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Generic competences in engineering field: a comparative study between Latin America and European Union

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Abstract

In this work, a comparison between the competences codes in the CDIO´s* curriculum, the ones defined for the Tunning Project and the International Project Management Association (IPMA) is made. The goal is to define the most appropriate competences codes for the engineering education in Latin America. The CDIO code is obtained from the engineering practice, and responds to the Accreditation Board for Engineering and Technology (ABET) standards of accreditation. The Tuning competences are the ones defined for Latin America and the IPMA´s are international competences for project management. It is the first time that the competences defined in ABET accreditation standards in the engineering field are compared with the international competences according to IPMA´s model. The results give evidence that, in first place, there is a need to apply holistic models in the definition of an engineering curriculum. Second, the pertinence of these models in the definition of engineering programs in Latin America.

Keywords: Generic competences, ABET, IPMA, CDIO, Tuning Project.

1. Introduction

Since late last century, an European Higher Education Area (EHEA) is proposed in the European Union. The Bologna Process is a system of comparables degrees, instituting an European Credit Transfer and Accumulation System and adopting a three cycle system (bachelor, master, doctorate), promoting mobility of students, graduates and higher education staff and also the academic interdisciplinary, looking forward to assure a quality level and setting comparable methodologies. Even more, considers an European Area in the curriculum development.

The EHEA propose a new methodology for education-learning and invites to implement a model base don the development of competences. The purpose is provide the students with certain competences that allow them to keep learning and find by themselves new knowledge paths and for problem solving. Equally, looks forward to provide technical education and give training to future professionals, giving them combined skills that helps both, the academic scope and the laboral one. (Sierra, Cabezuelo, 2009)

Then, in Europe is a need to introduce in the curriculum generic competences. With those competences, the students will reach the training that the actual society requires from them. Talk about competences is common now, and seems easy applicable to a curriculum. Nevertheless, there are different meanings in correspondence to different

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approaches: competences from the place of work, cognitive, behavior, entrepreneur, constructivist, humanist and holistic, some of them more complete than others.

Among all this approaches, *the holistic approach defines the competence as a result of a mixture of personal underlying issues, as communication, self development, creativity, problem analysis and solving, all of them named as target competences, and are the ones that allow the existence of cognitive, functional, behavior and ethic-values competences that in all determine the professional competence* (Guerrero, De los Ríos, Diaz-Puente; 2010).

Without any doubt one can say that *in the knowledge society of the new millennium, the profile of a good engineer has to be based in the capacity and will to learn, in the solid knowledge of the basic natural sciences and in the good knowledge of some technology area, besides the general human values. Moreover, has to be prepared for permanent learning and also has to have communication skills and team work. The technical competences are not enough in the actual world.* (Maffioli, Giuliano; 2003). This makes the holistic approach the more appropriate for the competences codification in higher education degrees, even in the engineering ones. Several lists of needed skills or "attributes" have been proposed. Among them, the one given by the American Accreditation Board of Engineering and Technology (ABET). This list is valid for all the engineers, and with appropriate weight given to each "attribute", conducts to the list of "indispensable competences" for engineers. (Maffioli, Giuliano; 2003)

In the following pages, the codification for competences are analyzed within an holistic approach, in a way that a list of appropriate competences for the engineering career is show. Then, a comparison between this list and the competences defined for the Latin American alumni of higher education is perform, obtaining a list of generic competences appropriate for Engineering in Latin America.

2. Generic competences in Engineering Education

Since the last decade of the 20th century, the academia try to reformulate the Engineering's objectives. Pister proposed doing it from the technical competence development, the understanding of the engineering practice as a social Enterprise, the acquisition of clinical experience in the practice, the preparation for the management and leadership role in the society and the construction of background for continuous learning (Pister, 1993). In this same years, the American Society for Engineering Education (ASEE) says that engineering education should not only focus on theory and experimentation, it has to have relevant, attractive and connected programs, preparing the students for continuous learning. For Vest, engineering education has to give technical knowledge and capacity, and the flexibility and understanding of the social context where it is located. (Augustine, Vest; 1994). Black says that international companies value the flexible teams with multiple talent members. For this author, the industry has already recognized it, and for that reason it focus on total quality management and removed the personnel hierarchies. The team goals, the team contributions and the team rewards replaced the individual goals and contributions. (Black, 1994).

