

**Design of a software prototype for the registration and control of academic advising****Diseño de un prototipo de software para el registro y control de asesorías académicas**

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**Abstract**

This article describes the development of a prototype of software that attends the academic advisory process, from its request to the evaluation of the service granted. For the design of this prototype the model based on prototypes was used, considering the following order: First phase, definition of the problem where the analysis and requirements of the system are included, this, through the application of an unstructured interview and using StarUML as the tools of the Unified Modeling Language (UML). The second phase was the design of the prototype, using the Visual C # programming language and ASP.Net. As third phase, the validation of the prototype was carried out by the coordinator of the academic advisory program for its approval and when the system is developed, the testing will be carried out. The contribution of this project will be the systematization of the counseling process that is currently carried out manually, obtaining timely and truthful information, statistical reports and thus be able to make decisions that support the improvement of institutional indicators. To conclude, it is important to mention that this document presents the first stage of the project to later perform the coding and implementation of this software prototype.

**Prototype, Advice, Software****Resumen**

El presente artículo describe el desarrollo de un prototipo de software que atiende el proceso de asesorías académicas, desde su solicitud hasta la evaluación del servicio otorgado. El método aplicado para el diseño de este prototipo fue el modelo basado en prototipos, considerando el siguiente orden: Primero, definición del problema donde se engloba el análisis y requerimientos del sistema, esto, mediante la aplicación de una entrevista no estructurada y utilizando StarUML como la herramientas del Lenguaje de Modelado Unificado (UML). La segunda fase fue el diseño del prototipo, utilizando el Lenguaje de programación Visual C# y ASP.Net. Como tercera fase, se realizó la validación del prototipo por el coordinador del programa de asesorías académicas para su aprobación. El resultado fue la sistematización del proceso de asesorías obteniendo de forma oportuna y veraz la información, reportes estadísticos y así poder tomar decisiones que apoyen en la mejora de los indicadores institucionales. El estudio concluye con la importancia de realizar la codificación e implementación de este prototipo de software a nivel institucional.

**Prototipo, Asesoría, Software**

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## Introduction

In 2001 the National Association of Universities and Institutions of Higher Education (ANUIES) published that "one of the biggest problems that occur at the bachelor's level in the first semesters are: failure, desertion, poor use and low terminal efficiency" (Chávez & Vargas, 2007, p. 12). In response to these problems, new proposals for tutoring programs that seek to address these indicators arise, with tutoring programs being one of the main efforts of the institutions.

The mentoring according to Ariza and Ocampo (2004) is present in the new models of education, embodying the need to support educational processes, not only with conventional didactic activities but also addressing the individual in its different facets, accompanying their decision-making processes of decisions from the purely academic to the personal, providing models and alternatives to make better use of their educational experience and find practical application to the different knowledge that is shared or constructed in academic activities.

As mentioned by Álvarez (2013), "In the educational model of the European Higher Education Area (EHEA), mentoring is considered as a task contemplated in the responsibility of teachers, which implies a more personalized interaction of the tutor with the student body. This is intended to monitor the acquisition of basic skills and guide their learning process throughout the degree, ensuring an adequate academic and professional development".

During the nineties of the twentieth century was when the largest global wave of interest in mentoring occurred. In this way, international and national organizations such as the National Association of Universities and Institutions of Higher Education (ANUIES), and the General Coordination of Technological Universities (CGUT), have included in their menu of recommendations or in their "strategic lines of development", both medium and long term, to tutorials as a mechanism to "raise the quality of higher education", starting from a more individualized accompaniment to students, within a general framework derived from the idea of making the student / to the center of learning. (Aguilar, 2012).

According to Romo (2011), "the character of innovative strategy and improvement of quality that is granted to mentoring is in seeing it - then - as a viable alternative to help reduce the dropout and lag in higher education.

Certainly, when talking about mentoring, there is no reference -in fact- to a new practice, but what is important to consider is that its operation and impact from an innovative perspective, depends on the ways in which it is implanted and organized in a institution".

