Communications of the IIMA

Volume 9 | Issue 3 Article 6

2009

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Recommended Citation
Gomez Reynoso, Juan Manuel and Muñoz Andrade, Estela Lizbeth (2009) "Redesigning a Bachelor Degree in Mexico for Accreditation ," *Communications of the IIMA*: Vol. 9: Iss. 3, Article 6.
DOI: https://doi.org/10.58729/1941-6687.1112
Available at: https://scholarworks.lib.csusb.edu/ciima/vol9/iss3/6

# Redesigning a Bachelor Degree in Mexico for Accreditation

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## ABSTRACT

*Accreditation is a major issue for Mexican universities. As of February 2009 there were 48 technology-related programs at 31 universities accredited in Mexico, 14 of them in Information Systems (IS). This paper describes some experiences in redesigning an IS program for accreditation purposes that can be helpful to other programs that are thinking about starting an accreditation initiative. This paper describes the four profiles defined by accreditation bodies and compares them to what programs in institutions around the world are teaching.*

## INTRODUCTION

Aréchiga and Llarena (2003) mention that Mexico has a set of problems regarding its quality in higher education. Problems such as low flexibility in its programs, low graduation/enrollment ratio, graduate unemployment, low integration between research and teaching activities, poor career selection, unintegrated academic bodies, low creation of new knowledge, some private institutions have a low quality in their programs, and low society participation in the development of higher education, among others. In addition, bachelor degree programs in Mexico have been challenged over the years to be up-to-date with the rest of the world due to economic issues, especially for Mexican public universities. One way to address all these issues is through accreditation by external bodies recognized by the Mexican government.

Aréchiga and Llarena (2003) define an accreditation body as a civil organization, who's main goal is to evaluate the quality of academic programs offered by public and private higher education institutions in Mexico. Some characteristics that they must have are: being non-bias and autonomous and can work within a specific area of knowledge (Aréchiga & Llarena, 2003). One of the main accreditation bodies is the Inter-institutional Committees for the Evaluation of Higher Education (CIIES), which evaluates only programs and institutions in the higher education Mexican system and sets the standards for many accreditation bodies. CIEES are formed by nine committees: Architecture, Design and y Urbanism; Agronomic Sciences; Health Sciences; Natural and Exact Sciences; Social and Management Sciences; Education and Humanities; Engineering and Technology; Management and Administration; and Diffusion and Extension of Culture. Any program that wants to be accredited must contact a committee related to its program. CIIES' tasks are to (SEP, 1991):

1. Make diagnostic evaluations about functions and tasks regarding higher education in a particular area of knowledge;
2. Grant accreditation to academic units or academic programs, to those that satisfy established criteria and quality standards;
3. Make precise diagnostics about academic projects or academic programs that request additional budgeting, based on requests from government offices that provide those resources;
4. Provide consultation for the creation of new programs and projects as well as their implantation when an institution makes such a petition.

Accreditation bodies must follow general policies; demonstrate that they follow only academic criteria; and must work 1) with fairness and impartiality, 2) congruence and trustworthiness, 3) control and securing of quality, 4) responsibility and seriousness, and 5) transparency and surrender of accounts.

The Informatics and Computation National Accreditation Council in Mexico (CONAIC) and the National Association of Educational Institutions in Information Technology (ANIEI) are organizations in charge of evaluating and accrediting only those information technology-related programs, which comply with their standards. These organizations define four profiles. Each profile is based on a number of units divided into eighth different areas of knowledge. A particular bachelor program's profile is dependent upon the percentages of units in each area it has. Thus, if any program wants to be accredited, it must comply with a particular profile. Table 1 (ANIEI, 2009) shows the four different profiles and its related percentage of units per area of knowledge.

