DESIGN OF AN INNOVATIVE LEARNING EXPERIENCE FOR THE FINAL PROJECT OF THE BUILDING ENGINEERING DEGREE

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Abstract

This essay presents the bases for a new teaching methodology for the Final Project of the Degree of Building Engineering. The aim of this methodology is to approach students to advanced forms of work in architectural and engineering offices by employing Building Information Modelling (BIM) technologies. This initiative has been funded within the Call 2011 for Teaching Research Incentives of the I Teaching Plan of the University of Seville. Following the guidelines of the European Higher Education Area, the learning experience designed has to enable the future Building Engineers to acquire specific and generic competences ascribed to the Final Project in the Verification Report of the Building Engineering Degree.

The specific competence "E71. Presentation and defence before a university board of a final project, consisting of an integration exercise of the formative contents received and skills acquired through the degree" is trained by the development of a building execution project with the use of BIM technologies. For a decade, architecture and engineering offices have increasingly been incorporating in their projects new tools for information processing in digital integrated systems, i.e. programs which allow the construction of building virtual models in three dimensions, and the identification of their constructive components, providing them with parametric dimensions. The operating capacity of BIM programs is stronger than that of 2D drawing programs, since they can manage and generate all the technical documentation in an integrated way.

As far as the generic competences are concerned, the problem is that the Final Project has ascribed twenty four competences and their training and evaluation throughout a single term, which seems rather unattainable. In order to solve this matter, the four most important generic competences of Building Engineers have been identified according to their professional profile: "G01. Capacity for organization and planning", "G06. Information management skills", "G09. Ability to work in an interdisciplinary team" and "G13. Positive social attitude towards social and technological innovations". The use of BIM technologies and collaborative work methodologies allow the training of these generic competences.

Finally, assessment matrixes of the five competences involved have been established with the descriptors of the assessment indicators for each of their corresponding criteria at each level of student achievement. This study is limited to the design of the experience; its implementation could be carried out in the first term of the 2012/2013 academic year, provided the main pre-requisite are met by students, and command of BIM programs such as ALLPLAN, REVIT or ARCHICAD, is achieved. Aware of this challenge− since BIM programs are taught as optional subjects− a curricular line for students interested in participating in this experience is also proposed for the next academic year.

Keywords: Building Information Modelling (BIM), technology, cooperative work, generic and specific competences, Final Degree Project (FDP), Building Engineering Degree.

1 INTRODUCTION

Currently, the improvement of Spanish university teaching involves the knowledge and construction of the European Higher Education Area (EHEA) in which it is located. The EHEA is much more than a collection of agreements and common processes between forty six European countries; it is an international meeting area focused on the creation of an excelling European university, able to qualify the professionals that the XXI century requires. The harmonization of the university studies engaged relies on the following four basic principles (Universidad de Sevilla, 2012):

- Common formative unit of measurement: the European credit (ECTS).
- Common formative structure: Undergraduate degree – Master – Doctorate.
- Quality warranty.
- Information openness.

Following these four principles, an interdisciplinary teaching team of the Building Engineering Degree of the University of Seville proposes a teaching model for the Final Degree Project (FDP) a subject, which integrates the student learning experience achieved through the degree and transfers it to society. This model will be experimentally implemented in a group of students, in a number of no more than ten, which meet the requirements previously established in the following academic year 2012/2013.

FDP is a subject in the last academic year of the Building Engineering Degree of 12 ECTS, which corresponds to 300 hours of student work. The main goal of FDP is to prove the ability of students to apply the knowledge, skills, values and attitudes acquired through the degree in their professional practice. In order to achieve this goal, the teaching model proposed emphasizes the necessity of a practical and innovative methodology, which allows students to meet the role of advanced Building Engineers. This innovation is achieved through the use of Building Information Modeling (BIM) technology, the development of cooperative work and the implementation of a Project Based Learning (PBL) methodology.

2 SPECIFIC AND GENERIC COMPETENCES

The Verification Report of the Building Engineering Degree establishes the competences that must be trained and assessed in FDP. These competences are divided into a specific competence and twenty four generic competences which have been previously introduced along the degree.