The ANUIES in 2004 published that, "the implementation of the tutoring programs has also made possible, in a short time, that the Institutions of Higher Education (IES), through the efforts of their respective teams of computer specialists, have generated their own software for the registration and systematization of the tutorial exercise. The systematization of the tutorial experience is feasible when there is clarity in its meaning and scope, and when it is based on a creative spirit to streamline the processes".

An interesting research is carried out by the University Center of Los Altos of the University of Guadalajara (CUAltos), where the following need is described in its PIT (Institutional Tutoring Program): "The administrative and academic structure that is responsible for coordinating and evaluating the PIT, requires timely information on the activities of the tutors, in order to guide the respective action plan tutorial that leads to the solution of academic or personal problems detected in the tutor-tutor relationship, this in order to provide a timely and real-time follow-up of the actions that are being carried out and thus, be able to inform the corresponding authorities about the achievements of the program". (Islas, Baltazar, & Arriaga, 2010)

As of 2003, the Technological University of the South of Sonora (UTS) has applied an Institutional Program of Tutorials (PIT), attending the lines of action of the CGUT in the subject, which includes the services of psychological attention, academic advising, individual and group tutoring sessions. The records of the activities of the tutoring program were carried out manually for about 8 years, to subsequently develop a tutorial software that deals only with the records of group and individual sessions and basic reports of the tutorial activity, leaving out the complete systematization of a fundamental process such as academic counseling.

In the Institutional Program of Tutorials (PIT) of the National Autonomous University of Mexico (UNAM), academic counseling is defined as a support activity that a teacher provides to students, outside of their class schedule, in order to overcome the academic difficulties of the different subjects they attend, or strengthen their school education.

In addition, various studies of Higher Education Institutions on the subject show that this service carried out with quality allows a positive impact on the indicators of failure, dropout and academic achievement (2011).

The objective of the Consultancy Program in the UTS is to provide timely academic support in the different subjects that the student of the different educational programs, in order to reaffirm their knowledge, solve their doubts and develop the habit of being self-taught, which is translated into better academic performance. "It is known that the lack of reliable and valid information hinders actions and hinders analysis that limit the evaluation and confuse the purpose of the programs" (Islas, Baltazar, & Arriaga, 2010)

Considering all of the above, it is essential to record and monitor, through a prototype of computation, the monitoring and control of the academic advisory process that allows, due to the absence of technological support tools in these activities, specifically referring to the software, to carry out An analysis of information that does not hinder the achievement of institutional academic objectives.

The objective of this research work is to design a computational prototype through the use of a development methodology to improve the monitoring and control of the academic advisory process.

### Problem Statement

In 1990 the Secretariat of Public Education (SEP) of Mexico undertook a series of studies and analysis of academic experiences with several nations to define a pedagogical model of higher education linked to the socioeconomic context existing in the country. As a result of this, the system of Technological Universities is created, whose fundamental characteristic is its relationship with the productive sector and with society.

Cendejas (2014), states that, as a consequence of the above, "a sub-system of higher technological education was conceived that would have the objective of providing services to the productive sector, as well as to society in general, and at the same time, expand the expectations of young Mexicans". This subsystem offers the level of Higher University Technician (Level 5B) and Engineering Studies (Level 5A).

One of the benefits of this system is the personalized attention provided to the student through a tutor, who is assigned to each group where he is in charge of giving academic follow-up to the whole group, the student has the support of the academic technicians to carry out internships in different laboratories, in addition to receiving advice from both the teacher and the assigned tutor, which helps the teaching-learning process with the aim of consolidating academic growth.

The National Association of Universities and Institutions of Higher Education (ANUIES), as a regulator of public HEIs in Mexico, states that in order to fulfill the purposes of the university; It is necessary that each HEI design strategies and implement actions to increase the quality of the students' comprehensive educational process, increase their academic performance, reduce the number of students who fail and drop out, and contribute to the achievement of satisfactory achievement rates and terminal efficiency.

The academic advising within some Universities has been implemented as part of the Institutional Tutoring Program, with the purpose of accompanying the students academically during their training, however this program is regularly requested by a very low percentage of students or when the student it is already reprobated.