**Table 1: Percentage per profile (Adapted from ANIEI, 2009).**

| Profile / Area | **A.** Information technology **(IT)** | **B.** Software engineering **(SE)** | **C.** Information systems **(IS)** | **D.** Computer sciences **(CS)** |
|---|---|---|---|---|
| **1. Social environment** | 30% | 12.5% | 10% | 10% |
| **2. Mathematics** | 10% | 12.5% | 25% | 17.5% |
| **3. Hardware** | 5% | 7.5% | 10% | 17.5% |
| **4. Computer networks** | 7.5% | 7.5% | 10% | 15% |
| **5. Base software** | 7.5% | 7.5% | 10% | 12.5% |
| **6. Programming and software engineering** | 17.5% | 22.5% | 20% | 17.5% |
| **7. Information management** | 17.5% | 20% | 7.5% | 5% |
| **8. Human-computer interaction** | 5% | 10% | 7.5% | 5% |

The Bachelor's degree in Computer Systems Engineering (ISC) is offered at the Autonomous University of Aguascalientes, Mexico (UAA). This program was founded in 1982. It has profile "C" assigned to it. It has changed over time to accommodate technology-related emerging knowledge in its curricula. However, we faced some issues to really comply with this profile. Thus, it was diverted from such profile, which causes some issues regarding accreditation. In 2008, this program started a major redesign so that it really complies as much as possible in order to avoid putting accreditation in jeopardy. This paper describes the adaptations made to ISC's curricula by analyzing related programs in other countries so that accreditation was granted.

## METHODOLOGY AND DATA ANALYSIS

As of February 28, 2009 there were 48 technology-related programs accredited by CONAIC distributed among four profiles (COPAES, 2009), 36 programs are from public institutions and the rest from private. Table 2 shows how these programs are distributed in Mexico among the four profiles.

**Table 2: Distribution of Mexican technology-related programs accredited.**

| | A. IT | B. SE | C. IS | D. CS |
|---|---|---|---|---|
| Total | 4 | 27 | 14 | 3 |
| Percentage | 8.33% | 56.25% | 29.17% | 6.25% |

Accreditation is very important because it allows students the opportunity of transferring from one institution to another due to economic, change of residency, or any other issues they might have. However, our main concern is to keep our program current to what other institutions around the world are visualizing as the main direction that an undergraduate in IS student should take as well as to include a set of skills that Mexican organizations are requiring. Table 3 shows what Mexican accreditation bodies suggest compared to some IS programs in other countries. We can see that the most prestigious Mexican institutions are not really following such profiles. They are following what they identify as main trends in the IS field. In fact, those programs have not yet been accredited and it seems that its institutions are not interested in having them accredited in the near future.

**Table 3: Comparison between profiles defined with programs in other institutions.**

| Country | Institution \ Area | Social environment | Mathematics | Hardware | Computer networks | Base software | Programming and software engineering | Information management | Human-computer interaction |
|---|---|---|---|---|---|---|---|---|---|
| **Country** | **ANIEI/CONAIC** | **10%** | **25%** | **10%** | **10%** | **10%** | **20%** | **7.50%** | **7.50%** |
| **USA** | U. of Arizona | 11% | 5% | 9% | 19% | 15% | 18% | 11% | 11% |
| | Yale | 4% | 13% | 0% | 8% | 13% | 33% | 17% | 13% |
| | Stanford | 4% | 20% | 10% | 15% | 12% | 20% | 6% | 12% |
| | UCLA | 6% | 12% | 15% | 15% | 8% | 26% | 11% | 6% |
| **Canada** | Ottawa | 3.7% | 0.0% | 3.7% | 14.8% | 11.1% | 40.7% | 11.1% | 14.8% |
| | Alberta | 0.0% | 29.2% | 8.3% | 0.0% | 12.5% | 33.3% | 4.2% | 12.5% |
| | Toronto | 1.67% | 13.3% | 6.7% | 8.3% | 8% | 27% | 10% | 25% |
| **Mexico** | Technical Institutes | 11.4% | 24.5% | 10.4% | 15.5% | 9.8% | 16.3% | 6.0% | 6.0% |
| | ESCOM-IPN | 15.9% | 24.2% | 9.4% | 7.3% | 7.5% | 23.7% | 7.2% | 4.8% |
| | UNAM-FI | 11.1% | 25.0% | 10.0% | 11.7% | 10.0% | 17.2% | 7.8% | 7.2% |
| | BUAP | 12.8% | 21.8% | 10.0% | 10.9% | 9.5% | 19.0% | 8.5% | 7.6% |
| **Germany** | Luidwig Maximilians Univerität München | 18.5% | 11.1% | 3.7% | 11.1% | 11.1% | 14.8% | 22.2% | 7.4% |
| | Technische Universität München | 0% | 15% | 10% | 15% | 15% | 20% | 15% | 10% |

This data gives a set of courses that are being –or not – taught in programs similar to our own around the world; courses that later on we use as guides to modify our program.

