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Generation of a Model of Relational Marketing Based on the Factors that Affect the Choice of a Scientific-Technological degree in Universities of the State of Hidalgo in Mexico. Case Universidad Politécnica de Tulancingo.

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Abstract

International organizations such as the Organization for Economic Co-operation and Development, OECD, have pointed out that the region of Latin America has experienced in recent years lower levels of competitiveness in activities based on knowledge. Our levels of scientific productivity, training of human resources, investment in science and technology and applications for patents are low too. This problem is increased by the lack of interest in pursuing graduate studies in areas related to engineering, science and technology. Given the above problem, it was considered that marketing, specifically the relational marketing, might offer options to increase the interest in this type of professions, as well as to assist in the continuation of those who are studying them. The study was non-experimental, quantitative, descriptive and cross-sectional. The subjects were 290 undergraduate students just about to graduate from engineering colleges in Hidalgo. Results showed that 81 percent of respondents are interested in pursuing a master's degree in engineering, and the factors that influence their decision are: the belief that studying a master's degree will give them a higher status and the belief that studying a master's degree will give them greater financial solvency. With this information, a Model of Relationship Marketing was designed to attract students to this area of knowledge, and to decrease levels of dropout students among those who are already studying them.

Key Words: *Education, didactics of mathematics, relationship marketing, Model of Relationship Marketing, Engineering.*

Introduction

The purpose of this research is to identify the factors affecting the study level at graduate scientific and technological areas, to design a model of relationship marketing, which look for the attraction and retention of students, which help strengthen these areas necessary in Mexico and in developing countries. Such studies help to find new ways to increase both the number of entries and graduations in the area. International organizations such as the Organization for Cooperation and Economic Development, OECD, (2009) pointed out that the region of Latin America has experienced in recent years lower levels of competitiveness in activities based on knowledge. Our levels of scientific productivity training of human

resources, investment in science and technology and applications for patents are low too. Suffice it to point out that the production of scientific papers in Mexico represented in 2011 only .86 percent of the global total. From this production a 7.3 per cent corresponded to areas of engineering. This placed Mexico in place 21 of 34 OECD member countries. Regarding the state of Hidalgo, according to the report of Scimago Research Group, in 2014, the Universidad Autónoma del Estado de Hidalgo, highest seat of learning of the State, provided a rare .59 percent of the world total.

On the other hand, figures related to the legalization of patents as a means of generation and registration of knowledge for exploitation there's a forceful leadership by developed countries presented in this category. In Mexico in 2013, for every million inhabitants in the country, 0.5 patents arose, as opposed to leading countries such as Taiwan, in which the number amounts to 287.1. With regard to the State of Hidalgo, Mexico, 24 patents were requested, which represented 67 per cent of the national total (IMPI, 2010). Around the resources of high level trained in research, in 2012, Mexico had a 0.9 per cent for each thousand members of the economically active population, PEA, figure away from countries like Germany which has 7.9, or the United Kingdom, with 8.2 (CONACYT, 2011).

Researchers who speak about the causes affecting the interest in studying scientific careers and engineering mention from motivational factors and didactics of teaching, to cultural factors and study habits (Posada, 2010; Gorostiza, 2000; Rivas, 2005; León, 2006; Blazquez, et al, 2009). In what to the didactics in the teaching of mathematics refers, the authors comment that more memorization than reasoning is used, that there are few concepts and applications that are truly understood by students, and that they are also usually alien to their reality. Desertion in the initial courses of careers with high content of exact sciences as computing represents 30% even in developed countries (Bennedsen, 2007). There are studies that are dedicated to analyzing the ways to counteract this aversion; within this group there are the ones of: SEADE (1985); García (2001); Port, et al (2002); Williams and Emerson (2002), who proposed a series of educational measures and forms of teaching-learning to motivate students to study math logic..

Literature Review

In higher education it is evident the little demand areas of engineering and science have, since they are described as *hard* areas in the sense that subjects such as mathematics, physics, chemistry, etc. dominate. There are analysis (Gorostiza, 2000; Rivas, 2005; León, 2006; Valdivia, 2003; Blazquez, et al.,) which study the reasons why students are interested in studying scientific-technological careers; that found that the most important factors are family support and the support of teachers. With regard to the first, it is argued that there is a close relationship between the expectations that parents have of their children, reflected in the expressed confidence about their abilities when they are children, in the pride and recognition for their achieved school performance. These authors point out that the confidence of parents is more common to their sons, since they consider that their success in their studies, such as mathematics, is due to their natural talent, while the successful performance of their daughters in this area is attributed it to their hard work and dedication. With respect to teachers' support it is related to the empathy, kindness and fair treatment they have with students, as there is a positive correlation between the level of support given by teachers in the classroom and motivation to study these careers.