Currently it is about carrying out early actions to impact the indexes in a positive way, also, it is important to work with the motivating factor in order to achieve a better performance of the participants, in this type of programs. However, the process is not controlled, generating lack of information for decision making and for the successful attention of students.

On the other hand there is the development and accelerated growth of Information Technologies (ICT), the administration of educational institutions tends to evolve; however, at present the great part of this type of institutions does not have the vision to systematize through the use of ICT the processes that are daily required by students, teachers, administrators and the community in general. That is, useful information such as statistics, reports, indicators that support for decision making. The non-existence of an effective and efficient administration, causes ignorance of both opportunities and threats that surround it; it falls into habits until the educational task is demerited, which is paramount for any educational institution.

Therefore, having information systems adequate to the needs of any institution would allow at least:

- Not having a bad image towards the community
- Optimize academic and administrative processes
- Have reliable information for a timely and effective decision making at any level.

At the Technological University of the South of Sonora, a program has been implemented to advise students with low performance. With this activity, students are supported so that they can understand the different subjects that are being taught in a subject. Academic advice is provided to students by team, individually or in groups, usually outside of their teaching time on specific topics.

For the UTS to do it, in 2016, a professor responsible for the academic advisory program was appointed, which handles the processes, and in doing so, there is information that is lost since it is not considered in the quarterly report, because when the registration forms are delivered and the coordinator has already captured, it does not make updates, therefore; These consultancies are not considered as imparted although they are carried out. In addition to this, statistical reports are not generated, only informative, which allow a more timely follow-up and a decision-making with veracity, given that the information is not complete or measured. Therefore, senior managers or academics can not make decisions to improve this process truthfully.

That is why, because the current process is completely handmade, it is easy to make mistakes in the follow-up of the forms filled out and follow-up control, causing the lack of information generated in time and form, and there are teachers who do not reach report their advice and therefore; The decision to make unsafe decisions arising from incomplete reports.

However, although statistics are not carried out because it is an artisanal information system, it is possible to obtain the number of students that were attended in consultancies, for example in 2016, 425 students were attended in all the courses, also for the next year there was an attendance of 290 students and by the date of 2018 289 have been attended, the previous since the beginning of the program in 2016.

In this sense, the research question is aimed at understanding:

Will the systematization of the academic advisory process allow us to improve the monitoring, control and obtain in a timely and accurate way the information of this academic indicator?

## Method

The prototype design method is the model by prototypes, since this model is mainly responsible for helping the systems engineer and the client to understand what the construction result will be when the requirements are satisfied and allows, at the end, to show to the client a model or prototype of screens that show the interface of the application, its external face. This interface is fixed, static, does not process data. The prototype does not have an internal logic developed, it only shows the screens through which the future application will go. The main phases for the design of the prototype are, see Figure 1:

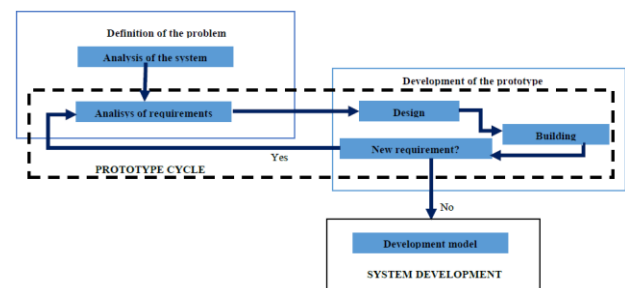


Figure 1 Phases of the prototype model

## Phase 1 Definition of the problema

In this phase, a preliminary investigation was carried out, considering in the first instance the analysis of the system and requirements through the application of an unstructured interview to the coordinator of the academic advisory program. In the second instance, through the use of Google Docs forms user stories were raised to some of the actors involved in the process, being teachers, directors and tutors. Once the information has been obtained and the problem analyzed, a list of findings will be made, with the use of Unified Modeling Language (UML) tools, such as StarUML, to model the user's needs through the case diagrams use, description of use cases, class diagram and sequence diagrams respectively. In the Figure 2, the diagram of use cases is shown where different users of the system can log in.