The specific competence E71 consists in the presentation and defence before a university board of a final project with the capacity to integrate the formative contents received and skills acquired through the Building Engineering Degree.

On the other hand, as far as the generic competences have been trained and assessed along the degree, it seems unnecessary to assess all of them once more. Hence, the main generic competences involved in FDP have been identified in order to assess and work with them: “G01. Capacity for organization and planning”, “G06. Information management skills”, “G09. Ability to work in an interdisciplinary team“and “G13. Positive social attitude towards social and technological innovations”.

3 BASES OF THE EXPERIENCE OF SUBJECT INTEGRATION IN PFG

The main basis of the proposed co-operative task is the constructivist educational orientation with regards to the development of the activity, shaped according to previous requisites the part-takers must meet.

3.1 Constructivist orientation in the design of the model to carry out the experience

The proposed PFG model consists in carrying out the Architectonical Execution Project starting from the virtual scale model as a Basic Project, and using for this purpose BIM Software. In this model, students are to take active part in the search of information, re-shaping of the given virtual scale model, and management of the work team, with the final goal of completing, validating, and optimizing the execution project assigned by the teaching staff.

With regards to methodology, error is to be taken as a part of the skill-acquisition process, aimed for students to obtain the necessary strategies comparable to their learning process in a professional environment.

According to Herrero (2011), “placing them in the line of learning architecture: knowing how, depending on what, where, and when learning is done.” Therefore, our proposal pursues two very different targets that meet ends in the authenticity that is reflected in what could be a professional assignment.

- Teaching target: to develop a teaching-learning methodology able to include the knowledge acquired throughout the Degree in Building Engineering, and train all the competences of the subject. This methodology must be flexible, dynamic, active, and focused on the professional practice the future building engineer will face when entering a working environment.

- Professional target: to develop an efficient working methodology based in the use of BIM technology, and working in co-operative team, as done in architecture and engineering offices.

3.2 Students’ Pre-requisites

Students taking part in the experience must have a previously acquired basic knowledge of BIM technology programs. This knowledge can be acquired in any of the following procedures:

3.2.1 Passing grade in Computer Design and Virtual Scale Modeling: A subject available in the fourth year of the grade at ETSIE Seville, and in which BIM technology programs are used.

3.2.2 Passing grade in the courses of Permanent Development Centre of the University of Seville: Courses in Specialised Training which use BIM technology to develop architectural executive projects using the Allplan program.

3.2.3 Attendance to official courses that guarantee a level of knowledge similar to that obtained through the previously mentioned means.

This required knowledge will encompass the following operating skills:

a. Creation of virtual scale models through BIM technology programs.

b. Application of rules for graphic creation and representation in architecture.

c. Organization of the creation of an architectural graphic Project from virtual scale models.

d. Exporting and importing IFC files−except for those in DWG or DXF formats−to calculus specific programs.

e. Use of calculus specific programs such as, TRICALC, SCIA Engineer (ESTR./INST./CALIF. ENERG/…) and measuring programs (ARQUIMEDES/PRESTO. GEST…).

A practical test on the students’ skill using BIM technology could also be a desirable evaluation tool.

3.3 Professors’ Pre-requisites

The proposed teaching model for PFG must be tutored by a team of professors with an expertise in the different fields involved in the elaboration of executive projects and in the design of virtual scale models using BIM technology, and a professor with building background and mastery in teaching innovation focused on skill acquisition.

Thus, the part-taking professors of the teaching team will belong to the areas of Architectural Graphic Expression, Continuous Media Mechanics, Structural Theory, and Ground Engineering and Architectural Building. This team has taken active part in teaching research and innovation projects since the school year 2009/2010(Cortés et al., 2010 y Cortés et al., 2011), related to transversal subjects in the degree in Building Engineering.

