By the other hand, it is impossible to understand HCI discipline only from a theoretical point of view, because it is a very practical discipline.

All of them were the reasons because we choose the semi-distance modality for teaching the master. This modality allows minimizing the number of classes that a student needs to witness assist, but at the same time it is necessary the use of an online virtual campus. At **Error! No s'ha trobat l'origen de la referència.** it is showed a screenshot from sakai, the online virtual campus used in the University of Lleida [21].

This tool, as some similar tools do, offers the possibility for follow the master's subjects from anywhere with an Internet connection. Students have access to the contents, the exercises and space to discuss about some specific aspects related to each individual subject. But, although all this tools are very useful with theoretical concepts, it is necessary that students conduct their practices in a proper context. For this reason the Master has different sessions organized throughout the academic year, with the goal of bringing students to work in groups, among others in the usability lab, the global study case of the Master, as the tool to apply problem based learning methodology.

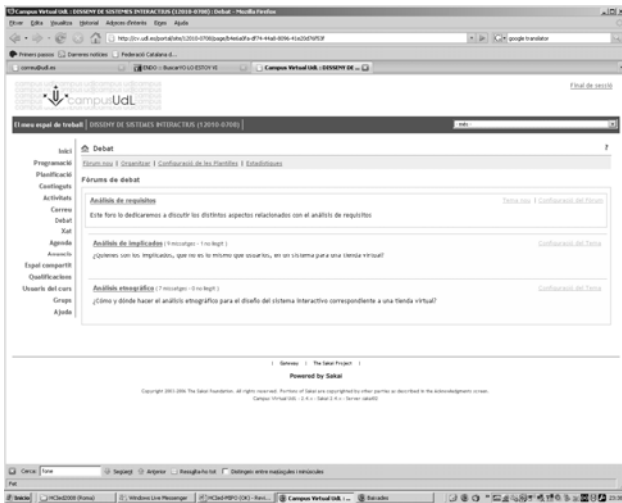


Figure 3. A Screenshot from Sakai

4.4 How to apply the PBL to the master

For the semi-distance modality that the master is offered, the classroom hours with the teacher are devoted to go beyond the classical class. Detailed subjects materials are distributed to the students so they can get deeper into subjects in a quite independent way. Then, classroom sessions are dedicated to collective discussion about the different aspects of the subjects' content. In order to assure students participation, there is a detailed planning of the content discussed in each session in order to facilitate that students consider it in advance.

In the levelling block, the discussion sessions are not the only teaching tool (just 40%). The learning process is backed up by the resolution of problems or study of cases (60%). However, the objective is to configure a multidisciplinary HCI master. Therefore, we consider it necessary to go beyond Problem Based Learning to Project Based Learning. This is one of the more consolidated learning process methods in the upper education institutions of the western world.

Project Based Learning (PBL) can be defined as a "systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks" [16]. Projects range from brief projects of one to two weeks based on a single subject in one classroom to yearlong, interdisciplinary projects.

Evidence shows that PBL enhances the quality of learning and leads to higher-level cognitive development through students' engagement with complex, novel problems. It is also clear that PBL teaches students complex processes and procedures such as planning and communicating. More concretely, it is reported that PBL provides, among other features, the following ones that are very relevant to the master objectives:

- Overcomes the dichotomy between "knowing" and "doing", helping students to both "know" and "do."
- Supports students in learning and practicing skills in problem solving, communication, and self-management.

- Encourages the development of habits associated with lifelong learning, civic responsibility and career success.
- Integrates curriculum areas, thematic instruction, and community issues.
- Assesses performance on content and skills using criteria similar to those in the work world.
- Creates positive communication and collaborative relationships among groups of students.

Consequently, the discussion sessions (30%) are combined with support sessions for the development of the proposed projects (70%). Projects constitute the core element of the whole master while the different modules establish the curricular itineraries and give coherence to the different options.

This seems the appropriate method in order to make the master address the requirements of the European Higher Education Area (EHEA). In order to facilitate an integral evaluation of all the competencies that are addressed by the master, the best choice is to follow a PBL approach. This approach allows evaluating the competencies specific to the HCI aspects of the master, but also other more general competencies required by the industry and research profiles like collaborative work, time and resources planning, etc.

Moreover, if a global project is established for all the master subjects, it is possible to establish a common framework where all the knowledge can be integrated. However, a clearly defined development process for HCI projects must be considered. It must accommodate the different aspects to consider during the development of an interactive product in order to guarantee and acceptable level of usability and accessibility of the end product.

The methodology for developing usable and accessible interactive systems, known as User-Centred Design (UCD), is based on an iterative development process based on a detailed study of the users' needs, the tasks they carry on in order to meet them and the context in which they are performed [19]. There are many UCD development processes proposals, but all of them provide a mix of software engineering plus usability and accessibility engineering tasks. One particular proposal, which combines both disciplines in a neat way thus facilitating its adoption, is the usability and accessibility Engineering Process Model (MPIu+a) [9], that is used in the master

This UCD proposal, as other software development processes, starts with the requirements gathering phase. However, the emphasis is placed on users. First of all, it is important to know who the users are. Then, the following step is to identify the tasks they are going to perform.

