Trainning model in TICs. CerTIC.
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ABSTRACT

Competitiveness in organizations plays a very important role since it allows them to achieve and maintain the set of "competitive advantages" that enables them to reach and sustain a position in the industry in which they are participating. In this sense, job skills certification of partners, plays a strategic role because it allows a theory-based training and practice according to the real needs of enterprises. The ITC industry itself led to the creation of a Supranational Training Industry with the following features: 1.- International character. (The certificates are job valuable where the technology is used, regardless of the country) 2.- Not subject to local regulations in each country 3.- With independent accreditation bodies (Validated by the ITC industry itself).

This paper highlights the impact of the CerTIC Model to achieve Technology Certifications in specialized training of participants in this industry, and because of its universality, requires knowledge and skills that focus on standards and methodologies applied internationally. Over 90% of students studying for certification demonstrate the Model CerTIC achieve appropriate certification exam, this percentage is much higher than that achieved by students studying the models developed by leading technology companies.

Keywords: Certification, TICs, training.

Introduction

The professional preparation today required by organizations, responds the need to provide knowledge and practices in each of the different processes that constitute it. Certification is a formal process on skills formation, which certifies the knowledge, practices and skills that are part of each employee of an organization. The purpose of certification is to provide a widely accepted industry recognition for the competence of those workers who participated in the certification process.

A competency certification of employees ensures superior performance, which must be demonstrated through an examination of assessment or accreditation. In the area of information technologies, the need for specialized skills training is very important because it supports the competitiveness of the industry. There are different agencies and levels of certification for each area of specialization. These certifications in the IT area, are internationally recognized, but they are so strict that there is a low percentage of accreditation for this type of competition.

1.- PUBLIC POLICY SUPPORT FOR ITC's IN MEXICO (PROSOFT)

The PROSOFT 2.0 program has the following goals for the year 2013.
Focus: Software, IT Services and BPO.
15,000 Million dollars in Software Production, IT services and BPO.
628,000 jobs in the industry.
(BPO, IT Services, Software Production, export and local)
Average expenditure IT / GDP 2.3% [1]
By 2007 the following figures were reached: 1,000 million dollars of software, 1,300 million in BPO and 3,100 million for IT Services. From these figures the exports represented 1,700 million. The industry has already reached 5,400 billion, missing just under 10 billion dollars by 2013 to achieve the goal.
In Mexico, there are currently 300,000 ITC professionals and around 60,000 graduate every year. The national education system has 616 institutions of higher education with career ITCs., (Prosoft Yearbook, 2006.)
Enrollment in the technical and undergraduate levels is above half million students, representing just under 20 percent of the total national enrollment in all areas of knowledge. The inadequacy of academic programs to the needs of industry and the excessive labor regulation and high social burden of the workforce, have resulted in lower competitiveness of Mexican labor in this industry. [2]

Strategies for human resources formation

There are three critical factors in the formation of export-oriented resources.
1.- Languages (English),
2.- Competencies (Teamwork, Focus on results, Work under pressure, Decision making, Analysis and problem solving, Frustration tolerance, Leadership, Communication)
3.- Knowledge (Certification of Technologies, Methodologies and Project Management)

2. CERTIFICATIONS
Cisco Academy Program, established in 1997, forms students in the creation and administration of networks. Since launched, the program has grown to more than 10,000 academies in the USA and more than 150 countries, is translated into nine languages. More than 400,000 students participate in Academies operating in high schools, colleges and universities, technical schools, community-based organizations, and other educational programs worldwide.

SAP intends to certify 10,000 professionals only in Latin America in 2010.

With this generates two labor markets:
1. A CERTIFIED force that has access to better paid global corporate markets.
2. A NOT CERTIFIED force that only has access to domestic markets with less favorable working conditions.

**Reasons to seek certification**

In Mexico, the top three reasons to become certified are:
1. - 44% higher wages,
2. - Further development 30%,
3. - Improved performance by 11%. [3]

**Certified Professional Profile in Mexico.**

Data from the years 2007, 2008 and 2009 show that of 2,500 students registered:
- USD/month. 71% are men.
- 73% are single.
- 53% are under 30 years.
- 88% are under 35 years.
- 88% are professionals.
- 70% earn less than $1,000.00

Students select the following certifications:
- 27% selected certification in network administration and communications.
- 18% selected certification in software development.
- 15% selected certification in databases
- 10% selected certification in software engineering
- 9% selected management certification business services[4]