4 ISSUE DEFINITION

Improving the outcome in architect offices requires examining the relationship between the different professionals involved in the process of execution of an architectural project, and exam that will show the importance of BIM technology based programs will have in the future of this intercourse. (Gaudioso, E. et al., 2009).

4.1 Identifying the issue

The advance that architecture working methodology has experienced in the last years is, no doubt, intimately linked to the evolution of CAD programs in which BIM has a strong influence.

4.1.1 Classical working system

In the traditional way of producing projects (figure 1), we can find that the Architectural Project is but an articulated series of independent projections: plants, elevations, and sections that together render its defining graphic documentation. It is perhaps computer science that offers the most ample possibilities to contribute to the work of an architect; CAD has evolved in the past twenty years in the process of building design, although this system is no more than a continuation in the work of a draughtsman.

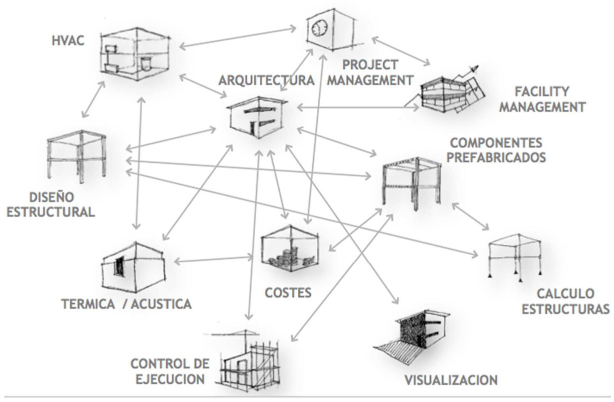

Fig. 1. Classical working system.

4.1.2 BIM technology based working system

This multidisciplinary co-operative system brings about a new approach that ought to be taken into consideration in the educational system for those future professionals in the designing and building construction fields.

The introduction of BIM is an ever the more important matter in the building and construction industries which are facing enormous challenges and obstacles with regards to increasing productivity, efficiency, quality, and sustainable development.

BIM technology aims at managing the Life Cycle of The Building Project (figure 2). The digital scale model provides through simulation with the possibility of a virtual tour of the design and management processes of the building prior to the beginning of the work, enabling all the involved professionals to actively take part in the process, and improving communication and error detection on the early stages of it.

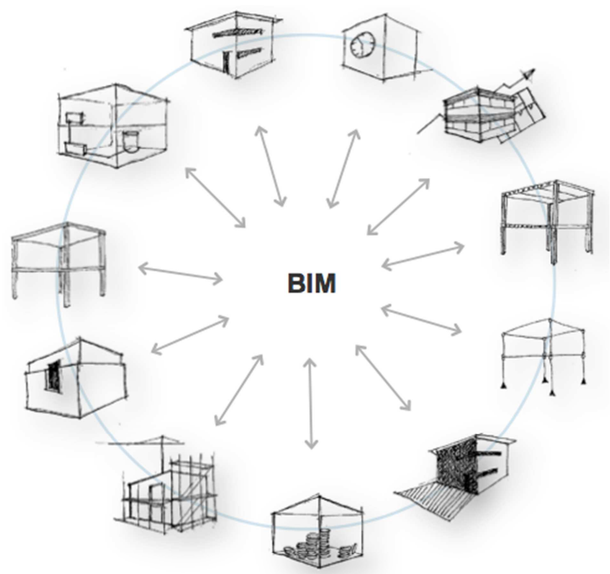

Fig. 2. BIM Technology-based working system.

4.1.3 Challenges of the new system

As it can be easily seen, the application of a new system means a profound change in the organization and structure of architect offices:

a. Diminishes draughtsmanship processes.
b. Requires fully-qualified professionals, having as a result a reduction in the number of draughtsmen.
c. Increases the managing process.
d. Urges specific training for its use.

4.3 Approach

Our target is to establish a BIM technology-based working procedure in the creation of executive architectural projects in the PFG subject at ETSIE University of Seville, using as an operative starting point a virtual scale model generated by co-operative programs that use measurable objects.

