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ADMINISTRATION TO CATCH FUTURE AND POTENTIAL STUDENTS TO UNDERGRADUATES IN MEXICAN UNIVERSITY USING GOAL PROGRAMMING MODEL

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Every year the Universities in Mexico need to establish goals to updated tuition in management of new students. As you know there are two periods to register students in January and August, because we have as many institutions in the world two semesters by year. This work is very important to keep updated academics programs, keep job to professors of full and partial time and the keep the classrooms to real capacity, everything it help to improve the quality of academic programs, and of course keep the budget to make investments to get certificated academic process because the students is the reason of to be in Universities. Well, at this moment they are working with traditional way and historical data to make forecasting and they are taking decisions in function to put desire targets, many times based in old experience or may be in the infrastructure of the university. But there is not evidence of make forecasting using science, particularly optimization model to large scale method. In this paper we can show an interesting and creative idea to take decisions in relation to forecasting of several goals at the same time in the enrollment process, this tool could be economic, practical and easy to try making implementation in the management of whatever University in the world is to say public or private Institutions.

Keywords: Optimization, Capture, Administration, Undergraduates programs, Goals Public and Private University, Gross National Product, Per capita

INTRODUCTION

The word catch comes from the collection “capio” Latin for capture. In education we talk about it when institutions try to capture the potential “customers” (students) entrust universities for them and as consequence their families put their trust to their comprehensive training that is, they

are looking for human values, provide knowledge, develop skills, be agents of change in their environment, generate leadership in their areas of expertise with entrepreneurial, innovative, progressive and human profile. Derived from the highly competitive educational offerings in México (70% population attends public universities, 30%

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attend private universities, ECLAC (2012)) and the apparent decline in the economic power of our society is generating in half-empty halls educational spaces, producing cannibalization among college segments, this forces more broadly identify and detail the current scenarios by changing the traditional way of performing marketing and new prospective student, in addition to the intrinsic requirement of quality educational institutions higher education and better job opportunities after completion of the studies as a means of social mobility in continuous improvement. Extending the concept to our country, we can mention that the uptake in Mexico is complex in paragraph private university and historically has established a right to public education in the constitution, where enshrines the right in the third article stating the education provided by the state shall be free, secular and compulsory for all citizens of this country, simplifying, is obliged to reside in Mexico to attend at least education, Elementary, School, Secondary School and High School. If we look

for the definition of quality in education in Mexico, let's go back to the philosophy of José Vasconcelos who conceived education as that to which the Mexican population should have access based on values such as honesty, respect, integrity, leadership, discipline Vasconcelos (1921). We cannot talk about quality education without including philosophy because all philosophy fits in education and all education ends in philosophy, then philosophy and education are daughters of time, Sabater (2011). Some also writes that high quality education is a privilege of few people is to say for those who have the economic possibility means. This statement was written by Freire (2012).

OPTIMIZATION MODEL IMPLEMENTATION

Let's return to that mentioned that Mexico is not a poor country, but is simply an unequal country, however there is a paradox because those who generate it are those who benefit from it. Consider some facts:

Gross National Product (GNP) Economic activity. forecasts							
	Q1 2014	Q2 2014	Q3 2014	Q4 2014	2014	2013	2012
inflation%	4.3	4.0	4.7	4.2	4.3	3.8	4.1
Unemployment rate. dollars %	4.7	4.6	4.5	4.4	4.6	4.9	5.0
Income per capita. dollars	10,631	11,171	11,244	11,567	11,153	10,742	10,135
Formal employment rate%	3.2	3.5	4.1	3.2	3.5	3.5	4.6

Source: BBVA economic studies services (2013)

ANALYZING

According to these indicators are expected that in 2014 the average quarterly inflation is higher than 2013, we can see how (4.3 > 3.8). The unemployment rate is expected to decrease (4.6 < 4.9) The average annual per capita income will increase (11,153 > 10,742) The formal employment rate will remain the same terms (3.5% vs. 3.5%) unchanged. Three important indicators oscillated in favor of the economy in Mexico, that is able to flow more capital into Mexican families, although the items are not of countries world-class, if we are in a position of improvement, and this will be very good approach to capture the second half of 2014 increases mean better students for college campus, how the cake will be distributed a set of strategies and ongoing work processes and operations, the end results will tell us as account we are doing things in and out of schools. It is worth commenting on the following indicators:

Worth Commenting on the Following Indicators about México

No doubt that in reviewing the indicators at the top, we can see the area of opportunity that exists in México to attract new students, no doubt that respect for the initial population targets for new semesters should be one of the edges meet as category information even accurate macro emits

Distribution Coverage of Undergraduates Programs in Latin America		
Country	Public Education	Private Education
Chile	0%	100 %
Colombia	34.9 %	65.1 %
Brasil	25.8 %	74.2 %
México	70%	30%

signals opportunity for the Under Graduates Programs education in Mexico.