**Certified salaries in Mexico. (2007) USD/YEAR**

In Mexico, Software Guru made a study of salaries and certifications in this country in 2007 giving the following results:
- The highest paid
  1. - Certification Project Management Institute (PMI) with an average salary of $40,800.00
  2. - The IBM-Websphere certification with an average salary of $33,900.00
  3. - Information Security Certification with an average salary of $33,200.00 USD/Year
  4. - SAP Certification with an average salary of $30,200.00

The average salary of a professional with high school degree was $14,700.00, a college graduate of $19,500.00, a masters degree $26,600.00, a PHD $31,900.00
- The most sought

Moreover, the certification most sought was certified CISCO with a average salary of $17,800.00 [3] (SOFTWARE GURU, Nov. 2007)

3. METHODOLOGY

The methodology proposed in this project generates the reference model CerTIC, which uses a framework considering the profiles of participants, needs and formation strategies of the organizations and the approach of a model of technology formation specific to the area of IT’s.

**Figure 1. Research Scheme.**

Source: Own design.

**Data gathering.**

CISCO sample format for statistical analysis.

**Table 1. CISCO sample for statistical analysis**

Source: Own design with data from IT University, 2009.

**Table 2.** This format is the record of personal and work data (before and after taking the certification) of the student.

In this format changes of employment and salary are recorded. It shows the effectiveness of the CerTIC Model in the Labor Market.
4. CONSTRUCTION OF THE CerTIC MODEL

Recurring features in the technology manufacturers’ models:
1. Intensive training mode. (8 hours per day, 40 hours per week)
2. Intensive laboratory use of their own technology to learn by solving problems and cases.
3. Intensive use of Educational Technology. (Web Pages, E-learning, Tutorials, Simulators)
4. Low approval ratings for the certification exams, less than 30%.

Qualitative differentiator
1. Delete the term “intensive” programs and do five hours of class per week. With this the student has time to develop, test and prove the concepts learned.
2. The instructor must be certified in the technology that is going to teach.
3. Use own teaching material in addition to the ones provided by manufacturer and the publishing industry.
4. Link the performance indicator of the instructor with the index of student certification.
5. Develop own problem-solving laboratories, in addition to the ones of the manufacturer and the publishing industry.
6. Develop test preparation material itself, in addition to the ones provided by the manufacturer and the publishing industry.

Quantitative differentiator.
1. Designing a poka-yoke system for recycling within the CerTIC model, where students can go to the next stage of the model until they get 90% of correct answers in the corresponding test.

Within the CerTIC Model, in the formation module, the quantitative variables of this poka-yoke system are:

**Generic Formation (Learning Cycle).**
- Test Score per module with support.
- Cycles required to obtain a score of 90% or more.

**Specializing Formation (Certification Cycle).**
- Final Exam Score per Module WITHOUT Support.
- Cycles required to obtain a score of 90 or more.
- Pre-Certification Examination Score.
- Cycles required to obtain a score of 90 or more.

Conceptual Description of the CerTIC Model.

Fig. 3. Global view of the modules and phases of the CerTIC Model

Source. IT University, 2009

**Formation Module**
As shown in Figure 4, this module integrates three phases to achieve the comprehensive training process. • Generic Formation (Learning Cycle) • Specializing Formation (Certification Cycle) • Generic Formation Laboratories (Labor Market.)

**Generic Formation**
Because candidates come from different universities or different areas of knowledge or different levels of skills, formation takes place to align every student in the program’s basic skills needed for the specializing formation.

**Specializing Formation.**
In this formative phase, the model focuses on learning knowledge domains identified by the industry or manufacturer that grants the certification.

**Labor Market’s Lab.**
In this phase of the Formation module the student faces with the resolution of cases and scenarios with an equivalent degree of difficulty to the one you have in the real certification exam to be presented.

Figure 4. Formation module. CerTIC Model. Source: IT University, 2009

Formation Module Tools
The tools used for the formation module are 8 and are described in the instructional manual.
1. Syllabus (program guide of the sessions during the year)
2. Student Handbook. (E-Book, publisher Sybex)
3. Learning Support Software (Manufacturer’s software: tutorials, simulators, virtual machines.)
4. Computing Center equipment.
5. Manufacturer’s E-learning (if applicable)
6. Certification Support Site (IT UNIVERSITY own)
7. Laboratories for certification (IT UNIVERSITY own)
8. Implementation of certification exam.