From a teacher-generated virtual scale model, at the level of basis Project, and given its defining graphic documentation, students are requested to provide:

a. Critical analysis (qualitative), and identification in the proposed virtual model of the measurable components.
b. Creation of IFC reference models or sub models, necessary for the Exchange of information with the structure calculus, installations, and energetic efficiency programs.
c. Structure Calculus, Installations, and Energetic Efficiency.
d. Re-designing of the original virtual scale model, including the changes made.
e. Cost analysis from the information gained through the different used programs.
f. Generation of written and graphic documentation requested by the CTE for the executive architectural project.

5 WORK PROCESS MODEL

In the qualitative analysis, the student must make a reasonable reading of the proposed design, based on the data presented and oriented to the pursued goal.

5.1 Work strategy

The aim of the proposed teaching-learning process is to train the students in the development of cross-grade materials in order to develop a technical project within the framework of the duties of the building engineer through collaborative working techniques with technology BIM. This process is broken down into the following seven stages of work.

5.1.1 Project Management. Competences: G07, G09, G10, G12, G23, G24

- Development of strategies.
- Identification of the work to be performed.
- Formation of working teams composed of five students and weekly assignation of roles (BIM coordinator, specialist in structures, specialist in facilities y cost specialist) and tasks.
- Establishment of mechanisms for communication and control.
- Holding of group meetings weekly where the roles of participating students will be dealt (BIM coordinator, specialist in structures, specialist in facilities, cost specialist) and the work, done throughout the week, will be shared.
- Literature review with a professional, commercial and teaching character what can enrich the experience.
- Installation a virtual network that allows participants to work on the same model and share information in real time.
- Analysis and evaluation of the trained competences in the experience. Identifying strengths, weaknesses, opportunities and threats of the work methodology implemented.
- Identification and implementation of proposals that provide improvements to the working methodology implemented.
- Extracting the final conclusions in relation to the teaching-learning methodology implemented.
- Diffusion of the proposed design, experience and results obtained between the university and professional community.

5.1.2 Information and analysis. Competences: G05, G06, G18

- Reception of the building virtual model defined to basic project level.
- Study of the virtual model. Identification and characterization of its components: site, foundation, structure, envelope, facilities, interior layout, coatings and finishes.
- Study of the current legislation about the drafting of execution building project.

5.1.3 Planning and development of the execution project. Competences: G01, G02, G03, G11

"The search for ways of solving involves elaborate, explain and evaluate possible alternatives, planning with order and method of the sequences of action, clearly linked with the body of knowledge available" (Urraza and Ortega, 2009).

- The students will analyze the possible alternatives that will solve the foundation, the structure and the building facilities, establishing the criteria for its further calculation.

- IFC files generation for structural and facilities calculation.
- Process of analysis of the IFC file for structural and facilities calculation. Resolution of the problems found in its import. Assessment of their advantages and limitations depending on the structure and the foundation chosen for the resolution of the building.
- Optimal design, from the chosen alternative, and calculation of the foundation, the structure and the building facilities (electricity, plumbing, drainage and air conditioning) in accordance with the current regulations.
- Estimation of the costs of implementation of the proposed works.

5.1.4 Collection and critical analysis of results. Competences: G08, G16

- Inclusion in the virtual model of the changes made.
- Analysis and evaluation of results. Identifying strengths, weaknesses, opportunities and threats of the proposed design (consideration of technical, economic, environmental and social aspects…).
- Identification of proposals that provide improvements to the solutions developed in the project and the work methodology implemented.

5.1.5 Implementation of proposals for improving the initial design. Competences: G13, G14, G17, G19

- Redesign and recalculation of the foundation, the structure and facilities (electricity, plumbing, drainage and air conditioning) in accordance with the current regulations.
- Re-estimation of the costs of implementation of the proposed works.

5.1.6 Collection and analysis of results. Competences: G04, G20, G22

- Inclusion in the virtual model of the changes made.
- Obtaining of all required documentation to the execution project by the Technical Building Code (reports, plans, budget and specification).
- Analysis of results and extraction of the final conclusions in relation to the project developed.