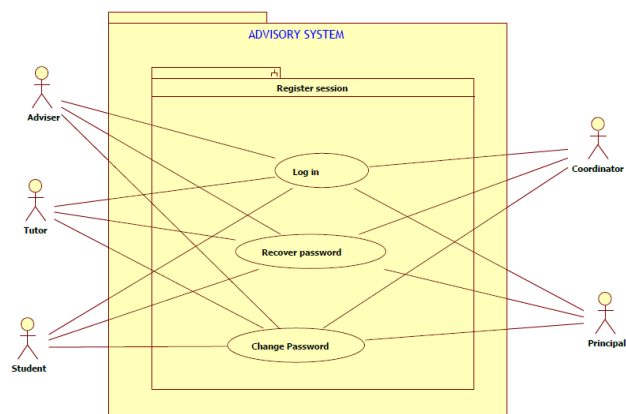


Figure 2 Use case diagram register your login

Likewise, in picture 3 the diagram of use cases is shown of how the administration of the consultancies will be carried out and the actions that can be carried out by the different actors of the system.

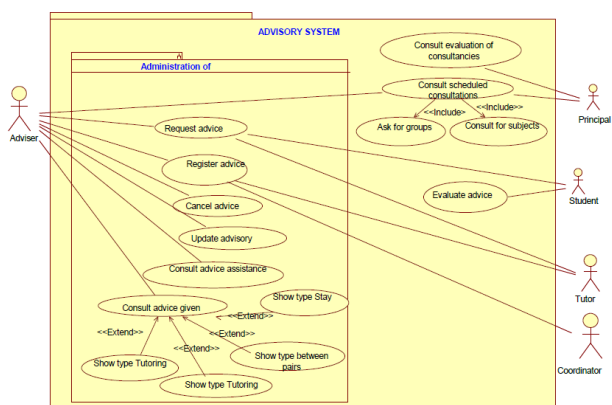


Figure 3 Diagram of use case administration of advisory

In Figure 4, a use case diagram is again shown where the actors that can be advisors and what actions can be done as a consultant in the system.

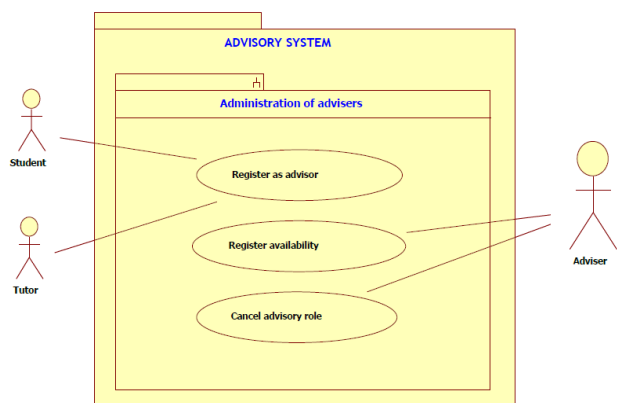


Figure 4 Diagram of use case administration of advisors

To finish with the diagrams of use cases, in Figure 5, the actions that the coordinator of the consulting program in the system can perform are shown.

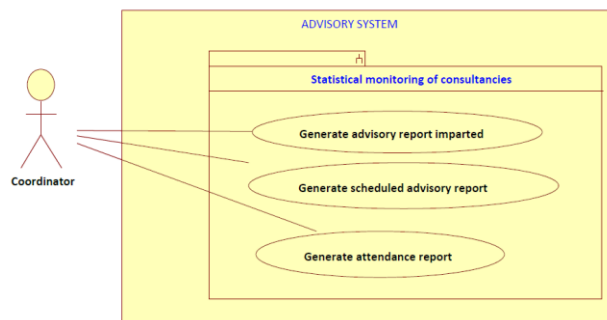


Figure 5 Diagram of the use case statistical monitoring of consultancies

Continuing in this phase, we continued to make the sequence diagrams. When speaking of sequence diagrams, reference is made to a type of diagram used to model interaction between objects in a UML-based system. Therefore, in Figure 6, you can see the interaction that objects have when making the request for an advisory as an advisor.