The statistics in Mexico speak about the education sector net coverage of 90% in Elementary education, 86% coverage in Secondary School and the High School 72%. Source SITEAL (2013)

With the previous information you can start drawing strategies for administrative and specific marketing areas to care for these populations of different academic levels. In the short time will be the new students in Under Graduates Programs, monitoring the behavior of the system is considered vital the elementary, Secondary School and High School for the achievement of objectives in institutional strategic planning environment.

Occupying a fifth place in the Human Development Index (HDI) in Latin America and ranked 57th in the world, Mexico invests follows as a percentage of Gross National Product. G.N.P.

Important aspects about Demographic Situation in México	
City Population %	78 %
Immigration Process	-3.8
Birth ratio %	2.0
Distribution of population in most important cities%	México D.F. 18 Guadalajara 3.6

Source: Cepal (2012)

Important Aspects about Labor Situation in México Siteal (2013)	
Productivity Rate (2010)	62.2
Employment Rate %	57.9
Unemployment Rate %	5.6
Informal Employment Rate%	43.2
Salaried Workers Rate %	73.7
Source: Inegi (2010)	

Public expenditure G.N.P. Education 3.8%
 Public expenditure G.N.P Health 2.72 %
 Source: SITEAL (2013)

Hard to understand how a country like Mexico spends more on education programs than health programs, the important thing about the urgent, then this country should be a force in research and the Universities academic programs. Now what would you think if you observe the following index.

Percentage of Investment in G.N.P. Health and Education		
Country	% Health	% Education
Spain	9.6	5.4
United States	17.9	5.0
Israel	7.5	5.6
Source World Bank (2013)		

Moreover, INEGI (2012) reports 59% of Mexicans in the informal employment representing some 28.9 million people, here a beta that has served little or no leaving everything to the public sector, in essence free. But the indicators do not endorse that. Then a great job of social contribution and can even add significant numbers to the goals of attracting, remain as unfinished. Let's look in more detail by performing a basic question: Is this segment is in poverty?

Could pay tuition for your family? What hedging levels are we talking? Will they interested in having their boys and girls study a career? How many students will study in a private university? Do they know which universities exist in their geographical areas? Many questions could be made in every state, city and family, In every segment surely you could have different and interesting answers. Does the administration in our university campus know this important information? Are they updated? We believe it would be helpful information for strategic decision-making institutions, if it is not available, then they need to establish how to get it for the administration and persons who is taking decisions at the University. Why do we think it is important to take important decisions? Because in Mexico many people inside informal employment not pay taxes, (not there are perspective of gender to reach justice and equality in labor sector in Mexico (Guzman, 2013), but they have to pay fees to meet federal corruption obligation, researchers mention that there are parallel schemes for the expenditures they make, but not ethical to perform. Hernaldo Soto (1986) says when legality is a privilege that only access to political and economic power to the majority that they have no more illegality. However there is a social responsibility to care for these millions of Mexicans, who have family and education are far from being one of the main reasons of why engage in the underground economy, and they are nevertheless support the national economy growing labor and money in the Mexican market otherwise many offer and important information institutions the competitiveness increase to try catching students to rise registers to their classrooms, then the Universities could make or could choose some of the next options 1) Modify or eliminate some academic program inside

careers in ever shorter cycles. 2) Close University campuses and integrating into one, is to say a multiple university where academic, cultural diversity and continuing education is incorporated. 3) Staying with the same numbers and self-motivated registering and canceling registrations in the timeline and their school systems, where all segments of universities will always meet or near the goal with this approach. Everything is right, with populations below 50% of installed capacity. 4) Decrease administrative budgets that will result in poor quality due to lack of academic leaders, less updated technology systems and equipment, less laboratory automation, training and austere smaller scale processes. But let's detail: remembering the appointment of Cuban poet José Martí who expressed. "I know the monster because I lived in her womb" By other hand we can see deeply into a particular college or career where traditionally the numbers are low or distant goals that provide management, never grow up! Simple answer, the relationship that fewer students, if you enter one or two percentages presented significant progress when you really are not grow up. Remembering interesting quotes, Wilfredo Pareto 17th century Renaissance saying, "if you torture the numbers tell them what you want to read." Concluding the administration of institutions will continue inflating time bombs in their innermost structures, until the economy and the scope of any government decision not productive order can fracture the whole organization, in the best cases. However, because the above happens? If the rate of population continues to rise? The assessment is that wealth is poorly distributed, but not necessarily analyzing only one social segment, from an almost tripartite social and cultural anthropological vision !! high, medium, poor, marginalized, is insufficient as brief analysis to