5.1.7 Simulation of the presentation and defense of the developed project before a university court. Competences: E71, G15, G2

5.2 Considerations to be taken into account for the verification and optimization of the design and calculation of the foundation and the structure

a. Election by the teachers of the typology of foundation and structure, which the building will be resolved with: Reinforced concrete structure: Once the characteristics of the proposed building are known, the students have to discuss the type of foundation and the structure that will be used to solve the problem. The structure is restricted to a reinforced concrete one, so, the students have to decide the typology, always justifying the adopted solution. The students will lay down the characteristics of the materials used in the structure and foundation in accordance with current regulations.

b. Generation and import of the IFC file: The student group defines the IFC file, where they will have to see which restrictions the software presents, during the calculations of this type file.

c. Structure obtained from the IFC file: The student group analyzes the obtained structure and checks the missing elements before import.

d. Calculation of the structure and foundation: The student will develop the calculation of the foundation and the structure, based on the criteria agreed by the group of students, bearing in mind that it was a first approximation and, always in a justified and agreed (with the other components of the group) way, may change and improve the initial proposal.

e. Analysis and evaluation of the obtained results: The student must make a detailed and critical analysis of the results and see if they are consistent with the design that has been raised. (Individual).

f. Redesign y recalculation of the structure: Each student, in the role change, will analyze the design of the structure proposed by his classmate, being possible to present improvements in the proposed design, always inside the criteria set at the beginning. Of course, if the changes were raised outside of these criteria, the same ones could be discussed with the rest of the group to see if they are adequate or not, and so justifying. Likewise, the calculation made will be checked by a review structural sheet to see if some error or possible improvements could be. The check sheet will be provided.

g. Joining to the virtual model: The results of the design and calculation of the structure and foundation are introduced into the virtual model to see the possible interactions enter the different elements that make the execution project (plumbing, sanitation, air conditioning, etc.). The students will have to set the criteria for solving the emerging problems of integration into a virtual model of the results obtained in each of these points.

5.3 Considerations to be taken into account for the verification of the basic documents of the Technical Building Code (CTE): SI, SU, HS, HE and HR

For the verification of the Basic Documents SI, SU, HS, HE y HR, the CTE.C tool (version 2.0) will be used, provided by el Ministry of Housing from its official webpage: http://www.itec.es/cte.c/

The CTE.C is an Internet tool which allows checking the compliance of the CTE Basic Documents previously cited in a building project.

Scope of application of the CTE.C: Non-singular buildings that respond to the following typology, building up to 4 apartments per floor with a maximum of 5 floors above ground and 2 below ground excluding houses that are developed in more than one floor.

5.3.1 Procedure to be followed by the students

a. First, the module CAD2FIDE will be incorporated to CAD software (Computer Aided Design) "Autocad".

b. From the virtual model, provided in "Allplan", the floors of the building will be exported to "Autocad".

c. Inside "Autocad", all the information, necessary to ensure the verification of the Basic Documents, will be incorporated to the plants with the module CAD2FIDE.

d. This information will be transferred to a FIDE file, on the same one, the CTE.C will effect all the validation calculations. The system must know the benefits of the constructive solutions adopted. For that, the Computer Catalog of Building Elements (CEC) or solutions defined by user will be able to establish, giving the properties of their components or reusing the CEC values.

e. If the check has been made as a sketch, the system offers constructive solutions, provided by default, in order to complete all the validation.

f. In case of failure to comply with any requirements, possible alternatives will be proposed for each one.

g. Once the alternatives were accepted by the working team, the system checks again on the transversal compliance.

h. The introduced changes, that affect graphic design, are shown in the FIDE file and the same one are transferred through the CAD2FIDE as "warnings" to "Autocad" for graphical correction.

i. This process will iterate until obtaining the full compliance with the requirements of CTE.

5.3.2 *CTE.C Characteristics of the method.*

Verification by simplified options (DB-HR and DB-HE).

