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# Final Qualifications Work Definition in the EHEA

Mercedes de la Cámara Delgado, F. Javier Sáenz Marcilla
and Eugenio Fernández Vicente
*Universidad Politécnica de Madrid, Universidad Politécnica de Madrid &*
*Universidad Rey Juan Carlos*
*Madrid*

## 1. Introduction

The environment of this study is the European Space of High Education (EHEA) that the European Economic Countries (EEC) has proposed, in the Bologna Declaration. In 2010 thirty three countries will must adopt a system of easily readable and comparable degrees, with two main cycles, and establish an European Credit Transfer System (ECTS). The main objective of this area is to improve the quality of teaching, learning and investigation at the universities of the European Economic Community (EEC). The adaptation to the norms defined in this area supposes for universities a big challenge whose attainment will allow them the integration with this area. The EHEA tries to establish a system of homogeneous degrees and post-degrees, in the EEC countries, with a new model of teaching and learning.

The EHEA proposes for his curricula a mandatory final subject for degree or master work called Final Qualifications Work (FQW) including between six and thirty European Credit Transfer System (ECTS) (European, 2007) (BOE, 2007) The main target of this subject is the acquisition by student of a set of knowledge, skills and new research capacities oriented to the society requirements (ANECA, 2005). The definition of the new degrees demands a reframing of their current curricula, orientating them to the professional's formation or their preparation for a third cycle of formation. Our job has been oriented toward these objectives.

The frame that we have chosen in this study for the analysis of the state of the FQW has been Polytechnic University of Madrid (Universidad Politécnica de Madrid, UPM) and Juan Carlos King University (Universidad Rey Juan Carlos, URJC). Both are characterized by offering engineering degrees. Later we focused it to the Computer Science Engineering degrees on public and private universities in the Community of Madrid (Comunidad Autónoma de Madrid, CAM)

This chapter presents a reflection about the FQW and proposes a set of best practices whose application could facilitate his definition and implantation in the curricula in the EHEA. The following sections show the method we have followed in order to obtain the proposed best practices. First of all we present the environment we have chosen in order to define these

best practises, next the processes included in these best practices and, finally, the conclusions and future lines for the realized work.

## 2. Method of work

First of all, as it has been said before, we choose the universities that formed the environment for our study. We study the information about the FQW that we could bring over the webs of thirty three universities.

This information was classified as information for the administration and information about the accomplishment of the FQW. We were surprised because most of faculties and centres of all the universities were showing information only for the administration. This was the reason we began to define the FQW as a service and then the actors that they take part in a FQW.

Once the actors were identified, we were able to define the objectives for each one and then their activities. Each one would need different input information and would produce different output information. So we could study and think about the phases of the life cycle for a FQW and the activities and products in each phase for each actor.

The process involves actors as students, teachers, personnel of administration and external organizations agents. As a result of this study we can obtain a set of templates, we could catalogue different types of FQW, and supply for each actor the information and a method to make his/her work, all of this inside of the life cycle of a service.

## 3. Studying the environment

Usually FQW is a key subject for the definition of most of the engineering degrees. Initially it was denominated Final Year Project (FYP) but it has been evolving, throughout different curricula in different schools and faculties, towards the FQW. Also, there are faculties, whose degrees are not included in the engineering environment, which consider in their curricula a Practicum as a subject necessary to obtain the degree. This article tries to show the present state for these subjects at the engineering degrees and contribute to some best practices which facilitate their definitions and the inclusion in the curricula in the EHEA and the EEI.

An analysis of the state of the FQW has been made and the framework chosen for this study has been the UPM and URJC. Later we have focused this environment to the degrees on Computer Science Engineering of other public and private universities in the Community of Madrid, and it has been more detailed for the University School of Computing of the Polytechnic University of Madrid where they want to adopt a system:

- of easily readable and comparable degrees,
- with two main cycles (graduate and postgraduate), and
- Establish an European Credit Transfer System