establish marketing programs with such a general basis, but must be sculpted detail the feasibility, that is, how it is made and how society while taking the social mobility, that last sentence, you can answer us because our careers and campus are not growing, who are having the best income from lawful approach to professional and personal improvement? What are their interests? Where will they attend? What is your favorite place or institution? It could give us interesting reflections to generate analysis to define the strategies and actions.

SOME DEVELOPMENT STRATEGIES FOR ATTRACTING STUDENTS

- Formation of a committee of the university to verify the transparency of administrative procedures for opening new universities to prevent corruption, i.e., the issuance of securities and titles without the institutional academic support to the Government authorities. Thus avoiding unfair competition.
- Delivery schedules with options for morning and afternoon shifts at the time of giving admission test results with comprehensive university options menu, i.e. language, sports and / or cultural activity with its corresponding academic load. This action will increase the number of enrolled students approved in the admission system.
- Issuance of provisional credential with photo and email from the university at the time of giving admission test results, in order to establish identity with the potential student. The technology is a pre requirement to achieve success Rueda (2013)
- Signing of partnership agreements with social

clubs such as Rotary, Lions for promoting international student integration, try to be more timely, periodically these associations whose goals include the internationalization of Mexicans students.

- Signing of cooperation agreements with chambers of commerce, processing to distribution supports scholarships to children of its members, you can have a shed to establish the annual fee economic participation among partners to support a certain number of students will be displayed in the agreement, this periodically forms a group of students will have in new revenue.
- Start collaboration agreements for long-term programs to elemental and secondary schools including, visits, trips to these primary and secondary schools to promote careers periodically through campus information, visit programs to install. • Organization of sports games tournaments between primary and / or secondary schools, through the secretary of

education and town in the state, where the university-based analysis and act as organizer, this will set in the short term but not only academic leadership sports and / or cultural to those children who will soon be looking for a university educational option where the campus is located geographically.

- Participation of university researchers in the dissemination of his work as part of the attraction of future science professionals rarely if ever marketing leverages this area, very different from what they do world class universities look.

Every administrative process inside quality education in different levels must try to look for the infinitum quality and decrease to costs zero Santoyo (2010).

Implementation of Linear Program Using Inside Undergraduates University Program

- Implementation in Marketing area, Analysis for

Table 1: The Mexican University Administration Seeks to have Several Targets Simultaneously

Undergraduates Programs Information			
	BIT	IIS	BBA
Estimated Incomes per capita enrollment by career semester august- December 2014 (millions of dollars)	12	9	15
Requirements of employers august- December 2014 (hundreds of employers)	5	3	4
Requirement Investment for quality programs august- December 2014 (millions of dollars)	5	7	8

Integral Catchment within the Institutional Planning implementation proposal for capture planning and Increase Budgets. An Educational Institution of Undergraduates program offer three careers, Bachelor of Business Administration (BBA), Bachelor of International Trade (BIT), and Industrial Engineering and Systems (IIS), is concerned that record numbers of students show a tendency down, and decided new strategies, before closing educational programs and the name and content. Therefore, it has asked the marketing area to develop a work program that meets expectations comprehensive, based on available information has been updated.

The Mexican University Administration seeks to have several targets simultaneously. 1) Tuition revenues exceeding \$125 mn 2) The number of

employees is maintained, with penalties of \$ 2.0 for each additional hiring and penalty of \$ 4.00 for dismiss personnel. 3) Investment in academic programs does not exceed \$ 55,000. * Note how interesting it is to focus on an amount of income, rather than a number of students, the final result more realistic analysis focused on income to a register, no doubt that budgetary planning cannot be closer to the true that the institution requires.