The fast pace of knowledge development and technology requires a new paradigm to develop in the engineering students: team work skills. They should be comfortable and capable to use more advance technology to access to information and communication with others. (Shuman, Larry, et al; 2002). They will not acquire good team work knowledge, if only do team work in one or two subjects. Research results show that the students that work in good teams, learn more and in a deeper level that the ones that work individually. There are less likely to quit the subject, develop positive attitudes and generate more confidence in themselves. (Felder, Brent; 2004). Apply effective the cooperative learning is not a trivial task. There are work strategies to reach a right application of cooperative learning, and allow to achieve the learning results required by the ABET Engineering criteria. (Felder, Brent; 2003)

In 1996, the ABET board approved the Engineering Criteria 2000 (now known as ABET Engineering criteria). A two year proof period was designed and one of three years phased implementation. In these periods not only the board criteria changed, also changed the ABET operation philosophy. ABET accreditation had turned rigid and governed by many rules, giving as result thirty pages of small letters with the detail requirement for subjects credits and their distribution, the professor and laboratories requirements (Prados; 1997). Later on, three easy to read pages replaced the small letter. It turns to a group of eleven results that every graduate must have. This are show in Table 1(ABET, 2009), and they can be divided in two groups: a group of five "hard" skills and a second group that we called "professional" skills. In the following table, the changes introduced the 28th of October, 2004 are show in italic. The hard skills are a, b, c, e y k, while the soft ones or professionals are d, f, g, h, i y j (ABET, 2003).

Table 1: ABET criteria for last year engineering students

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs *within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability*
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, *economic, environmental*, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The hard competences don't produce any reaction between the Engineering academics, there is agreement in the need to insist in them. Nevertheless, the professional competences conduct many discussions about its pertinence.

Smerdon says that, small engineering design teams of today use powerful design tools. More engineers will be taking part of the so called "new economy", without leaving aside the activities of the "old economy" that are always important. The engineer must take advantage of this new opportunities and Engineering education has to be more integral. The technical education has been based on an analytic model (the science). The technical education of the future has to be more integrative. (Smerdon, 2000)

In this context arises in the Massachusetts Institute of Technology (MIT) the interest in having a support to build a frame of appropriate generic competences and curricula that develop them. They start with the believe that today engineers are involve in all the stages of the product, process and systems life cycle. The CDIO (Conceive, Design, Implement and Operate) proposal is base on the certainty that the job of higher education is educate students to be modern engineers, capable to participate and eventually became a leader in conception, design, implementation and operation of the cycles where thet develop their activity. To do so, the alumni have to be technical experts, socially responsible and innovative. (Crawley, Malmqvuist, Östlund, Brodeur; 2007). The CDIO system, initially developed by the MIT and the Sweden Universities of Chalmers, Linköping and that today are use in almost 40 engineering programs around the world, defines a list of competences (syllabus) in different levels, and promotes the competences learning as a context for the development of subjects. (Bragós et al, 2010).

If we base on the context of engineering professional practice, the implications of its teaching are relatively clear. We must firmly focus the education in the timeless aspects of the professional context: focus on the customer's needs, products and systems delivery, new inventions and technology incorporation, contribute to the development of *their products* and do it while working in engineering *organizations*. It is implicit that, the engineering alumni have to develop as reflective and matures individuals. (Edward F. Crawley; 2001)

CDIO defines the competences that must have the students at the end of their engineering careers. The competences are organized in four levels: technical knowledge and critical thinking, professional and personal skills, interpersonal skills and CDIO (Highest level: *Conceive-design-implement-operate*). Table 2 shows the first and second level competences defined by CDIO. ABET 2000 Engineering criteria, establish that, to accredit an engineering program, it must assure that its graduates had developed the knowledge, skills and attitudes that are listed in Table 1. It is show that the CDIO syllabus coverage CDIO, Table 2, with the ABET points is strong, but CDIO`s are more complete than ABET`s. This is detailed on *The CDIO Syllabus. A Statement of Goals for Undergraduate Engineering Education*., Edward F. Crawley. (2001) in Table 3b. To make easy a direct contrast with ABET EC 2000, in the short form of CDIO`s proposal in Table 2, the ABET ones are annotated with letters [a] to [k], to show the elements that are stronger correlated between the two documents.