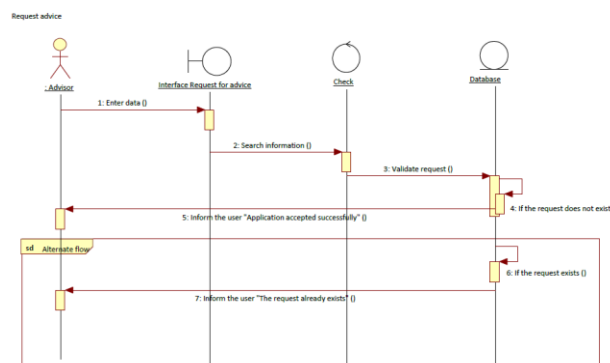


Figure 6 Sequence diagram request advice

In the picture 7, a sequence diagram is also presented in which the interaction of the actors and objects to carry out the registration of the advice in the system is shown.

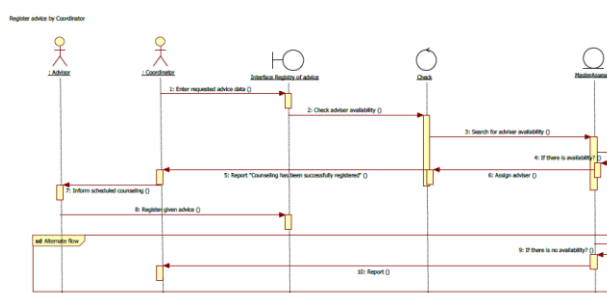


Figure 7 Sequence diagram register advice

To finish this phase, in Figure 8, the class diagram is presented where you can see how the consultancies are linked with the advisors and the subjects to be requested, as well as the existence of a link between the advisors with the teachers and students, so that both a student and a teacher can give advice.



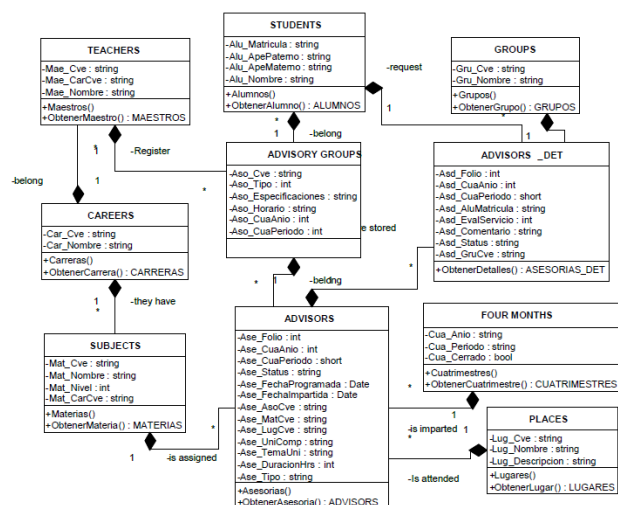


Figure 8 Class diagram counseling system

Phase 2. Development of the prototype:

In this phase the construction of the initial design of the prototype was carried out, using the Visual C # programming language and ASP.Net. Subsequently, the review was carried out in conjunction with the client for modifications to carry out the redesign and finally obtain final approval. The validated prototype interfaces will be presented in phase 3.

Phase 3. System development:

In this phase, the codification of the system is carried out, a phase that will be worked on in the next stage of the project.

Results

In this phase only the main interfaces of the academic advisory system are presented, its external face, but this interface is fixed, static, does not process data.

In Figure 9 the interface where the request for advice will be carried out is shown, the assessor is selected, the type of advice, it is specified in what competence, theme and how long it will last and in what date, in addition in the lower part it is specified to which students will be requested.