The development process continues with the common software engineering phases, i.e. design, implementation and launch. Despite these similarities, the focus continues to be placed on the user. All the previous phases, from requirements to launch, are considered in the master subjects related to Interactive Systems Design (ISD) and Web Systems Design Initiation (WSDI). Moreover, there are other subjects that also participate during these phases, the ones related to Information Architecture (IA), Graphic Design (GD) and Digital Edition (DE). Figure 4 shows, in a graphical and more comprehensive way, how different subjects involved in PBL are distributed around the DCU used model.

In order to keep user needs present during the whole development process, the previous phases are complemented with two additional ones that are performed in parallel, for each process iteration, prototyping and evaluation.

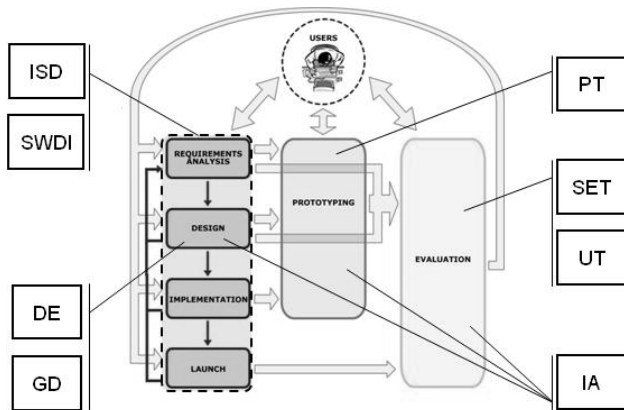


Figure 4. How different master subjects fit with the used DCU model (Usability and accessibility Engineering Process Model, MPIu+a).

Prototypes are created from the beginning, for instance paper prototypes [21], which do not require any implementation, or simple applications with limited functionality. All of them are used to evaluate the system with users so their requirements are taken into account and contrasted with the developed system just from the beginning and through all the development process iterations. This part is covered by the Prototyping Techniques (PT) subject, though the Information Architecture (IA), Graphic Design (GD) and Digital Edition (DE) subjects are also involved in this part.

Once developed, prototypes are tested with users and experts in the evaluation phase. Evaluation techniques are considered in the System Evaluation Techniques (SET) and User Tests (UT) subjects. There are three kinds of evaluation methods:

- **Inspection:** these evaluation methodologies are performed by experts, the evaluators, that inspect the usability and accessibility aspects of the system based on a set of guidelines, e.g. heuristic usability evaluation and walkthroughs [18].
- **Inquiry:** the objective is to draw usability conclusions from observing and talking with users. There are surveys, interviews, field observations, focus groups, logs analysis, etc.
- **Test:** they are performed in a controlled environment, usually a usability laboratory, where specialized software applications are used to record and analyze the whole interaction, i.e. screen capture, key strokes, mouse clicks, user video record and voice,... while representative users interact with the system or a prototype. This part is considered in the User Tests subject and carried out in the GRIHO's usability laboratory. This laboratory is equipped with commercial software such as Morae [17] for usability

testing, JAWS [13] for providing accessibility experience to the students or, specific tools (developed by ourselves) for card sorting or heuristic evaluations.

As it has been shown, the different master subjects concentrate on different parts of the DCU model. In practice, the DCU model is applied to a project proposed at the beginning of the first year master course. This year project is related to the development of an online store. From this initial and general set of requirements, each subject states one or more engineering process tasks to carry out and a complementary set of requirements that help focusing on the task at hand.

The development process corresponding to each subject is carried out during the period of time devoted to that subject, starting from the results obtained from subjects devoted to previous tasks in the development process. Consequently, it is possible to put into practice all the content from each subject in an integrated and complete way through the whole development process of a typical HCI project.

5. ACKNOWLEDGMENTS

The master would not be a reality without the participation of different people from universities and HCI-related companies around Spain and Latin-America that, with a lot of voluntarily, had been involved in.

Not forgetting our deceased director, Jesús Lorés, who was the master's soul.

6. Conclusions

This paper explains a recent experience about starting a Master in HCI in the Spanish-speaking context. It explains the followed path since the early HCI years (not long ago), through the AIPO initiatives and, then, the GRIHO research team that believed in the project and took the challenge to run the master.

After some months (the master started in September 07) we would like to express some thoughts on the master.

Students, in general very participatory and motivated, highlight the professionals from the companies' participation. They provide for each item a deeper insight from the most theoretical given from the university teachers.

At the beginning, PBL methodology surprised the students. The fact to solve a huge project to carry out throughout the course and, mainly, distributed among many subjects were amazed and seemed difficult to resolve. However, now it is looking like a case closer to reality and they are facing in a very positive way.

From organizational point of view, it should be noted that managing a new master with very ambitious goals and to coordinate such a large number of teachers will never be easy. On the one hand, the majority of them reside very long from our school and coordinating timetables is a complex task. Not to mention about, by other hand, the different content, points of views and methodologies. One particular aspect sometimes is taught or putted in practice (depending if it is managed by university teachers or companies professionals respectively) in a different way.

Finally, we are convinced that in next master's editions negatives aspects will be corrected, positives reinforced, and some others will be improved.

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