We can say that CDIO proposal is well aligned with the ABET criteria and also has to advantages. The first one is that are organized in a more rational way, because they are explicit derivative from the modern engineering functions. The second and principal advantage is that has three more detailed levels than the ABET document. (Crawley; 2001). This allows the CDIO proposal be an important reference for the competences definition in an Latin America Engineering program.

Moreover, the university must show adaptability to the society requirements. Changing society requires graduates with suitable professional competences to its needs more than experts in specific areas. Project-based learning (ABP; PBL Project-based learning) is a more appropriate education methodology for competences development, linking education with the professional sphere. This learning technique is based on cooperation, active participation and interaction, offering multiple possibilities for the development of technical, contextual and behavioral competences. The integration of Project-based learning models has its scientific foundations in the generation of a learning process in which the students are not passive receptors of knowledge. Demands that both teachers and students assume an active role, more shared commitment and in the particular case of students, more responsibility for their own learning process. (De los Ríos, Cazorla, Díaz-Puente, Yagüe; 2010).

Table 2. First and second level objectives of CDIO`s syllabus

1 TECHNICAL KNOWLEDGE AND REASONING
1.1 Knowledge of underlying sciences. [a]
1.2 Core engineering fundamental knowledge. [a]
1.3 Advanced engineering fundamental knowledge. [k]
2 PERSONAL AND PROFESSIONAL SKILLS AND ATTRIBUTES
2.1 Engineering reasoning and problem solving [e]
2.2 Experimentation and knowledge discovery. [b]
2.3 System thinking
2.4 Personal skills and attitudes. [i]
2.5 Professional skills and attitudes. [f]
3 INTERPERSONAL SKILLS: TEAMWORK AND COMMUNICATION
3.1 Teamwork. [d]
3.2 Communication. [g]
3.3 Communication in foreign languages
4 CONCEIVING, DESIGNING, IMPLEMENTING, AND OPERATING SYSTEMS IN THE ENTERPRISE AND SOCIETAL CONTEXT
4.1 External and societal context. [h], [j]
4.2 Enterprise and business context. [c]
4.3 Conceiving and engineering systems. [c]
4.4 Designing. [c]
4.5 Implementing. [c]
4.6 Operating. [c]

Also ABP helps the students to connect theory with reality through problems treatment that arise in real life situations. When the content with the context is associated, ABP is based on the memory fundamental structure. Teaches concepts through real problems, and in this way generates an association between theory and practice, an this association allows students to recall in a better way the theoretical knowledge needed. (Chinnowsky, Brown, Szajnman, Realph; 2006). An improved Project-based learning, will push the students to higher learning levels.

These superior learning levels are a way to fulfill ABET`s vision of an engineer or to reach the goals for future engineers. Of course, it doesn`t mean that because is a high level learning, the students (or their colleagues) will appreciate the effort. (Barroso, Morgan; 2009). The formation of an engineer must look at, among the graduate achieved competences, those that are required for Project management. These conduct us to the need to count on a clear competences codification for the engineering profile that is need in a professional practice.

Increasingly, more organizations are realizing that people are the ones that work in projects and that is vital for Project success an understanding of the people related and management skills. The University professors need to take in account this point of view and increase their efforts to improve student’s skills in Project management practices, including soft skills, hard skills and tacit and explicit knowledge. In the majority of universities context, the focus has been in technical knowledge education that are required for Project success, and that are in the triangle of time, cost and quality. This is due that technical skills are easier to treat when are compared with the more difficult areas of soft skills. (Pant, Baroudi; 2008). The demand related with behavior competences for organizations directors and team members are more exigent and pronounced in the last decade and are an additional essential element for the technical competences. The International Project Management Association (IPMA) and the Asociación Española de Ingeniería de Proyectos (AEIPRO, Spanish Association in Engineering Projects) through the Organismo Certificador de Dirección de Proyectos (OCDP, Certifier Body of Project Management) select the competences in three areas: technical, behavior and contextual. 46 are the required elements for one person that acts in a transparent manner, looking forward the benefit of the Project, program or portfolio to satisfy needs of the customers, suppliers and other involved parties. (IPMA, 2009)

The holistic and meticulous focus of this competences definition, makes this codification suitable for the determination of the group of competences required for an engineering graduate. Table 3 shows competences elements coded by IPMA.

The competences codes defined above, in the case of CDIO took as reference North America reality, and European area in IPMA`s case. We need to prove if one of them is applicable to the latin-american context.