Bigss (2008) indicates the levels of non-commitment of students, the level of activity related to learning and academic guidance received as factors affecting the problem. Blazquez, et al, (2009) manifested as the most common problem in the study of mathematics: the difficulties of the language due to the use of concepts for spatial information. It is to say, difficulties to represent a spatial mathematical situation or a geometrical problem due to incorrect associations or rigidity of thinking, which are caused by the lack of flexibility of thought to adapt to new situations. Gorostiza (2000) lies within the group of scholars who believe economic factors are the main obstacle of the election and the completion of a scientific-technological career. Other authors consider that the most important factor is inadequate vocational guidance. Leon., et al. (2006) conducted a study in which it was found that an adequate vocational guidance

could influence the modification of the criterion for pre career choice in upper level students. According to the results obtained after investigating a total of 1,055 students it was found that students do not have enough information or guidance for performing career choice as one in five students decide to change their original choice. Gomez (2012) found that the elements that influenced the decision to pursue a career in the scientific technological area were perception of the teacher, the way in which he/she explains and the materials used.

With regard to relationship marketing, these studies indicate its importance in organizations: Sainz, 2001; Reinares, 2002; Alfaro, 2004; Kotler and Keller, 2006; Gronroos, 2007; Kasper, 2007, among which Kotler and Keller's (2006) work outstands. They consider this type of marketing aims to establish mutually satisfying, long-term relationships between the main actors, in order to preserve and increase the company's participation in the market. There are other works (Manes, 1997; Petrella, 2007; Carrasco, 2008; Sanders, 2009; Linoff, 2011) which link relationship marketing to education, stressing that education institutions, regardless of the level in which they are found, should consider this type of marketing as a tool to improve communication networks aimed at the educational community and include a wider service according to the their demand.

Table 1. Integrated concepts of relationship marketing

CONCEPTS	CHARATERISTICS
Direct Marketing	Structure of the enterprise oriented to the direct relationship with the customer.
CRM	Tools for communication and information technology enabling the relationship strategy. Customization Resources in communication.
One-to-one marketing	One-to-one marketing- individualized strategy, treat different customers differently. Satisfaction and differentiation by personalization.
Micromarketing	Incorporating the concept of segmentation to marketing strategy. Elaboration of marketing plans for segments or groups of customers
Data Base Marketing	Application of database clients in marketing activities.
Permission Marketing	Massive Collection of personal information of little validity (Internet) and saturation of customer need to enable trust and comply with regulations.
Internet Marketing	Adequacy of marketing aiming internet.
Online marketing	The high interactivity of the internet means implies providing a new marketing approach to achieve fast response. Adaptation of the business to the network and a new consumer
e-marketing	Adequacy of marketing to the companies with business models based on internet.
e - Loyalty	Marketing techniques to capture the loyalty of consumers on the Internet.
e- CRM	Part or functionality of CRM tools designed to capture, process and facilitate decision-making regarding customer interaction in the internet.
Telemarketing	Use of telecommunications as a means to relate or contact with a customer or potential buyer.
Mailing and Direct Mail	Using the traditional (non-electronic) mail as a means to relate or contact a customer or potential buyer.
e-Mailing	Use of e-mail as a means to relate or contact with a customer or potential buyer.
Mass Media Direct Marketing	Using mass media (TV, radio, press, etc.) to contact potential (rarely present) client. The message has to incorporate the means (phone, fax, letter, etc) through which the contact will be established.
Task force	Sales force. Support for marketing activities, through a team of salespeople, product demos or visitors.
Web-contact	Function enabled on a web-site which offers Internet online consultations about the services offered.

Source: Reinares (2002). pp. 20-23

It is also important to know the integrated concepts used in relationship marketing (Table 1). Among those, the most related to this type of marketing is Customer Relationship Management (CRM).