Our job has been oriented toward these three objectives. We have focused it on thirty three Spanish Universities that together with the ANECA, have developed the White Book for the Computing Engineering Degree (ANECA, 2005). This book is signed by the totality of the Spanish universities where the Computer Engineering Degree is offered, on one or several centers, and all of them propose the FQW as a mandatory subject. We are going to detail our study at universities of Community of Madrid, where there are eight public and six private universities in which Computer Engineering Degree is taught.
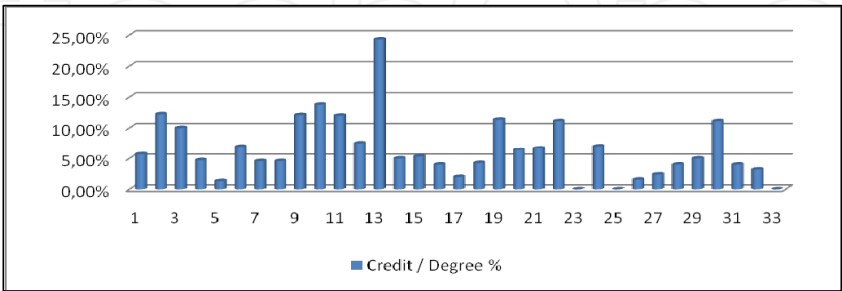


Fig. 1. Percentage of Credit for FQW in thirty three Spanish Universities

First of all we are going to see the current average number of credits for the FYP and then we will see a possible evolution for the FQW in the EHEA. We have to separate the Computer Engineering Systems and Management three-year degree, and Computer Engineering Degree of four or five years, and we can see that the percentage of credits for the first is slightly higher than for the second. Those percentages approximately match 10 current credits.
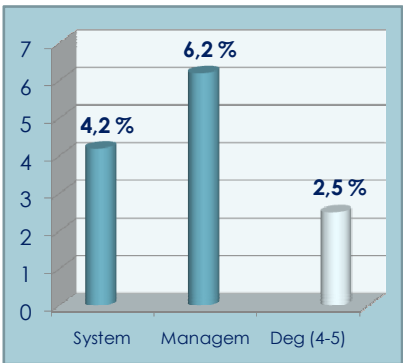


Fig. 2. Credits Number for FQW before 2010 in System, Management and Degree

Our approach for 2010 according with the ANECA and ACM curricula proposes a four-year degree with 240 ECTS and 12 ECTS for the project, which involve 300 working hours. The percentage will be slightly higher than now, but the number of working hours is three times superior.

The UPM and our University School of Computing provide professionals in Information and Communication Technology and Engineers to the society and, in order to obtain the degree, they have to make the FQW. When the students want to know what the FQW is, he has different sources to look for this information. Frequently he or she uses the teachers´ knowledge to do it, but the most important source of them is based on internet.

We have studied the website of all universities in the Community of Madrid and found that there are a lot of specific information about administrative procedures but there aren't any specific technical information related to FQW, such as:

- Actors and roles of a project
- Number of credits
- General and specific objectives
- Type of projects
- Where to make it

It is fundamental to know how the FQW is defined in every faculty and which are its most important aspects: what is a FQW, which are their objectives, how it must be made, when and who must be involved in every stage. The UPM and URJC has delegate these definitions to its faculties and everyone of them will have to decide the adaptation of the FQW to its curricula, endowing it of a number of credits and deciding about its nature and how the FQW will fit with the aims of the faculty and the necessities of the society.

A few web sites show information that can help to the actors (students, teachers, personnel of administration and external organizations agents) during the development of the FQW. More than 90% of the web pages we have investigated correspond to faculties of computing science. Instead of information related to the definition and management of FQW, they have information about deadlines and for managing the project. It is different from other type of faculties where the stress is on the information related to what a project is, objectives, kinds of projects, way of evaluation...

The focus varies from a faculty to other, from being an way of communicating information for management to being a real help for the knowledge of the basic concepts related to a FQW and the way different actors are implied.

Only a 17% of faculties at UPM have defined their curricula totally adapted to ANECA´s recommendations in order to join the EHEA as soon as possible. None of these faculties have defined, or at least have published in his webpage, information related to the definition and management of FQW. This fact is the main cause that has induced us to propose a pack or activities or "best practices" (BP) to help to define the subject FQW as an important part of the engineering degree curricula in the scope of EHEA, and consequently to improve the learning and teaching process.