Table 4 shows current and new profile contents compared to those suggested by accreditation bodies. Percentages are measured in number of units. This table shows that our program does not really comply with profile "C". It exceeded the number of credits in the areas of Social environment and Hardware. Mathematics is about the same and there is a need to add units in the five areas which, coincidently are the main work tasks for an IS professional. Thus it is clear that a major redesign was needed.

**Table 4: Profiles defined by ANIEI.**

| | Percentages for Profile C | | | | |
|---|---|---|---|---|---|
| **Area** | **Suggested by ANIEI/CONAIC** | **Current curricula** | **Curricula 2009** | **Under /Over** | **Units** |
| 1. Social environment | 10% | 22% | 10.94% | 12.0% | 51.0 |
| 2. Mathematics | 25% | 23.7% | 25.0% | -1.3% | -5.5 |
| 3. Hardware | 10% | 15.8% | 11.24% | 5.8% | 24.65 |
| 4. Computer networks | 10% | 7.0% | 9.64% | -3.0% | -12.75 |
| 5. Programming software | 10% | 7.0% | 9.11% | -3.0% | -12.75 |
| 6. Programming and software engineering | 20% | 14.0% | 20.57% | -6.0% | -25.5 |
| 7. Information management | 7.5% | 7.0% | 6.75% | -0.5% | -2.15 |
| 8. Human-computer interaction | 7.5% | 3.5% | 6.75% | -4.0% | -17.0 |

It was important to learn which IS skills/knowledge Mexican organizations require from an IS professional. We asked our alumni for help in this matter by answering a questionnaire. The only requirement was that respondents be working in an IS-related position. Basically, we asked only one question that is applicable to each area in the profile. The question is *"In order to perform your job, you require a set of skills/knowledge that you should acquire while you were taking courses. In order to maximize your effort in school to perform better at work, your think that the area of Area_Name should be:"* We received a total of 99 useful questionnaires. Table 5 shows how answers were distributed for each area.

**Table 5: Opinion of alumni about knowledge areas defined by ANIEI.**

| **Area** | **Social environment** | **Mathematics** | **Hardware** | **Computer networks** | **Base software** | **Programming and software engineering** | **Information management** | **Human-computer interaction** |
|---|---|---|---|---|---|---|---|---|
| *Opinion* | *%* | *%* | *%* | *%* | *%* | *%* | *%* | *%* |
| *Reinforce* | 3.8 | 30.8 | 23.1 | 73.1 | 46.2 | 73.1 | 53.8 | 26.9 |
| *Add* | 3.8 | 3.8 | 23.1 | 19.2 | 15.4 | 11.5 | 15.4 | 19.2 |
| *Modify* | 38.5 | 23.1 | 26.9 | 3.8 | 19.2 | 11.5 | 11.5 | 26.9 |
| *As-is* | 19.2 | 38.5 | 19.2 | 3.8 | 11.5 | 3.8 | 15.4 | 19.2 |
| *Reduce* | 26.9 | 3.8 | 3.8 | 0 | 7.7 | 0 | 3.8 | 3.8 |
| *Eliminate* | 7.7 | 0 | 3.8 | 0 | 0 | 0 | 0 | 3.8 |

By analyzing percentages we notice that alumni identify software-related and computer networks as areas that need to be reinforced as well as to add more subjects. Also, we can identify major changes (like reducing or modifying) in social environment, mathematics and hardware. These opinions agree with what accreditation bodies recommend.

We faced the decision to either comply with accreditation standards or follow what other institutions were doing. In addition, one very important aspect is that accreditation bodies suggested us to reduce our program by 1 or 2 semesters (from 10 to either 9 or 8). We thought that our best decision was to reduce it by 1 semester and to comply with unit standards as much as possible while including subjects that other institutions are teaching.