5.3.3 CTE.C Current Legislation and codes.

Transversal verification of the following Basic Documents for the building elements: Section HE 1 of DB HE, DB HR, DB SI, DB SU and DB HS.

5.4 Considerations for checking the facilities

5.4.1 The procedure will be the following one:

a. Study which facilities the building needs.

b. Study and discussion by the students on the program of needs and uses that affect the different building facilities.

c. Review and adaptation to current regulations.

d. Adaptation of these needs and intended uses to TBC conditioning and regulatory particular restrictions that affect the building.
e. Design process of components and materials.
f. Pre-design of the different facilities as previously revised regulatory criteria.
g. Exporting the virtual model to Cype software.
h. Analysis and checking by the students of the imported IFC file; revision and complementation, in its case, of the virtual building model.
i. Design and calculation of the building facilities with Cype software.
j. Arrangement of the elements and component systems of the different facilities previously predesigned, on the virtual model with the corresponding modules of Cype and Cypelec software. Alternatively, the involved students will revise the design and calculation executed by their classmates and the will propose improvements of their own choosing.
k. Development of the report and the term of references of the facilities.
l. Performing and revision of the reports and terms of references provided by the Cype software.
m. Composition and layout of the execution plans.
n. Performing the facilities plans corresponding to the execution Project from the Cype software. Alternatively, the involved students will revise the existing plans, and they will propose the improvements in the composition and layout of their own choosing.
o. Preparation of the Waste Management Study.
p. Performing the Waste Study Management from the Cype software. Alternatively, the involved students will revise and update the previous Studies, and they will propose improvements of their own choosing.
q. Preparation of the term of use and maintenance of the facilities.
r. List of the building conditions of use and maintenance from the Cype software.
s. Making the state of the measurements and budget of the facilities.
t. Making the measurements and the budget of the facilities from the Cype module and the same ones are exported to Presto or Arquimedes software, for their inclusion in the state of the general measurements and budget of the building.

The study was extended to the following facilities:

a. *Installation of water drainage*
b. *Ventilation*
c. *Electricity*
d. *Water supply*
e. *Sanitary hot water*
f. *Air-conditioning*
g. *Telecommunications*
h. *Accessibility conditions*
i. *Fire safety*

5.5 Considerations for estimating the expected costs for the implementation of the proposed works

5.5.1 *Election by the teachers of the cost data base and the classification system which are the base of the work:*

Option 1: Andalusia Building Cost Base - BCCA 2010 (last version allowed in the web of the Public Works and Building Ministry of the Andalusia Government). Advantages: mandatory for Public Works in Andalusia. http://www.juntadeandalucia.es/obraspublicasyvivienda/obraspublicasyvivienda/portal-web/web/areas/vivienda/texto/28c8aa4d-2483-11e0-a6d1-9169d730d750;

Option 2: Cost Base by Cype prices generator software. http://www.generadordeprecios.info/ Advantages: integrated in “Arquímedes” and monthly cost updating.

5.5.2 Election of the chapters to develop: Election by the teachers of the chapters whose costs will be estimated in the budge since their development requires a prior information that should be prepared by the student. So, for example, the estimation of the cost of the Safety and Health chapter requires the drafting of the corresponding Safety and Health Study. Similarly, the Waste Management chapter requires the development of its corresponding Waste Management Study. By default, the corresponding ones to the implemented project will be developed.

5.5.3 Structuring the budget by the student: The start point, for the student, is the budget in its levels of integrated details and definition of its different parts, which make up the project, and correspond to the chapter under study.

In order to accurately define the items is essential that the rest of the execution project is developed and in that way, to be able to know the characteristics of the different elements of the building (foundations and structures, facilities, envelope, etc). Therefore, the budget will be the last of the documents generated in the execution project. But the fact, that the budget depends from the remaining parts of the execution project and the same one was obtained at the end, doesn't mean that the budget shouldn't be in mind in the definition of the virtual model. The BIM design allows that the items were measured automatically from the virtual model, simplifying the work involved in the drafting of the budget and avoiding possible mistakes.