## 4. Best Practice to define the FQW

This way, to define and to make public this technical information about the activities that each actor must realize during the elaboration of a FQW, we decide to consider it must be a service that the university has to offer, in which different types of actors take part. This service has four types of actors: students, teacher, administration personnel, external managers and collaboration agents. First of all we have established five phases for making possible the definition, development and evaluation of the FQW, as well as the reviewing method.
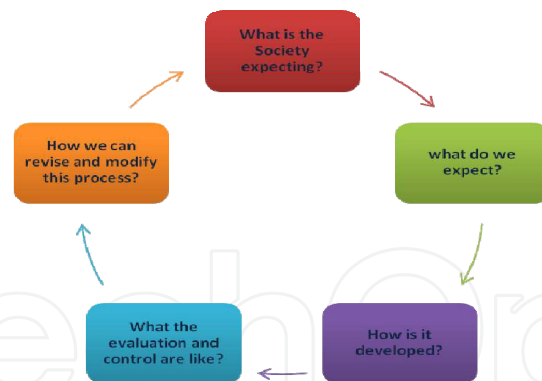
Fig. 3. Life Cycle in Five Phases

So, as we can see on Fig. 3, the first step of this method proposes the definition of what the society expects from our students. The second step is about to know and define what we expect from the FQW. We need to know what we want of the FQW in the Computer Engineering Degree curricula. In third place, we have to define how we want the FQW to be developed. And, of course, for the forth step we need an Evaluation of the FQW in order to know its state and measure it. Finally we need a phase where we can review this method, its techniques and tools in order to improve it. For each one of these steps we have defined a set of best practices which allow us to implement them. We have codified our best practices with the letters BP before the number of the phase and followed by a number (BP101).

For the first step of the life cycle we propose:

BP101.- **Requirements Elicitation of the necessities of the companies**. We need to know the requirements of the organizations and the way to define and classify different types of FQW adapted to their different needs. Teachers, personnel of administration and external organizations agents take part in this activity. We have designed some templates that can be used in different meetings and that will allow us to know these necessities. The teachers might prepare FQW with identical aims to the needs of the organizations; the personnel of administration could manage the necessary templates that students will use and that could be monitored by the teacher.

BP102.- **Establishment of contacts with companies** to define, according to both points of view, the project main aspects. The contact with the enterprise world must be realized so that it makes possible to have their necessities updated, and to check the continue update of FQW's lines. It is of great importance to count on teachers that share working day between the university and a company. They could help to other teachers and students. A good definition of this role is necessary because they have an important role between the society and university world. The special activities those teachers have to realize always must be focused on showing the FQW students the importance of their professional activity. The information of these activities is focused on the definition and planning of the skills that the students have to acquire.

BP103.- Teacher must **gather real information from the companies and define lines of work** as useful as it could be possible in order to help the students when they were looking

for their jobs after obtaining the degree. The profile of the students and their needs of training will be defined for the best accomplishment of the FQW. The aim of this complementary learning is that the students can develop special skills during the realization of the FQW.

BP104.- In the last activity for this phase the teacher will be able to make an **analysis of the information described above and define clearly**: capacities the student will have to develop, which abilities is going to acquire, what responsibilities will be able to assume, which techniques and methods must know, what criteria will have to know to decide among different alternatives based on the type of project. Teachers´ role is very important for this activity. They will guide and train the students with the methods and techniques, and will instill the criteria that they will use as future professionals and, of course, will help them to adopt their own criteria.

University must return to the society professionals and scientifics. Each university develops its self strategy and the activities in the second phase according to this strategic plan. If the BP104 is clearly defined and carefully implemented, it will be possible to decide what we expect from the FQW. In this step the human behavior and the relationships inside the university or in an enterprise are of great importance. In order to define this phase we propose a new set of BP:

BP201.- The Definition of the **human** and **social relationships** that imply the accomplishment of the FQW. In this activity take part the personnel of administration and the teacher. It is necessary to define this relationship in order to transmit to the students the value of these aspects. A table with the role and behavior of the student and his/her relation with others students or the teacher or personal implicated in the job will be elaborated before the begin of the FQW.

BP202.- The Definition of the **moral** and **legal implications** that entails the realization of a FQW, from all points of view (company, job, rights,...). Each university has its own laws and also must response to the legal implications the groups that it is a member (CAM, EEES…) are committed. The constitution and strategy of the university define the groups where each university is integrated. The behavior of the participant in the FQW must always be according to the behavior of these groups.

BP203.- Define the **contract templates** by which the faculty and the student are committed on fulfilling their respective responsibilities. A template for the agreement between company and university must been developed in order to establish both necessities and objectives. The objective of this activity is define the requirements of the company where a student will make the FQW but without forgetting that the university's principal aim of the FQW is to acquire skills and knowledge during its elaboration. It is absolutely essential to define which will be the aim of the work, to make a plan for the same, and a guide for the students that helps them to develop his/her job and to be able to know its evolution.

BP204.- Facilitate the creation of a **work group** to develop a **bigger project** joining the efforts of several students. All activities the student will develop in his/her professional life will be

represented in a work group. The preparation and definition of the different roles and activities inside the work group can help the student to know different ways to communicate and collaborate in order to obtain a common objective. In this step, the definition of these groups must be made according to the university strategy, objectives and its investigation lines.