Within the reviewed literature, one of the more serious works related with the definition of generic competences for professional education is Tuning Project. Project Tuning, where more than 175 European universities took part since 2001, look forward to consolidate agreement points, as a response to Bolonia Declaration challenge. Tuning was an exclusive european experience until 2004, when Tuning – Latin-America Project arises. The beginning of Tuning – Latin-America Project is given by the search of common references points, centered in competences. This Project worked identifying shared competences, that could be generated in any superior studies and that could be considered by certain social groups. (Proyecto Tuning; 2007).

Table 3. IPMA´s competence elements

1. Technical competences	**2.Behavioural competences**	**3.Contextual competences**
1.01 Success in Project management.	2.01 Leadership	3.01 Project oriented
1.02 Interested parties	2.02 Commitment and motivation	3.02 Programmed orientation
1.03 Project requirements and objective.	2.03 Self-control	3.03 Portfolio orientation
1.04 Risk and opportunity	2.04 Assertiveness	3.04 Project, pro -gramme and portfolio implementation
1.05 Quality	2.05 Relaxation	
1.06 Project organisation	2.06 Openness	
1.07 Team work	2.07 Creativity	3.05 Permanent organisation
1.08 Problem resolution	2.08 Results orientation	3.06 Business
1.09 Project structures	2.09 Eficiencia	3.07 Systems, products technology
1.10 Scope and deliverables	2.10 Consultation	
1.11 Time,Project phases	2.11 Negotiation	3.08 Personnel management
1.12 Resources	2.12 Conflic and crisis	3.09 Health, security, safety and enviroment
1.13 Cost and financiation	2.13 Relibility	3.10 Finances
1.14 Procurement and contracts	2.14 Values appreciation	3.11 Legal
1.15 Changes	2.15Ethics	
1.16 Control and reports		
1.17 Documentation and information		

1.18 Communication	
1.19 Start- up	
1.20 Close-out	

For the preparation, they took as starting point a list of 30 generic competences identified in Europe. This allowed to build a consolidate, with the contribution of the 18 participants countries, that gave as result a 85 generic competences list. The 62 participants universities of 18 countries were consulted, also the concerned parties and took the decision to present a final list of **27 generic competences** (see table 4).

Table 4. Agreed list of generic competencies for Latin America

1. Capacity for abstraction, analysis and synthesis
2. Ability to apply knowledge in practice
3. Ability to organize and plan time
4. Knowledge of the area of study and profession
5. Social responsibility and civic engagement
6. Communication skills oral and written
7. Ability to communicate in a second language
8. Skills in using information technologies and communication
9. Research capacity
10. Ability to learn and continually updated
11. Ability to search, process and analyze information from various sources
12. And self-critical capacity
13. Ability to react to new situations
14. Creative
15. Ability to identify and solve problems
16. Ability to make decisions
17. Teamwork capacity
18. Interpersonal Skills
19. Ability to motivate and work towards common goals
20. Commitment to environmental preservation
21. Commitment to socio-cultural
22. Value and respect for diversity and multiculturalism
23. Ability to work in international contexts
24. Ability to work autonomously
25. Ability to formulate and manage projects
26. Ethical commitment
27. Commitment to Quality.

With the context review until this point, we will proceed to make comparisons, trying to establish the best competences codification for Engineering Education in Latin-America. As we say before, the CDIO competences contain those in ABET summary. If we count with an holistic competence group that contained CDIO and that are based in Project Management, that is the education strategy with best results so far, we will have a solid group of generic competences for Engineering education. We will confront them with IPMA's competences, but this doesn't assure that will be applicable to Latin-America. For that purpose, we will compare the ones pointed in Tuning for all studies and we will verify if the result of previous selections could contain the Tuning ones. If this is true, we will have succeeded in defining a group of appropriate competences for engineering education in Latin-America.

3. CDIO – IPMA comparison.

We have two important codification, CDIO and IPMA, we will compare both to decide which one is more useful to cover the need of count with engineers that have solid technical knowledge, social and business respect and behavior skills with involved organizations and people. The comparison result is show in Table 5. In this table, we can see how the CDIO competences are reflected in the elements of IPMA's competences.