Column *Current* Curricula in Table 4 shows how subjects are distributed. We notice that our program has many issues regarding Profile "C". Thus, major changes should be taken care of. Also, by comparing our courses with programs in other universities we noticed that some important topics were missing. Hence, it was very important to add subjects that are being taught in other institutions. These actions improved our chances of being accredited and created a more current and dynamic program. In order to do that, we identified our program's characteristics which are listed below. One should note that a typical course in Mexican universities is taught in a full semester and has 6 or 8 units.

In order to accommodate such changes we did the following:

1. Identify our current profile as a first step so that any deviations should be corrected.
   - Identify the excess of units the area of Social Environment; this was our main concern because it could prevent accreditation. Thus, we transformed units from this area to software-related and computer networking areas.
   - Identify the excess of units in the area of Hardware. Again, we transformed units from this area to software-related and computer networking areas.
   - Add units in the areas of computer networking, software programming, software engineering, information management, and human-computer interaction.

2. Identify which areas have more units than those required so that we could change some subjects within them. Some of the subjects are: electronic circuits, computational organization, electronics, hardware design, and operations research among others.

3. Identify a set of subjects that are being taught in other institutions that were not present in our program. Some of these are: seminar in IS, programming IS, distributed databases, IS quality, two elective courses in IS.
4. Identify a set of subjects that can be eliminated completely. Some of them are: a statistics course, artificial intelligence and, simulation.

5. Redesign our program to accommodate all changes.

Column *Curricula 2009* in table 4 shows our redesigned program. It still may require some minor adjustments but is within accreditation body's limits. It is important to mention that our

program was reduced from 425 units to 384. The *Units* column in Table 4 shows the number of units that we needed to reduce (positive) or increment (negative) in each area.

Malo (2004) mentions that evaluation by external bodies is widely accepted, there are a set of external evaluators, actors and institutions. Evaluation actions cover many aspects, there are government policies that are supported by institutions, and evaluators (institutions and individuals) are accepted as authority figures. Thus, any accredited program is well accepted among peers and institutions, which would increase opportunities for students enrolled in such programs.

In order to be accredited, any institution must be evaluated by a set of three people from three different institutions. They review all aspects of the program comparing it with standards and make a set of recommendations as well as a final decision about the program: accredit without changes, accredit with changes, or not accredit.

## CONCLUSIONS

Mexico is a country that has approximately 67% poverty. The National Institute of Geography and Statistics (INEGI) mentions that a third of the population owns 61% of Mexican wealth (Digest, 2009; INEGI, 2006). This fact has a great impact in higher education. Most public universities survive because of public funding. However, it is well know that public funds are not distributed equally. For example, three public institutions (UNAM, UAM and IPN) receive 43.96% of the total national education budget (Mendoza Rojas, 2009). This is critical for public institutions because Mexican Government awards funds based on a set of parameters such as: number of programs accredited, enrollment-graduation ratio, research among others. Hence, the more the number of accredited programs that an institution has, the more quality value it receives. A program without accreditation could lose its ability to graduate students (Cantini, 2004). In addition, many Mexican organizations use as criteria the institution from which job-applicants got their degree. The more renowned a particular institution, the more likely graduates will get jobs. Thus accreditation is major issue for Mexican higher education institutions, not only because of budget implications but also, because accreditation enhances students opportunities of finding a good job.

Accreditation helps institutions to enhance the quality of their programs, which can be beneficial for both the institution and its students. Also, education is a way of improving any country's wealth (Patrick, 2002). We believe that a quality education enhances this opportunity. Thus, any Mexican program that wants to find out whether their quality is up to standards must initiate an accreditation process, and if does not comply, start an initiative to address all issues raised by evaluators. As a set of recommendations we believe that making the academic program more similar to a profile is critical for the success of such initiative. In addition, the Secretary of Education must realize that many universities are having problems because they are not receiving enough funds. We believe that a formula that uses very important variables such as: number of programs accredited, research productivity, and graduation ratio; to calculate the budget for each public university would be fairer. Finally, we call to support the idea that many universities' presidents are asking to the Mexican government for a major change in education budget assignation policies.

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