There are several models of relationship marketing, however, one of the best known is the one proposed by Reinares (2002) which considers eight steps: identify, inform, attract, sell, serve, retain and develop the relationship as well as creating a community of users with CRM elements in processes, people and technology

This model proposes a series of systematic actions that allow, from the retrieved diagnostic, the articulation of a methodology of attention, monitoring, evaluation and feedback with current and potential students that involves all areas around the issue, and which rests on relational marketing tools. The hardest thing is to create a community of users, so it is important to have a CRM to improve internal processes and organizational change of the institution seeking a total customer focus, looking for more effective and efficient processes and to adapt the same CRM system to the needs of the institution.

Methods and Materials

Based on the literature review, six factors affecting interest in studying postgraduate degrees in scientific and technological areas were raised: 1) skills and interests; 2) family., 3) professional myths; 4) educational offer, 5) perception of the teaching., 6) vocational choice (see Figure 1).

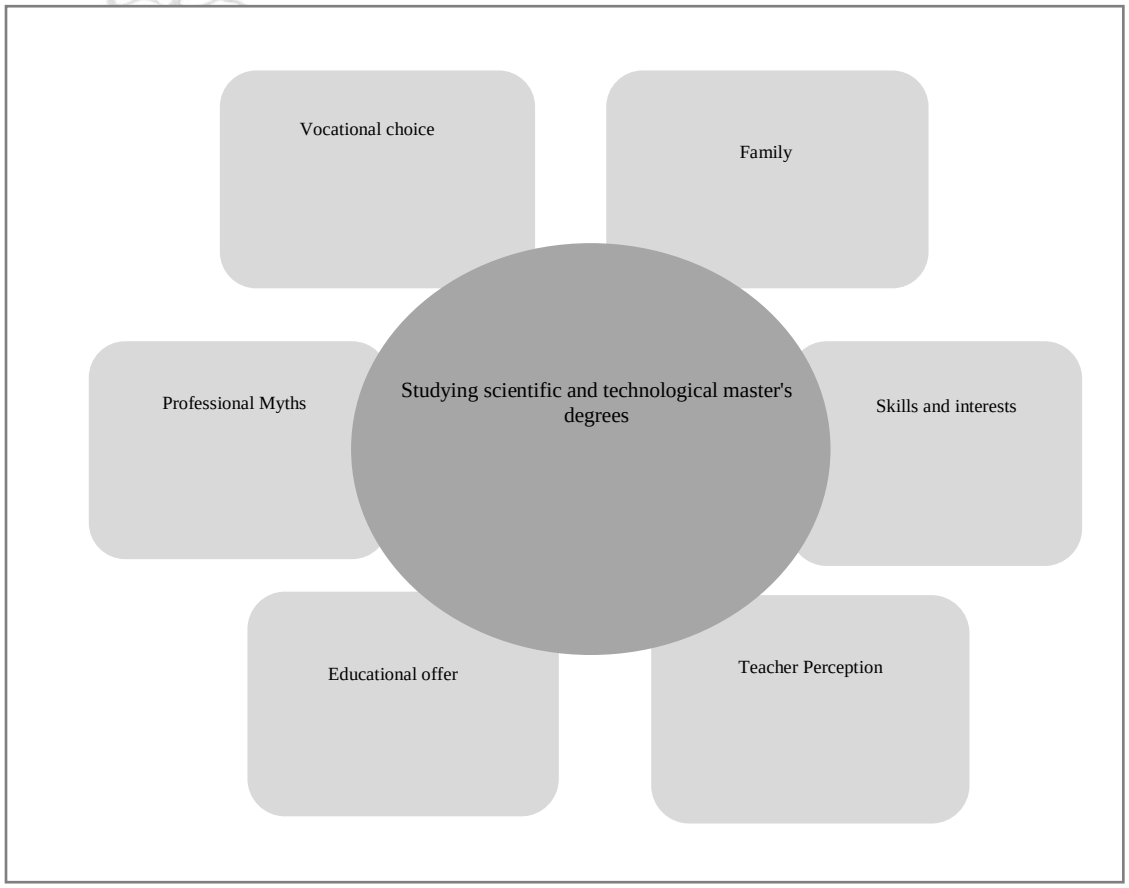

Figure 1 Factors affecting the study of careers in engineering.
Source Authors.