Generic Formation (Learning Cycle).
The Learning Cycle, at the stage of Generic Formation is a method of study based on poka-yoke system, allowing students to start acquiring concretely the knowledge and skills necessary to successfully complete the preparation course. The Learning Cycle is the main study guide to be followed by the student and includes the following items:
- Check the Syllabus to see which topic will be reviewed at the next meeting and make a prior reading of it.
- At the end of the chapter, in Support Site for certification:
  A) Locate content by chapter and read the articles associated with the Chapter seen in class.
  B) Locate the tasks and perform what is described in the document related to the chapter.
  C) Locate the Reference Tables and study the designated Table for the Chapter.

D) Locate tests by chapter, answer the review of the chapter seen in class and send it to the instructor via email to be evaluated. Upon receiving the assessment of the instructor, see the result and for the questions answered incorrectly, you must read the corresponding topic and answer the questions again, sending the answers to the instructor for the associated evaluation. This cycle should be repeated until achieving 90% of correct responses by chapter review.

Figure 5. Generic Formation (Learning Cycle)

Specializing Formation Phase (Certification Cycle).
At the end of the Generic Formation phase, students must initiate the Specializing Formation Phase (Certification Cycle). This is the phase to be followed by the student to meet successfully the certification exam. Here are the points dealt in this phase:
A) Reading study guides located on the support site for certification.
B) Present the Chapters tests. (Using the system POKA YOKE, this cycle should be repeated until achieving 90% of correct responses by chapter review.)
C) Present the Preparatory Exam. The preparatory examination was designed by the IT UNIVERSITY itself. It is a mixture of questions that have the following sources: 1.- The academic core of IT UNIVERSITY, 2.- From the creators of preparation exams Transcender and Selftest 3. - The CISCO site for exam preparation CCNA PREP CENTER.
D) Develop the Final Laboratory properly; the instructor will approve the correct conclusion of the Laboratory. The preparatory review itself is a design of IT UNIVERSITY.

Figure 6. Specializing Formation Phase (Certification Cycle).
5. RESULTS AND CONTRIBUTIONS.

According to Scott Perry (Cisco Certified Instructor, 2007), certification levels range from an average of 17%, when there isn’t a model focused on professional training which could lead to much better results between 50% and 75%.

Table 3 indicates the 98% rate of completion via the CerTIC Model in 2009 for CISCO certifications.

Table 3: annual CISCO certifications figures (2009)

<table>
<thead>
<tr>
<th>Certification Cycle</th>
<th>Duration</th>
<th>Technology used</th>
<th>Instructional design</th>
<th>Follow the student</th>
<th>Price</th>
<th>Competitive advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CerTIC</td>
<td>120 hours in 16 weeks</td>
<td>CISCO, INDUSTRY OWN, E-learning, Tutorials, Simulators</td>
<td>Poka-yoke recycling system until the student obtains 90% of correct answers on tests for each chapter.</td>
<td>Custom Permanent</td>
<td>$50.00USD</td>
<td>CerTIC</td>
</tr>
<tr>
<td>Students</td>
<td>280 hours in 4 semesters</td>
<td>CISCO E-Learning, Simulators, Tutorials</td>
<td>Linear model using the CISCO’s official materials</td>
<td>Student Optional Certification</td>
<td>No charge for students enrolled in the school. 2999.00 USD (courses only with partner)</td>
<td>CerTIC</td>
</tr>
<tr>
<td>Performances</td>
<td>CerTIC Academy &amp; Partner</td>
<td>CISCO, INDUSTRY OWN</td>
<td>Focus on students on graduation from college</td>
<td>CerTIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor</td>
<td>CerTIC</td>
<td>CISCO E-Learning, Simulators, Tutorials</td>
<td>Performance indicator linked to the pupil’s result in the certification exam</td>
<td>CerTIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certification rates</td>
<td>CerTIC</td>
<td>CISCO E-Learning, Simulators, Tutorials</td>
<td>Without academic performance indicator linked to the certification of students</td>
<td>CerTIC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: IT UNIVERSITY (2009)

Salary changes. Monthly salary in Mexican pesos.

Job changes achieved with certification in the field of network administration and communications were: Of the 39 respondents, 31 obtained a better job, 38 improved salary. The median salary of the sample moved from $7,000.00 to $14,000.00. The segment with the major improvement in pay, was the professional technician segment with a 250% increase, followed by the postgraduate segment with a 146%. The undergraduate segment salary increased by 59%.