BP205.- The university has **to** establish the **mechanisms** to **provide** the student with **methodologies**, **techniques**, and **tools**, ... in order to allow them to consult, acquire and select the best alternative to develop his project. The personal of administration and the teacher must collaborate to obtain agreements with different companies through which they will give the university adequate information with which the students could become accustomed and lately use it in their professional life. The role of the teacher is to know the different tools and techniques that the companies use in their daily life. These agreements must be updated each year according a plan and it is necessary that the students know the rules of these plan. The information given to the student shows the tools and techniques, companies and projects.

The approach of the third phase is focused on the elaboration of the FQW. Students and teachers are the principal actors. The tutor role is basic for a good performance of the students. Teacher will have to be centered in this role and go off some administrative labors like looking for the teachers that will take part as a member of the examining board.

BP301.- Definition of a mechanism for **assignment of a tutor** without delay and take into consideration that project supervision is part of the educational workload, trying to avoid overcharged teachers. This BP is very important for the students and teachers. If the lines and subjects for the FQW are well defined, the assignment of a tutor for each FQW will be possible and easy. It is necessary that this mechanism shared out all FQW among all teachers of the centre. It will be necessary to establish the FQW like a subject where the teacher effort will be bear in mind, control, define the different activities the teacher and student will make and the objectives.

BP302.- Definition of a "**tutor schedule**", in which landmarks were defined as well as the activities that have to be carried out to achieve every landmark. This job will be necessary for the evaluation and management of the FQW when it was necessary a external tutor for the student. This tutor will be "the guard" and he/she will help and keep conversations and meetings with the student and university tutor to monitoring the FQW. So, student, internal tutor and company tutor are implied in this BP. They have to define different templates in order to monitoring the FQW.

BP303.- Facilitate mechanisms that allow to use both knowledge acquired during the studies and new information and skills acquired during the development of the project.

BP304.- Establishment of the mechanisms for continuous evaluation of every landmark, defining the aims to reach and the skills to develop.

The fourth pack of BP is related to the evolution and control of the project, in order to identify problems in the earlier phases:

BP41.- Establishment of the "matching degree" between the work done and what was expected to be done. It will be very useful for the students and teachers.

BP42.- Definition of the ways that allow to restart abandoned projects.

BP43.- Definition of mechanisms that permit the student to adequate his work to his personal circumstances at certain moments.

BP44.- Definition of "supervision templates" adapted to all the BP defined.

BP45.- Definition of the evaluation criteria to evaluate every phase in the project development.

BP46.- Establishment of the mechanisms to validate the FQW credits.

The last pack of BP is related to the review of the FQW lifecycle itself. It is focused on the possibility of modification of the initial definitions, allowing to change, in a controlled way, some basic aspects of the project:

BP51.- Definition of a mechanism to audit the process, to evaluate the degree of fulfillment of the objectives set at the beginning.

BP52.- Determining the success based on the marks obtained by the FQW when presented.

BP53.- Evaluation of the degree of fulfillment of the objectives related to the companies involved in the project, detecting any deviation and defining the measures that must be taken to correct such deviation.

BP54.- Determining the possible new demands of the students and their initiatives. It will be necessary to adapt these initiatives to the objectives of the university and the companies.

BP55.- Determining the possible new demands of the companies involved in the project. The students come back to the society with a worker role and can help the teacher to know new and different aspects for the FQW.

BP56.- Try to achieve the implication of the direction teams of faculties or universities, during all the lifecycle, always according to the recommendations of the EHEA.

It is important that all those BP were known by the entire university community, providing all the mechanisms to broadcast the information related to FQW and the possibility of reviewing of those mechanisms.

## 5. Conclusion

- We have defined a set of BP for the definition, execution, supervision and revision of the process of developing a FQW, as well as its evaluation, permitting to adequate it to what the society demands at every moment.

- Every actor into the process has defined his/her role. And the responsibilities for the project are divided into all of them, knowing each one his/her own responsibilities.

- FQW is seen as a learning matter supported by a group of mechanisms that help to reduce the index of failure and the teachers´ discouragement caused by the waste of time and effort.

- We have new control points to measure and evaluate the effort made by students and teachers.

- These BP can be applicable not only to computer engineering studies but to all the technical studies.

- This study can be considered as a first step in the definition of FQW as a subject in the curricula of European universities.

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