Table 2. Operationalization of the instrument

DIMENSION	CONCEPTUAL DEFINITION	INDICATORS
Interest in continue studying a postgraduate	Student on the last semester showing or not interest in further study.	If he is or isn't interested
Career Choice	The process is aimed at knowledge of various personal aspects: capacity, tastes, interests, personal motivations, depending on the family context and the general situation of the environment where he/she is inserted to decide his/her own future (Alvarez, 2000)	Willingness to study a master's degree/Willingness to study a master's degree in social sciences/Expectations met/ Vocation for engineering
Skills and interests	A person's ability to do one thing easily. (Lafrenet, 2012)	Like to solve problems that involve mathematics/Facility for mathematics/Facility for Chemistry/Taste for physics/Does or Doesn't he/she have options
Family	The family influence in decision-making. Is the boyfriend also considered as part of the inner circle. (Lafenetre, 2012)	Family intervention/Family support/Maternal support/ Paternal support/Relationship status/Does or doesn't he/she have friends that will study
Professional Myths	It regards stereotypes with respect to certain university degrees who also have to face the students and that, far from helping them to choose their studies, they can further confuse their decision (Lafrenet, 2012)	Belief in obtaining a status/Belief that it will give better solvency/Belief that it limits social life/Believe it will give a better employment/Belief that only men should study
Educational offer	The vocational choice is defined based on the information that the student receives on the educational offer, conformed by different areas and careers available and the different centers that offer them. (Lafrenet, 2012)	Satisfaction with the academic program/Adequate infrastructure/The formalities were quick/Knowledge of the educational offer of the UPT/Whether or not he/she recommend the UPT
Perception of teachers	This variable refers to the perception the student of the teachers of exact sciences (Gomez, 2012).	Does or does not the teacher solve the doubts/Does or doesn't he use innovative practices/Motivated or not Whether it is cear or unclear/Whether he used sufficient materials/Whether or not accessible

Note. Authors

A simple non-experimental, quantitative, descriptive and cross-sectional research, is designed to analyze the factors that have an impact on the scientific study of graduate programs in the area and generate a model of relational marketing that contributes to increase the attraction and retention of students in graduate scientific and technological programs of the institutions of higher education in the State of Hidalgo. The subjects were students of the last semesters of engineering offered at the Polytechnic University of Tulancingo. Laura Fisher's formula was used for known populations with a confidence level of 95% and a 3% confidence interval. From a population of 398 students from the last semesters of undergraduate engineering, 290 were interviewed. Although the population is small, a census was not conducted because it is difficult to find all the students in their classrooms due to the fact that absenteeism can exist for various situations. (Table 3).

Table 3 Stratified sampling of students from last semester of engineering of UPT

Engineering	STUDENTS	%	Number Surveys
Electronics	40	10	29
Industrial	103	26	75
Manufacturing	18	5	14
Robotics	50	13	37
Systems	187	47	135
Totals	**398**	**100**	**290**

Note. Author's table with statistical information from the University.

The data collection instrument was structured with 40 items measured on a scale Likert 5, where position 1 corresponds to *strongly disagree* while position 5 corresponds to *strongly agree,* the items were distributed in the six dimensions that represent the model: vocational choice, skills and interests, family, professional myths, offerings and perception of the teacher. The pilot test was conducted with 50 students of the engineering areas from the institution, allowing to state that the data collection instrument is reliable because the overall Cronbach's alpha and each of the dimensions' one is greater than 0.65 (Table 4). It was applied to the population attaining the response of 290 students in the last semesters of careers in engineering area.

Table 4 Reliability of the data collection instrument

CATEGORIES	CRONBACH'S ALPHA
Total	950
Vocational choice	770
Skills and interests	846
Family	864
Professional Myths	868
Educational offer	890
Perception of teachers	860

Note. Based on data from SPSS

Based on the above scenarios raised were the following:

H1 There is no interest from students in the last semesters of Engineering to continue graduate studies in scientific and technological areas of engineering, in pursuing graduate studies in scientific and technological areas.

H2 The taste for study as a part of vocational choice influences the decision of the undergraduate students in engineering to continue graduate studies in the scientific-technological area.

H3 The skills and interests of undergraduate students of engineering influence their decision to study a degree in this area.

H4 The family of the student of engineering influences his/her decision to study a degree in this area.

H5 Professional myths regarding postgraduate studies in scientific and technological areas influence the decision of undergraduate students in engineering to continue graduate studies in this area.

H6 Educational offer influences the decision of the undergraduate student of engineering in pursuing graduate studies in this area.

H7 The perception of the teacher influences the decision of undergraduate engineering students in pursuing graduate studies in this area.