5.5.4 Preparation of the budget: For that, the allocation of the different parts of the same one will be reviewed, belongings to the data base chosen or created newly, to the corresponding objects of the virtual model. Subsequently, the measurements are exported from those items to specific software, as "Arquímedes" by Cype. In this software, each item is associated with its measurements, with the corresponding cost and the full project budget can be obtained.

6 FORMULATION OF THE PROPOSED DESIGN

The chosen model for our study is the Kleines House located in Taunus; Germany, (figure 3), by the Architect Office Traut Architekten. It is a two story building of modern design, constituted in a single cubic volume of 10x10 metres of ground floor, and 7 metres in height, partially interred.

The physical location for the development of the task is thought to be Seville, in an attempt to determine the starting parameters values, and rules valid for the site.

Students will be provided with the corresponding technical documentation –virtual scale model of the building and basic Project level blue-prints.

Fig. 3. Fachada de la vivienda.

7 ASSESSMENT MODEL

The assessment of the main competences trained in FDP, the specific competence E71 and the generic competences G01, G06, G09 and G13 (see section 2), is developed with a fluid assessment matrix (Herrero, 2011). This assessment tool is a teaching instrument (Herrero and Torres, 2009) as far as: gives fluency to the assessment process; provides confidence to the student in the monitoring of his own learning process; speeds up the tutorial work; promotes the permanent and autonomous learning; and encourages critical awareness.

The assessment matrix proposed is made of three columns: the first one for the assessment criteria, which correspond to the competences under study; the second one for the indicators, which are items that must be expressed with the greatest accuracy and clarity and negotiated with the students as far as possible; and finally, the third one for the improvement margin, comprises a value (a letter of the acronym SUMAR, which in Spanish means to add) and their corresponding comments.

The fluid assessment matrix of the four generic competences involved is shown below:

CRITERIA	INDICATORS	IMPROVEMENT MARGIN	
		VALUE (*)	COMMENTS (**)
G01: Capacity for organization and planning	Designing a proper and consistent planning with the resources available		
	Carrying out the work following the planning designed		
	Updating and optimization of the planning during the whole learning experience		
G06: Information management skills	Obtaining additional information		
	Differentation of the most important information		
	Interpretation of the information obtained		
	Carrying out the work according to the available information		
G09: Ability to work in an interdisciplinary team	Promoting the information exchange		
	Providing constructive suggestions		
	Appreciation of the work of the colleagues		
	Accomplishment of the commitment previously acquired		
	Involvement in the development of the work		
G13: Positive social attitude towards social and technological innovations	Compiling and implementing innovative suggestions		

(*) VALUE: **R Respect**: everything is useful; there is nothing missing nor left. *Justifying…*
S Suppress: almost everything is useful; there is nothing missing but something is left. *Indicating…*
U Unite everything is useful; there is nothing left but something is missing. *Proposing…*
M Modify: almost everything is useful; there is nothing left but something is missing. *Showing…*
A Annul: there is nothing useful. *Explaining…*

(**) COMMENTS: Appropriate remarks according to the value assigned.

Fig. 4. Fluid assessment matrix SUMAR to assess generic competences in FDP.

8 CONCLUSIONS

This paper presents a teaching model of a subject that joins two worlds, the academic and the profesional one, in which students and teachers of the Building Engineering Degree take part. Therefore, taking advantage of this privileged position, the model proposed aims at moving into the vanguard of both fields: constructing the EHEA by implementing the most innovative aspects of the profesional activity of Building Engineers.

Hence, this innovative model, inspired in the constructivist model and, specifically, in its *learning architecture* stream, is based on the PBL, the cooperative work and the most advanced technology for the development of technical building projects, the BIM technology. Students must manage this innovative technology and play different roles, related with the ones Building Engineers assume in their professional practice, in the development of a professional assignment in an interdisciplinary work team, simulating the current dynamics of the architecture and engineering field.

The usefulness, feasibility and interest of the teaching model designed must be assessed by the teaching team after its implementation during the following academic year 2012/2013.

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