Table 5. Comparison result of the elements of competence IPMA - CDIO (The letter x indicates correspondence between related items)

	1.	1.1	1.2	1.3	2.	2.1	2.2	2.3	2.4	2.5	3.	3.1	3.2	3.3	4.	4.1	4.2	4.3	4.4	4.5	4.6
1. Technical competences																					
1.01 Project management success.						X		X	X	X			X			X	X				
1.02 Interested parties													X			X	X				
1.03 Project require-ments & objectives		X	X	X		X										X	X	X			
1.04 Risk & opportunity																			X		
1.05 Quality												X						X	X	X	
1.06 Project organisation																	X	X		X	
1.07 Teamwork												X									
1.08 Problem resolution						X		X													
1.09 Project structures												X					X	X			
1.10 Scope & deliverables													X					X	X		
1.11 Time & project phases								X	X									X	X		
1.12 Resources									X									X		X	X
1.13 Cost & finance.		X																	X	X	X
1.14 Procurement & contract																	X		X		X
1.15 Changes								X		X			X				X	X			X
1.16 Control & reports								X		X			X					X		X	X
1.17 Information & documentation										X			X	X						X	
1.18 Communication									X	X			X	X							
1.19 Start-up													X			X				X	
1.20 Close-out								X	X				X							X	X
2. Behavioural competences																					
2.01 Leadership										X		X				X					
2.02 Commitment and motivation									X				X				X				
2.03 Self-control										X		X	X								
2.04 Assertiveness						X			X	X						X					
2.05 Relaxation									X	X											
2.06 Openness									X			X				X	X				
2.07 Creativity							X	X	X							X					
2.08 Results orientation								X					X					X	X		
2.09 Eficiencia						X		X								X	X				
2.10 Consultation								X				X	X			X	X				
2.11 Negotiation									X				X			X		X			
2.12 Conflic and crisis						X	X		X				X								
2.13 Relibility										X						X	X	X			
2.14 Values appreciation									X	X			X			X	X				
2.15Ethics										X			X								
3.Contextual competences																					
3.01 Project oriented						X		X		X						X		X			
3.02 Programmed orientation						X		X		X		X					X	X			
3.03 Portfolio orientation						X		X		X			X	X				X			
3.04 Project progr and portfolio implemennt.			X			X		X	X			X				X			X	X	
3.05 Permanent organisation																					
3.06 Business									X	X		X	X			X	X		X		
3.07 Systems, products technology			X	X				X										X	X		
3.08 Personnel management						X			X			X	X							X	X
3.09 Health, security, safety and enviroment																X			X		
3.10 Finances		X							X	X			X				X	X	X		
3.11 Legal																					

We can see the CDIO`s contents, except 3.3, are treated in IPMA`s competences elements. Also we noticed that exist two IPMA elements that are not pointed in CDIO: element 3.11 and 3.05. CDIO point 3.3 “Communication in foreign languages” are not treated in IPMA`s competence elements. 1.17 and 1.18 points attitude, opportunity, effectiveness, form and actions required for an effective communication and the required documentation.

IPMA`s “Legal” element 3.11 is described as the “law and standards impact about projects”. Is needed to know that is important to set limits to the legal exposure, to reduce the possibility of claims and, above all, have the diligence to work within the law and be capable to recognize and discover which activities have legal requirements and which legal principles are applicable to a project (IPMA, 2009). The only mention to CDIO in this topic is in 4.1.3. code, in the fourth development level, “how the legal and political systems regulate and influence Engineering” (Crawley; 2001). We consider that are not comparable the depth of IPMA and CDIO requirements in this topic.

Table 6. Comparison between Tuning generic competences-Latin-America and IPMA`s competence elements

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.
1. Technical competences																											
1.01 Project management success.									X							X									X		
1.02 Interested parties																						X					
1.03 Project requirements, objects		X		X																					X		
1.04 Risk & opportunity									X															X			
1.05 Quality																											X
1.06 Project organisation																X											
1.07 Teamwork																	X										
1.08 Problem resolution										X					X												
1.09 Project structures																									X		
1.10 Scope & deliverables	X																										
1.11 Time & project phases			X																								
1.12 Resources				X																							
1.13 Cost & finance.																									X		
1.14 Procurement & contract		X																									
1.15 Changes										X	X		X														
1.16 Control & reports																											
1.17 Information, documentation						X																					
1.18 Communication						X	X																				
1.19 Start-up																X											
1.20 Close-out																X											
2. Behavioural competences																											
2.01 Leadership																		X									
2.02 Commitment and motivation																		X	X								
2.03 Self-control																								X			
2.04 Assertiveness																X							X	X			
2.05 Relaxation																											
2.06 Openness												X						X					X				
2.07 Creativity										X				X													
2.08 Results orientation	X																										
2.09 Eficiencia																											
2.10 Consultation									X																		
2.11 Negotiation											X	X						X									
2.12 Conflic and crisis											X							X									
2.13 Relibility																		X						X			
2.14 Values appreciation					X													X				X	X				
2.15Ethics																		X								X	
3.Contextual competences																											
3.01 Project oriented																									X		
3.02 Programmed orientation																									X		
3.03 Portfolio orientation																									X		
3.04 Project progr. portf. implem.																									X		
3.05 Permanent organisation					X																X	X					
3.06 Business																											
3.07 Systems, products technology				X				X			X																
3.08 Personnel management																		X									
3.09 Health, secur, safety, envirom					X															X	X						
3.10 Finances																X								X			
3.11 Legal																								X			