Results

In relation to question one, which was used as a reference to whether or not there is an interest to continue studying a career of scientific and technological area. We considered as favorable responses items *agree*

and *strongly agree*, it was found that 81.4 per percent of respondents wanted to study a Masters Degree in Engineering which rules out the hypothesis that there is no interest in continuing (Table 5).

Table 5 Results disposition to studying a master's degree

Replies	Fr	Accumulated %
Total disagreement	5	1.7
Little disagreement	12	4.1
Neither agree nor disagree	37	12.8
Agreement	113	39.0
In total agreement	123	42.4
Total	290	100

Source Author's Compilation with data from SPSS.

The next step was to determine what factors are affecting that interest. Three types of statistics were used to obtain the results: Analysis of variance for one factor, ANOVA, Pearson correlations and finally by regressions.

For the analysis ANOVA, responses were reclassified dividing them in Yes answers 4, agree and 5, strongly agree and No answers 1, strongly disagree and 2, disagree. Responses 3, neither in agreement nor in disagreement were discarded.

Data was also verified by Pearson correlation through Likert-type questions where 5 is strongly agree, 4, agree, 3, neither in agreement nor in disagreement, 2 little agreement and 1, strongly disagree. The results obtained are shown in Table 6.

Table 6 Results in the study of the factors affecting the choice of a postgraduate career in the scientific and technological area

HYPOTHESIS	DIMENSION	INDICATOR	CORRELATION PEARSON'S	ANALYSIS	REGRESSION	ANALYSIS	ANOVA	ANALYSIS
H2	Vocational choice	Expectations met	272	It is not significant	.122	It is not significant	.000	Significant
		Vocation for engineering	.261	It is not significant	.137	It is not significant	.004	It is not significant
H3	Skills and interests	Like to solve problems that involve mathematics	.234	It is not significant	.027	It is not significant	.000	Significant
		Facility for math	.226	It is not significant	.094	It is not significant	.001	Significant
		Facility for Chemistry	.158	It is not significant	.083	It is not significant	.022	It is not significant
		Taste for physics	.160	It is not significant	.032	It is not significant	.015	It is not significant
H4	Family	Family	.051	It is not	.077	It is not	.580	It is not

		intervention		significant		significant		significant
		Family support	.133	It is not significant	-.004	It is not significant	.091	It is not significant
H5	Professional Myths	Belief that it will give a higher status	.293	Significant	-.015	It is not significant	.000	Significant
		Belief that it will give better solvency	.388	Significant	-.256	Significant	.000	Significant
		Belief that only men should study	.007	It is not significant	-.010	It is not significant	.565	It is not significant
H6	Educational offer	Adequate infrastructure	.130	It is not significant	-.071	It is not significant	.089	It is not significant
		Fast procedures	.166	It is not significant	.008	It is not significant	.146	It is not significant
		Knowledge of educational offer	.177	It is not significant	.015	It is not significant	.027	It is not significant
		Whether or not he/she recommend the UPT	.152	It is not significant	070	It is not significant	.044	It is not significant
H7	Perception of teachers	Whether or not he/she solves the doubts	.098	It is not significant	-.025	It is not significant	.285	It is not significant
		Does or doesn't he use innovative practices	.127	It is not significant	-.072	It is not significant	.104	It is not significant
		Motivated or not	.179	It is not significant	.047	It is not significant	.031	It is not significant

Source Author's with results of SPSS.

Based on the results in the study of the factors affecting the choice of a postgraduate career in the scientific and technological area, it is possible to conclude that the greater influence on the interest shown by young people in pursuing a career in this area are, by dimension, the following:

In the dimension vocational choice, no significant results were seen.

In the dimension skills and interests there were no significant results.

In the fourth dimension, family, one can detect none of the indicators turned out to be significant.

In the fifth dimension, professional myths There are two significant variables: i) the belief in obtaining a higher status and ii) belief in obtaining greater economic solvency.

The sixth dimension, educational opportunities, it was found that it is not significant.

Finally, the seventh dimension perception of teaching, it was found that it is not significant.

In general terms, you can see that from the six factors only one is statistically significant: the factor professional myths, in relation to the belief that studying a master's degree will give a higher status, and the belief that studying a master's degree will give a greater economic solvency.
In such a way that the hypothesis 2, 3,4, 6 and 7 are reject and the hypothesis 5 is accepted.