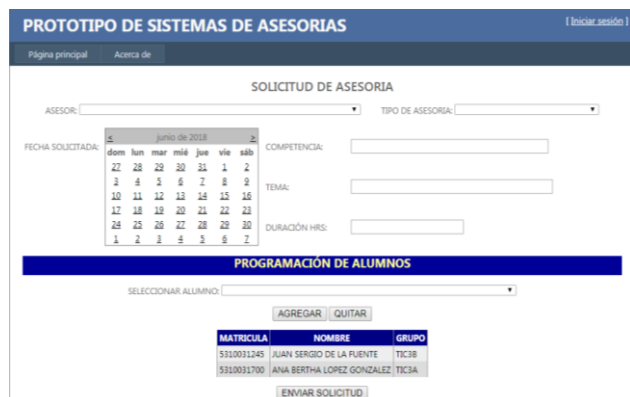


Figure 9 Advice request interface

In Figure 10, the system proposes the folio, the consultant is selected, the type of advice, it is specified in what competence, subject and how long it will last and in what date, in addition in the lower part the programmed students are specified.

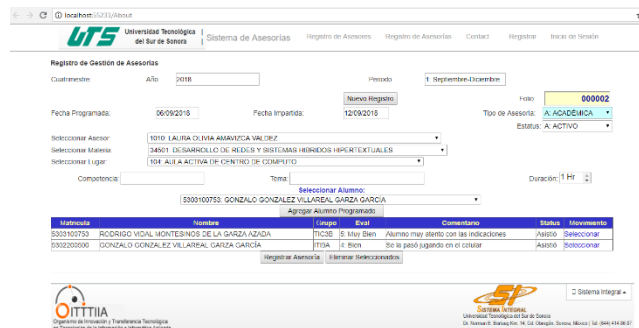


Figure 10 Advice Registry

In the Figure 11 represents the interface where the consultants (teachers or students) are registered by semester.

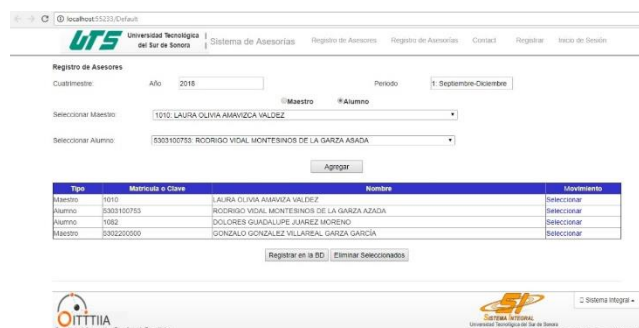


Figure 11 Register advisors

Likewise, Figure 12 shows the interface where a consultant can consult which consultancies are assigned in a four-month period.



Figure 12 Assigned consultancies

Therefore Figure 13, shows the interface where the student enters after receiving the advice and qualifies the advisors for the service received.



Figure 13 Evaluate advice by the student

To finish with the design of the interfaces of the prototype, in Figure 14 we can see the interface where the advisory coordinator can follow up the requests for new consulting programs.

| CONSULTA DE SOLICITUDES PENDIENTES |        |                                  |                  |             |
|------------------------------------|--------|----------------------------------|------------------|-------------|
| CUATRIMESTRE: 2018                 |        | PERIODO: I: SEPTIEMBRE-DICIEMBRE |                  |             |
| VALIDAR SOLICITUD                  | ASESOR | NOMBRE                           | FECHA SOLICITADA | No. ALUMNOS |
| MOSTRAR                            | 1034   | LAURA OLIVIA AMAVIZCA            | 10/06/2018       | 24          |
| MOSTRAR                            | 1003   | LUIS TADEO PORTELA PEÑUÑURI      | 13/06/2018       | 7           |
| MOSTRAR                            | 1015   | JUAN CARLOS VAZQUEZ BRINDIS      | 17/06/2018       | 11          |
| MOSTRAR                            | 2034   | HELGA KARINA TOLANO GUTIERREZ    | 25/06/2018       | 3           |
| MOSTRAR                            | 2056   | JULIO CESAR GAMEZ WENDLANT       | 25/06/2018       | 9           |

**Figure 14** Consult pending advice

The subjects involved in the development of this prototype are, mainly, the Coordinator of the academic advisory program of the Technological University of Southern Sonora as the main actor in this process, as well as the members of the Information and Communication Development and Application Center. Technologies (CADTIC), being the academic body responsible for analyzing and designing said computation prototype under the mentioned phases.

To finish it is necessary to mention that in each one of the phases of the model by prototypes the instruments and technological tools are mentioned with which this project will be carried out.

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