The Model is defined as;

$$Minz = \sum_{i=1}^q A_i * n_i + B_i * p_i$$

S.T.

$$f_i(x) + n_i - p_i = t_{(i)}, i \in \{1, \dots, q\}$$

$$x \in f_i(n) \geq 0, p \geq 0$$

```

*Program Code to Capture Students in function of several targets.
*Developed in a University of Undergraduates Program
*The Model run with different Objectives at the same time
*Program to large scale optimization
*Performance by Dr. Francisco Zaragoza H.
*July 2014

Sets
i/1*3/
j/1*3/

Parameters
b(i)
/1 125
2 125
3 125/

g(i)
/1 40
2 40
3 40/

h(i)
/1 55
2 55
3 55/

c(j)
/1 0
2 0
3 0

table a(i,j)
1 2 3
    
```

```

1 12 9 15
2 12 9 15
3 12 9 15

table e(i,j)
1 2 3
1 5 3 4
2 5 3 4
3 5 3 4

table f(i,j)
1 2 3
1 5 7 8
2 5 7 8
3 5 7 8

Variables
Z

positive variables
x(j), n1,p1,n2,p2,n3,p3

Equations
fo objective function
rest1 constraint 1
rest2 constraint 2
rest3 constraint 3 ;

fo..z=e= 5*n1+4*n2+2*p2+3*p3;
rest1(i)..sum(j,a(i,j)*x(j))+ n1-p1 =e= b(i);
rest2(i)..sum(j,e(i,j)*x(j))+ n2-p2 =e= g(i);
rest3(i)..sum(j,f(i,j)*x(j))+ n3-p3 =e= h(i);

model progmetprior/all;
solve progmetprior using lp minimizing z;
display x.1,z.1,n1.1,n2.1,n3.1,p1.1,p2.1,p3.1;

option x:3:0:2 display "the optimum quantity for each academic program is ", x.1;
option z:3:0:2 display "optimum value of the objectives is ", z.1;
    
```

Experimental Results

Model Statistics			
Blocks of equations	4	Single equations	10
Blocks of variables	8	Single variables	10
Non zero elements	50		
Generation time = 0.062 seconds 4 mb win237-237 aug 23, 2011			
Execution time = 0.062 seconds 4 mb win237-237 aug 23, 2011			
Gams rev 237 win-vs8 23.7.3 x86/ms windows 07/29/14 19:37:12 page 5			
General Algebraic Modeling System			
Solution Report Solve Progmetprior using lp from line 80			
Solve Summary			
Model	Progmetprior	Objective	z
Type	Lp	Direction	Minimize
Solver	Cplex		from line 80
**** Solver Status 1 Normal Completion			
**** Model status 1 Optimal			
**** Objective Value 16.6667			
81 Variable X.L			
1 8.333, 3 1.667			
----	81 variable z.l	=	16.667
	Variable n1.l	=	0.000
	Variable n2.l	=	0.000
	Variable n3.l	=	0.000
	Variable p1.l	=	0.000
	Variable p2.l	=	8.333
	Variable p3.l	=	0.000

83 the optimum quantity for each academic program is			

83 variable X.L			
1 8.333, 3 1.667			
----	84 The optimum value of the objective is		
	variable z.l	=	16.667

ANALYSIS OF RESULTS

From the results obtained can be seen that:

- Amounts in millions of dollars per income students are: $x_1 = 8.33$ (8.33 million dollars for new students for Bachelor of Business Administration (BBA). $x_2 = 0$, Industrial and

Systems Engineering Without additional revenue inscriptions (IIS). $x_3 = 1.666$ (1.66 million dollars in revenue from new students for the Bachelor in International Business (LIN).

- The first objective income new student enrollment exceeding \$125 mn is met.
- The third objective, the investment in academic programs not exceeding \$55,000 is fully met.
- The second objective is not fulfilled as it exceeds 8.33, the resulting penalty for hiring more staff will be 8.33 million.
- It is important as a first version of results can guide the feasibility of expected numbers of students in goal setting, both new records and respective tuition revenue.
- Note that an academic version of the software GAMS allows great information for decision-making, at zero cost.
- This type of computational effort complements institutional planning so accurate.
- The importance of having staff profile in exact sciences in the area of mkt is displayed.
- The programming was unpublished and/or original
- New knowledge is generated.
- Programming can be done on a large scale for all college campuses.
- World-class technology that would contribute to take the lead in administrative processes is used.

SUGGESTIONS

- A social analysis focused on social mobility to detail will set new promotional programs and marketing academic offerings, to deliver optimal and feasible option for society.