Based on the factors that influence the choice of graduate studies in scientific-technological a model that articulates a series of systematic and sequential actions to attract students to the scientific-technological area in a graduate level is proposed, as well as to reduce levels of dropout students who are already studying them (See Figure 2).

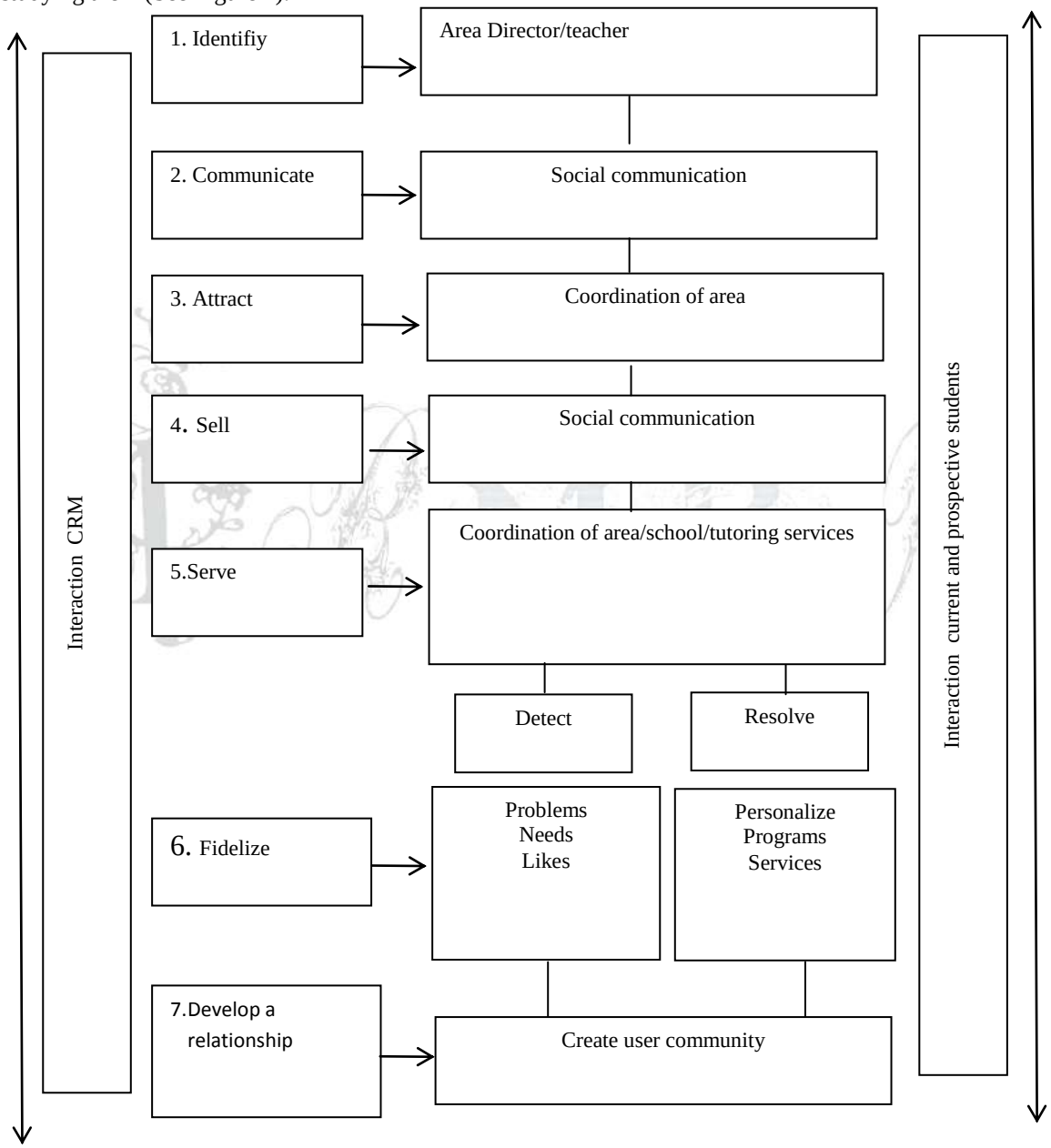

Figure 2. Marketing Relational Model to increase interest in scientific-technological areas
Note. Own elaboration based on the model proposed by Reinares (2002)