Element 3.05 “Permanent organizations”. is described by IPMA as hierarchically organized and that contribute or are related with the Project work. Says that “*for a Project is important to know how the policies and operations*

results of a permanent organization are defined, how are they controlled and which are the associated risks. Therefore, is necessary a good understanding of planning and operation management principles for a permanent organization and the Project contribution to them, to establish previous good conditions and obtain satisfactory results" (IPMA, 2009). CDIO in 4.1.2 "The engineering impact in society" treats this point as "*the impact of Engineering in social systems, knowledge, enviroment and economics in modern culture"* and in 4.2.4 "Succesfully working in organizations" says that "*Different roles and responsibilities in an organization*" and "*The role of functional organizations and programs*". We consider that the IPMA`s competence element covers a major and better description that the ones required by an engineering graduate in his professional performance, described by CDIO.

We consider that IPMA defines a set of competences appropriate to be basis in the design of and Engineering program curriculum, because that additional CDIO competence, is already contemplated in the majority of Latin-American Universities as an end of career requirement. We need to know if this IPMA codification could respond Latin-America requirements.

4. Latin America engineering competences.

With the codification of IPMA`s competences elements, selected as applicable to Engineering education, and the Tuning ones for any Latin-American superior studies, we can perform a comparison and establish if the first ones are applicable for Engineering Education in Latin-America. The comparison results are show in Table 6.

From the comparison results, we came up to the conclusion that in the competence elements defined by IPMA for the Project Management, without any doubt are included all the generic competences defined by Tuning for superior education in Latin- America. Tuning competence 7, to dominate a second language is not expressly indicated in IPMA and will have to put emphasis in competence element 1.18.

5. Conclusions

The definition of the European Higher Education Area has conducted to a codification of generic competences that, without taking off importance to the technic ones, must consider the development of contextual and behavior skills, in an holistic approach, indispensable for the graduate in actual superior education.

The 11 ABET criteria, show a codification in basic competences, 5 hard and 6 soft, that are useful for accreditation and are considered indispensable for engineering graduates. ABET defines a way toward a deep engineering education, integrative an responsible.

CDIO proposal defines a list of competences (syllabus) in several levels. Sets a product life cycle as ideal environment for engineering education and promotes the competence learning as a context for the development of subjects. CDIO proposal is organized in a rational manner and has three more detail levels than ABET, that makes easy its understanding and the application to the curricula design. It is well aligned with the ABET criteria, making easy a later accreditation.

The competences development requires the active participation and the interaction between the teaching and the learning process agents. The Project-based learning has its scientific basis in a process generation where the students are not passive receptors of knowledge. ABP teaches concepts through real problems, connects theory with practical and creates an association in the students minds, that, when they finish their career, allow them to remember in a better way the theoretical knowledge needed when they face real problems.

IPMA has defined a group of competence elements for Project management, with an holistic an detail approach, that makes it suitable to serve as base in the determination of a competences codification, required for a graduate of superior education.

The comparison between CDIO and IPMA shows that IPMA contains the CDIO ones. This allow us to use IPMA codification in competences definition of an engineering student and be confidence that will exceed ABET certification.

Tuning Project has developed a list of generic competences for Latin-America. When compared with IPMA we found that IPMA covers Tuning ones. We can say that IPMA competences can be use in superior education in Latin-America and obtain in the students, the involved parties expected results.

With the results of this work, we can say that IPMA`s competences codification can be use for Latin-American engineering students competences. This students will follow a certifiable curricula and could satisfy the expectations of groups interested in their performance.

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