- Any child or young person should have in his mind the idea of being a university student quality, public or private, regardless of their economic status and age.
- The university should not only be a trademark or logo should be a badge to society for effective, real and genuine social mobility.
- The financial resources should not be an obstacle but an element of chance to show among other things that education costs and worth paying for it, because it is a symbol of effort and synonymous with hope for a better tomorrow. Today the campus must continue to maintain and develop thinking about careers with human sense but should ensure they reach all areas of our country.
- Any geographic space in whatever city should be an expansion possibility, simply observe the lock having to take the key social changes required to make it feasible.
- No more lack of growth in a country where the rate of exponential growth of the continuous population all time is raising.
- Mexico one of the geographic locations where the richest men in the world are developed, and with so much economic inequality, seems short vision just thinking about scholarships as a way of attracting the best academic programs that exist today, not only in Mexico or Latin America, there are private universities and example of leadership on many European and Asian countries or northern neighbors.
- Universities who daily work for quality and investing in beneficial changes constantly and always deserve to have enough students to fill their classrooms, they deserve to be real and objective continuous upward
- The profile of employees in the catchment area should be more than good relations with superiors, ensure additional competencies and skills already mentioned above. To conclude: when listening and / or seen no growth in races or just campus remain with

Table 2: Ranking of the Best Universities in the World

Rank	University	Country	Scores over 100
1	California Institute of Technology (caltech)	United states	94.9
2	University of Oxford	United kingdom	93.9
2	Harvard University	United states	93.9
4	Stanford University	United states	93.8
5	Massachusetts Institute of Technology (mit)	United states	93.0
6	Princeton University	United states	92.7
7	University of Cambridge	United kingdom	92.3
8	University of California, Berkeley	United states	89.8
9	University of Chicago	United states	87.8
10	Imperial College London	United kingdom	87.5

populations of a few students on installed capacity, (half-empty rooms) is like listening expressions concerning when it is said that no well-paid work in Mexico, when the reality is that it is not so, but skilled labor for them will always be work and compensation is required. Then track should be more than the indicator reflecting a university enrolled or not enrolled as advances in installed capacity, what happens visually on a campus on an installed capacity?, one of the most frequently cited explanation is the economy you can be questioned, then because new universities and academic options at every turn, a possible answer would be: They get to any area of this planet with their information in different ways, competitive racing, stellar teachers, fantastic salaries for graduates, world rankings always on the rise, fame, transcendent order research coverage information in society in its various segments, comprehensively and in detail, is a full coverage!

CONCLUSION

The problem of lack of students in universities that have not ranking in the best schools in the world is a complex problem, however in this document we can appreciate how the use of science helps establish multiple goals by improving the possibilities for management of the institution but they need to have qualified personnel in areas of exact sciences as continuous improvement strategy. By other hand in Latin America still do not find in the literature those institutions using the mathematical programming as a tool to predict their future funding of potential students perceived staff. A successful case is the Massachusetts Institute of Technology (MIT) located in fifth place on the top ten universities

world wide. This University enrolled 4384 undergraduates and 6510 graduates, for 2011-2012 and this year (2014) received 18109 applications for registration with only 1620 candidates admitted, thereby maintaining an acceptance rate of 8.9%. Further comment that has among its 1000 (thousand) faculty members to 78 (seventy-eight) and 52 nobellaureates national medal of science, 45 scholars and rodes 38 McArthur Fellow, MIT has inherently strong business culture, the combined income of the companies founded by graduated MIT, place it as the world's eleventh largest economy!! Source (<http://es.wikipedia.org>). Now we can understand why any student of the world desire to enter MIT in particular Mexicans should travel 3602 miles with an average tuition of about \$ 50,000 annually. After rigorous methods in the acceptance process filter, besides the higher tuition feeno doubt who studies at M.I.T. it has a secure mobility for him and his family. Here we observed no semi empty halls but on the contrary there is sufficient demand and you might think that capacity is lacking, arguably even to one of the edges solution to the problem of recruitments the college quality or better expressed!!! Best world class University. If we extend the word quality university we are talking about some of the challenges in higher education is to provide greater coverage to the society with efficient educational programs governed by the authority, to promote and develop skills in students, values, leadership profiles entrepreneur with human sense, this is an outline of opportunities holistically to any Mexican citizen, regardless of their social, cultural or economic background can access a university education so they can develop fully, otherwise there will be injustices by preventing their income to the education and higher education.

Instances once registered in the programs should ensure that the issuance of securities to accredited students inability, knowledge and tools to successfully perform a job is given to society. Not a priority if a student how private or public universities, the important thing is to have the best teachers, the best trainer and studying in those deep and relevant educational programs that will ensure comprehensive social mobility of completing their studies. This will be possible from effective planning by the institutions of higher education since the scenarios capture new revenue with structured international competitiveness and scientific tools that are alternatives to the basic administrative processes are made.

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