Table 7. Marketing Relational Model to increase interest in scientific-technological areas

Phase	DESCRIPTION	RECOMMENDATIONS
Identify	Identify customers subject to relationship marketing strategy. Market segmentation	Monitoring the initiatives in institutions with better performance in the area to incorporate those that may be useful in the institution. Typology of teachers according to: their profiles, experience, teaching strategies. Lay the groundwork to develop a typology of students based on their educational background, family status, family responsibilities, school career and learning styles.
Communicate Attract Sell	To present products and services to those clients. Get the identified potential customer to have the information to become a real customer and buy.	Engineering area career enhancement visits with innovative methodology, promoting recreational and social interaction situations, supported by multimedia materials. Workshops to parents about the importance of their children to study and require spaces and times suitable to do so.
Serve	Deliver the purchased product, install it, adapt it to the needs of the client, to carry out the contracted service. Interaction with all public related to the student: mathematics teachers, tutors, academic secretary, department of school services.	Individualized tutoring system. Providing advice to the students to have more information about their way of thinking and their deficiencies. Promote the use of participatory teaching methods that facilitate group work; conducive to the assimilation of knowledge and methods for creative problem solving. Promote the "learning by doing", where students observe a teacher in action (demonstration class) and then participate in various kinds of "laboratories" where they practice teaching in small groups and their performance is recorded (Isaacs, 2001). Teaching of mathematics playfully with socialized meetings and recreational activities.
Satisfy	Get satisfied customers with the product or service purchased. Entertaining classes, first quarter	Implement early intervention workshops and programs arriving as soon as entering the University in an attempt to increase their interest in engineering sciences and to improve their academic background. Encourage pre-engineering programs in which the association between engineering students high school students and academics be possible.
Fidelize	Get the customer back to buy the same product or service. Reduction of desertion, evaluation of school performance.	Workshop for new professors, providing i) assessment of verbal skills, and ii) emphasis on presentation skills and class management. Generation of teaching programs for teaching materials of exact sciences. Teachers participating in the course will lead seminars and demonstrative classes, and also will serve as guardians of the teachers to guide, advice and criticism of the teaching of the participants (Isaacs, 2001).
Develop the relationship	Increase the number, amount and variety of products or services.	Registration in continuous education courses. Continuity of postgraduate studies Attendance at training workshops Widening participation of young engineering students in research related activities to promote continuity from this level of education in the areas of engineering.
Create a community of users	Facilitate linkages or relationships among customers. Success stories, peer support. Teacher an student socialization experiences.	Join the success cases detected during the implementation of the model and promoting the work in pairs as some of the strategies for the creation of a community of users. Creating a bank of teachers with better teaching skills. Develop a training manual for professors of mathematics.

Source Authors.

Conclusions

The problem of the lack of students attending the programs of scientific-technological area must be analyzed through research from various fields of knowledge as it is of vital importance for the development of society and nations that measures are discovered and proposed to address this deficiency. This is not to discredit the humanistic and social programs, but science and technology have a direct impact on individual and social welfare.

Much is said about the enthusiasm for studying this type of programs is an endemic problem in the sense that it is the Mexican culture itself, and especially parents and teachers, who encourage or discourage students to enroll them. But this prejudice must be broken. No culture is "born" with better or worse skills to develop a certain type of knowledge; it is the individual and society those who favor or stigmatize some over others, so programs to change the false view we have of them must be created.

It is interesting to note that the same way as parents encourage their children to be a great athlete or player, it would be if they stimulated their sons and daughters to be great scientists or innovators in technology. This can be achieved if parents become aware that if their children attend these programs then they are most likely to progress economically, culturally, and socially.

Relationship marketing is an alternative for the technological institutes and universities to increase the number of candidates who pursue scientific and technological programs. If one approaches the problem holistically, then it can be dealt with higher chances of success.

References

Alfaro, F.M. (2004). *Temas clave en el Marketing Relacional*. Madrid: McGraw Hill.

Bennedsen, Jens Aspersen (2007), Failure Rates in Introductory Programming. ACM-SIGSE Bulletin Vol. 39 , 32-36.

Bigss, J. (2008). Calidad del aprendizaje universitario. Edit. Narcea. Madrid.

Blázquez, C. and Álvarez, P. et al. (2009). Factores que influencian la motivación de escolares en las áreas tecnológicas e ingenierías. *Revista Calidad en la educación.* 31 (47), pp. 46-64.

