

Evaluation of learning and performance indicators in virtual classroom for generations 2016- 2021 TecNM-Campus Boca del Río, Veracruz, Mexico.

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Summary— This article presents the results obtained after the analysis and design of a web application that will allow the automation of all those processes of registration, assignment and consultation, academic and administrative carried out in the company Ingeniotics of the municipality of Acapulco de Juárez, Warrior. The case of the company Ingeniotics was taken as a starting point since at the present time they have weaknesses in their processes, and it is necessary to be more efficient in the development of their internal activities, in order to optimize their resources in order to satisfy the needs of its users.

Therefore, to meet the requirements, the implementation of the OOHDM methodology is carried out due to its affinity and clarity with the development of web applications, later the models that represent the functionalities that will ignite the application are shown, in addition the method used for the solution of the development of this web application is described, finally, the results obtained from the design stages marked by the phases of this methodology are graphically detailed. It is worth mentioning that this article is part of a series of works, this being the second carried out, following up on a previous article which is entitled: Proposal de a Web System for the automation of the Academic-Administrative processes of the company Ingeniotics [3].

Keywords— Net5, Entity Framework, OOHDM, Modeling, Web Applications.

I. INTRODUCTION

At present, organizations are no strangers to the use of information technologies; they require them to automate and improve their processes, which gives them competitive advantages, for an adequate management of information and make sound decisions.

The company Ingeniotics S.A de C.V, is a company dedicated to teaching courses in educational robotics, however since the beginning of the company have been developing poor administration processes, in terms of registration and search for information, being the current mode of operation manually and through spreadsheets in Excel files, making queries slow by the traditional method used and that those in charge of serving customers misplace the documents, weakening the control in the themselves; In addition, the files undergo accidental changes such as the deletion and / or combination of the information compromising the integrity of the same.

Spreadsheet files are efficient for centralizing static data, but not large amounts of information, which also undergoes constant changes.

The inadequate execution of such important processes where it involves customer service also generates an economic loss for the company, by not meeting the expectations of this.

Being a company that uses state-of-the-art technology for educational teaching, it cannot afford to ignore such processes, it is necessary to make use of technology to

automate processes that are running inefficiently.

With respect to the above, the development of the system will streamline, facilitate and automate the processes that are carried out within the company and that will also benefit in different aspects of it.

II. OR GENERALBJETIVO .

Develop a web system that integrates academic and administrative processes in a unique software that generates reliable, truthful and detailed information through the consultation of the different modules and that supports the automation of the company's processes.

III. MARCO CONCEPTUAL.

Below are the maintenance tools selected to carry out the analysis and design of the application.

A. Enterprise Architect.

It is a visual design and modeling tool based on OMG UML. The platform supports: the design and construction of software systems; business process modeling; and industry-based domain modeling. It is used by companies and organizations not only to model the architecture of their systems, but to process the implementation of these models throughout the entire application development lifecycle [9].

B. .Net5.

It is an open source, cross-platform and free developer platform for creating many different types of applications.

With .NET, you can use multiple languages, editors, and libraries to build web, mobile, desktop, gaming, and IoT applications.

It is a cross-platform .NET implementation for websites, servers, and console applications on Windows, Linux, and macOS[6].

C. Entity Framework Core.

It is a data access technology for .NET Core and the .NET Framework. It is cross-platform and open source developed by Microsoft with community input. It is properly a relational object mapper or ORM. Its main function is to serve as an interpreter between two technologies based on different principles on the one hand object-oriented programming and on the other the bases of relational and non-relational data.

It allows the programmer to control a relational database using a programming language instead of standard SQL or one of its dialects. It frees the programmer from writing a lot of repetitive code to access the data[2].

D. MySQL.

It is a fully managed database service that allows developers to quickly develop and deploy secure cloud-native applications using the most open source database popular of the world.

The MySQL database service is the only MySQL cloud service with a high-performance integrated analytics engine, HeatWave, that allows customers to run sophisticated analytics directly on their operational MySQL databases, eliminating the need for complex, costly, and time-consuming data movements. integration with a separate analysis database[8].

E. Nuxt.

The framework is advertised as a "meta-framework for universal applications". The term universal is used here with the meaning that the goal of the framework is to allow users to create web views in JavaScript using the Vue.js single file component [1] and it can function as a single-page application in the browser.

IV. IMPLEMENTATION OF THE OOHDM METHODOLOGY FOR THE DEVELOPMENT OF THE APPLICATION.

Below are the models with which the functionalities of the system are reprimanded, for the realization of these designs the Enterprise Architect tool was used, following the unified modeling language (UML)[4], following the stages of the OOHDM methodology[5].

A. Context Diagram.

This model describes the external entities of the company Ingeniomatics, which will interact with the system, all this in a general way (See fig.1).

1) *Administrator*: This external agent corresponds to the person in charge of registering the users, in addition to the data corresponding to the courses taught as well as their respective schedules, has access to consult this information, as well as assign the teachers to each course, according to its availability.

2) *Receptionist*: This external agent corresponds to the person responsible for the reception area, which receives and attends to customers from the moment they approach to ask for information, makes the corresponding records of personal data and payments, also assigns to the customers (students) to their corresponding course.