Results for undergraduate level:
The median salary increased from $7,000.00 to $ 12,000.00 and the average time to take the exam and get certified was 7.2 months with a median of 8 months.

Results for postgraduate level:
The median salary increased from $8,000.00 to $16,250.00 and the average time to take the test and get certified was 8.6 months with a median of 8 months.

Results for professional technician level:
The median salary increased from $3,500.00 to $ 12,250.00 and the average time to pass the certification exam was 7 months with a median of 7 months.

Comparative between CerTIC Model—CISCO Model

The comparative between CerTIC Model with CISCO Model is central to maintain competitive advantages for the CerTic model.

Table 4: Comparison between CerTIC—CISCO Models

Source: Own design

In tests for the CerTIC Model application in internal training programs, was observed an increase in efficiency and accreditation of 20% to 96%, which verifies the operation of the Certification model. Key elements in achieving these results were the learning and certification cycles (Student, Instructor, Academy) which are supported by specialized materials, preparatory tests, partial laboratories and a final integrating laboratory.

Original Contributions Summary

1. The Manufacturer’s educational technology (websites, tutorials and simulations) is a necessary condition used by all three models intensively.

2. Since the objective is to generate in students the skills to identify and solve technical issues, educational technology itself, is necessary but not sufficient to achieve a high certification rate (80%). We also noted that since the certification standards are different in each model: CISCO 12%, SAP 30% and 98% CerTIC; is the teaching PROCESS and how to use its own, the publishing industry’s and the manufacturer’s educational technology, what develops the skills in students to achieve high levels of certification.

3. The teaching-learning process is fundamentally social, which is achieved by monitoring and personally supporting each student.

4. The teaching method integrates the Poka-yoke system that recycles the student in each level until it achieves results of 90% correct answers on every test, is a CSF for the CerTIC model.
5. - The non-intensive teaching method that delivers 120 hours in 16 weeks.
6. - The teacher evaluating method in the CerTIC Model, linked to the outcome of the students in the certification exam.
7. - The price is 70% cheaper than the CISCO Partner or SAP option, allowing students with fewer resources to access studies for certification.
8. - The maturity and motivation of students to achieve professional credibility makes them very dedicated students.

Social Impact of the Model.
1. - Using the CerTIC Model in other sectors of the ITC industry to achieve technological certifications and / or related methodologies such as:
   By using the CerTIC Model more than 2,855 people have already been certified (until the end of 2007), in different technologies (CISCO, IBM, MICROSOFT, SUN, Oracle, SAP, LINUX, PMI …) winning with this, a better alternative in terms of jobs and salaries.
2. - This model supports strategy #2 of the Prosoft Program 2.0, generating 628,000 quality jobs for ITC in Mexico.
3. - Democratizing element of the labor market. The price, which is 70% cheaper than the competition, allows students with fewer resources access to certification. This allows the specialized CerTIC profile to be an element of democratization in the labor market, it increases employment opportunities for a greater number of university graduates.

Following are the statistical tests applied to the CerTIC Model.

Design of the test on the effect of the process
Is intended to compare two dependent groups. Group 1 is the group before the intervention (implementation of the CerTIC Model) and group two is the same group after the intervention (implementation of the CerTIC Model).

Taking a sample greater than or equal to 30 and based on the Central Limit Theorem, the T test was used for means of two matched samples.
T test for paired sample means.
The test was carried out with the records of the sample at the beginning of the program (PRE-PROGRAM SCORE) and with the final records of the sample prior to the Pre-Certification exam. (FINAL SCORE WITHOUT SUPPORT PER MODULE) (see Table 1).

Since p = 8.7E-25 is less than 0.05, this demonstrates that the process produces changes.

Design of the test on the correlation between the final CerTIC evaluation and CISCO's accreditation
The intention is to correlate two variables. The independent variable is the PRE-CERTIFICATION SCORE and the dependent variable is the SCORE OF CISCO CERTIFICATION.
Since the value of p = 3.7E-39 is less than 0.05 the hypothesis that the CerTIC Model does not gives the required specialized professional profile for the sector of telecommunications network management is rejected.
The correlation coefficient is r = 0.9989 thus demonstrates that the CerTIC Model and its pre-registration predicts the 99.7% the students will get when taking the CISCO certification exam, profile required by the sector of network telecommunications management.

Conclusions
The CerTIC reference model proposed in this project provides a working method which ensures an efficiency rate above 50% in passing certification exams that validate the skills of the participants in the certification process for the area of Technology Information, compared with percentages of 15% to 40% of existing models.

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