Carrasco R.S. (1999). *Desarrollo de la motivación y las estrategias de aprendizaje en los estudiantes de nivel medio superior para mejorar su logro académico*. México : Universidad de las Américas.

Consejo Nacional de Ciencia y Tecnología, CONACYT. Informe General de Ciencia y Tecnología 2011, extraído desde http://www.conacyt.gob.mx, México.

De Puerto, S.M. and Minnaard, C. L. et al. (2004). Errores en el aprendizaje de las matemáticas, *Revista de la Universidad de CAECE*, 19 (74), pp. 5-18.

García, A. G. (2001). *El método comunicativo y participativo de las matemáticas.* México: Universidad de las Américas.

Gómez, G. (2012). Generación de un Modelo de Marketing Relacional basado en la percepción hacia las ciencias exactas como factor que inhibe el interés en las áreas científico-tecnológicas, Memorias del XIX Congreso Internacional de Administración, Contaduría e Informática de la Universidad Nacional Autónoma de México. México, 2014.

Gorostiza, L. (2000). *Las matemáticas en México: Educación y desarrollo*. México: Academia Mexicana de Ciencias. México.

Gronroos, C. (2007). *Service management and marketing*. England: John Wiley & sons.

Instituto Mexicano de la Propiedad Industrial, IMPI, 2013. Reporte Anual 2013, Extracted from: http://www.impi.gob.mx/QuienesSomos/Documentos%20Varios/IA2013.pdf. México.

Isaacs, J.A. (2000) Mejorando el éxito de los estudiantes de la licenciatura en Ingeniería : un taller de enseñanza para los profesores y los asistentes académicos. Journal of Materials Education. Primavera, año1, vol. 22. Universidad Autónoma del Estado de México: University of North Texas. Toluca, México. Pp. 88-94.

León, M. and Rodríguez, M. et al (2006). La orientación vocacional y la modificación del criterio de pre elección de carrera técnica en alumnos del nivel medio superior en la CBTA No. 1 en el norte de México. Revista Educere, enero-marzo, año/vol. 10, número 032. Universidad de los Andes. Mérida, Venezuela. Pp. 71-76

Manes, E. G. (1997). *Predicate transformer semantics*. New York : Cambrige University Press.

Organización para Cooperación y el Desarrollo Económico, OCDE. Informe 2009, extracted from: http://www.oecd.org/pisa/pisaenespaol.htm

Organización para Cooperación y el Desarrollo Económico, OCDE. "Evaluación sobre Ciencia, Tecnología e Industria, 2007", extracted from: http://www.oecd.org/centrodemexico/publicaciones/M%C3%A9xico--Compendio%20de%20Estudios%20y%20Reportes%20de%20la%20OCDE.pdf

Kasper, H. (2006). *Services marketing management*. England: John Wiley & Sons.

Kotler, P and Keller, L. (2006). *Dirección de marketing*. México: Pearson.

Petrella, C. (2008). Gestión de la relación de las universidades con docentes, estudiantes y egresados. *Revista Iberoamericana de Educación*, (1), pp. 5-25.

Posada O. (2010). Implementación de estrategias constructivistas en la enseñanza del álgebra, que fomenten el desarrollo de la función neurocognitiva automonitoreo, como un estudio de caso de la educación primaria. Medellín, Colombia.

Reinares, P. (2002). *Marketing relacional, un nuevo enfoque para la seducción y fidelización del cliente*. España: Prentice Hall.

Rivas, P. (2005). La educación matemática como factor de deserción escolar y exclusión social. *Revista Educere*, abril-junio, año/vol.9, número 029. Universidad de los Andes, Mérida, Venezuela. Pp.165-170

Sáinz, M. (2001). *La distribución comercial: opciones estratégica*s. México: ESIC.

Sanders, D. (2009). *Hecho para servir: como impulsar el desempeño de sus empleados de la línea frontal*. México: McGraw-Hill.

Seade, K. (1985). *Aportaciones matemáticas*. México: Sociedad matemática mexicana.

Scimago Research Group. Scimago Institutions Rankings, 2014, extracted from: http://www.scimagoir.com/research.php?rankingtype=research&indicator=Scientific%20Talent%20Pool

Williams M. and Emerson, C. (2002).*Becoming leaders: A handbook for women in science engineering and technology.* St. John's, Canada: Memorial University of Newfoundland.