3) *Teachers*: This external agent is the one who is in front of a group, in charge of registering the absences and attendances of their students, you can consult their information, courses and schedules.

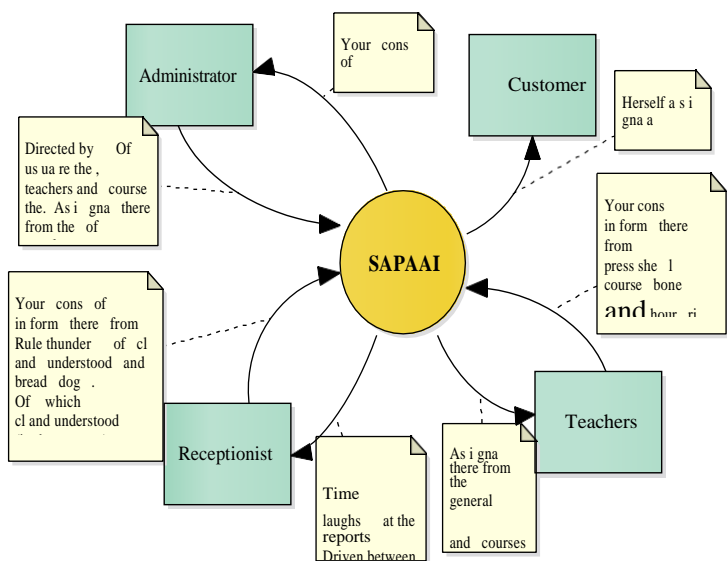


Fig. 1. Diagram of Context of the System (Elaboration own).

B. Use Cases Diagram.

In the following use case diagrams (See fig. 2,3,4), Can observe the Features of every One of the Actors What Have access to the system.

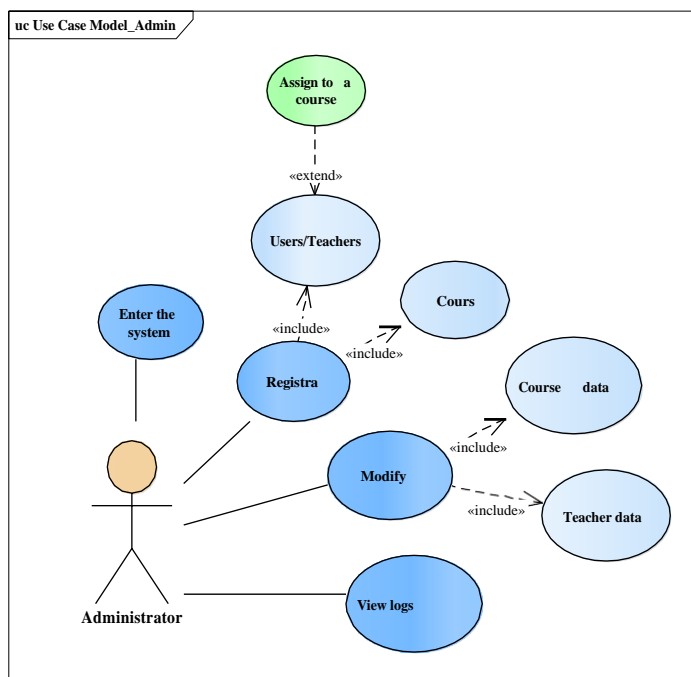


Fig. 2. Main USE case Administrator (Own elaboration).

In the Fig. 2 Can observe the diagram What Corresponds to the actor Administrator of the which between their Main Tasks are the registration of collaborating users, as well as the Courses.

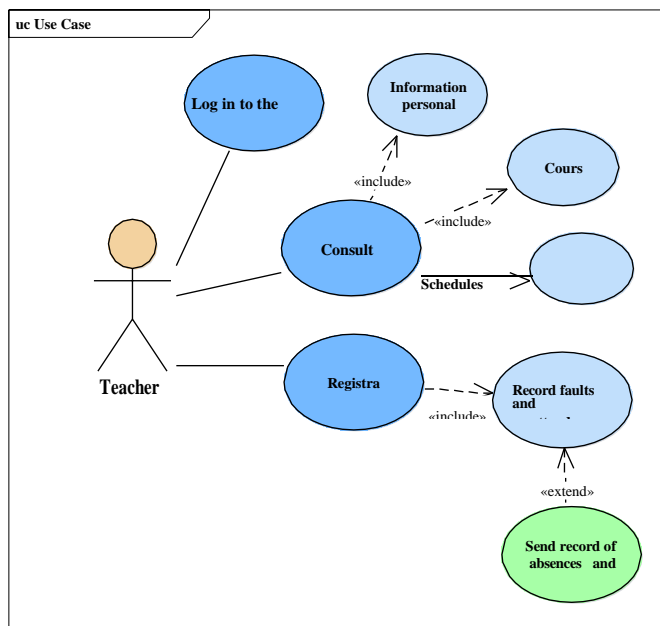


Fig. 3. Main Use Case Teacher (Own elaboration).

In the Fig. 3 herself Observed the diagram What Corresponds to the actor Teacher y in the Which one Can see some of their Tasks main that are, the registration of faults and asitencias of each student, as well as sending the report of this data to the actor receptionist.

Fig. 4. Case of Use principal Receptionist (Elaboration own).

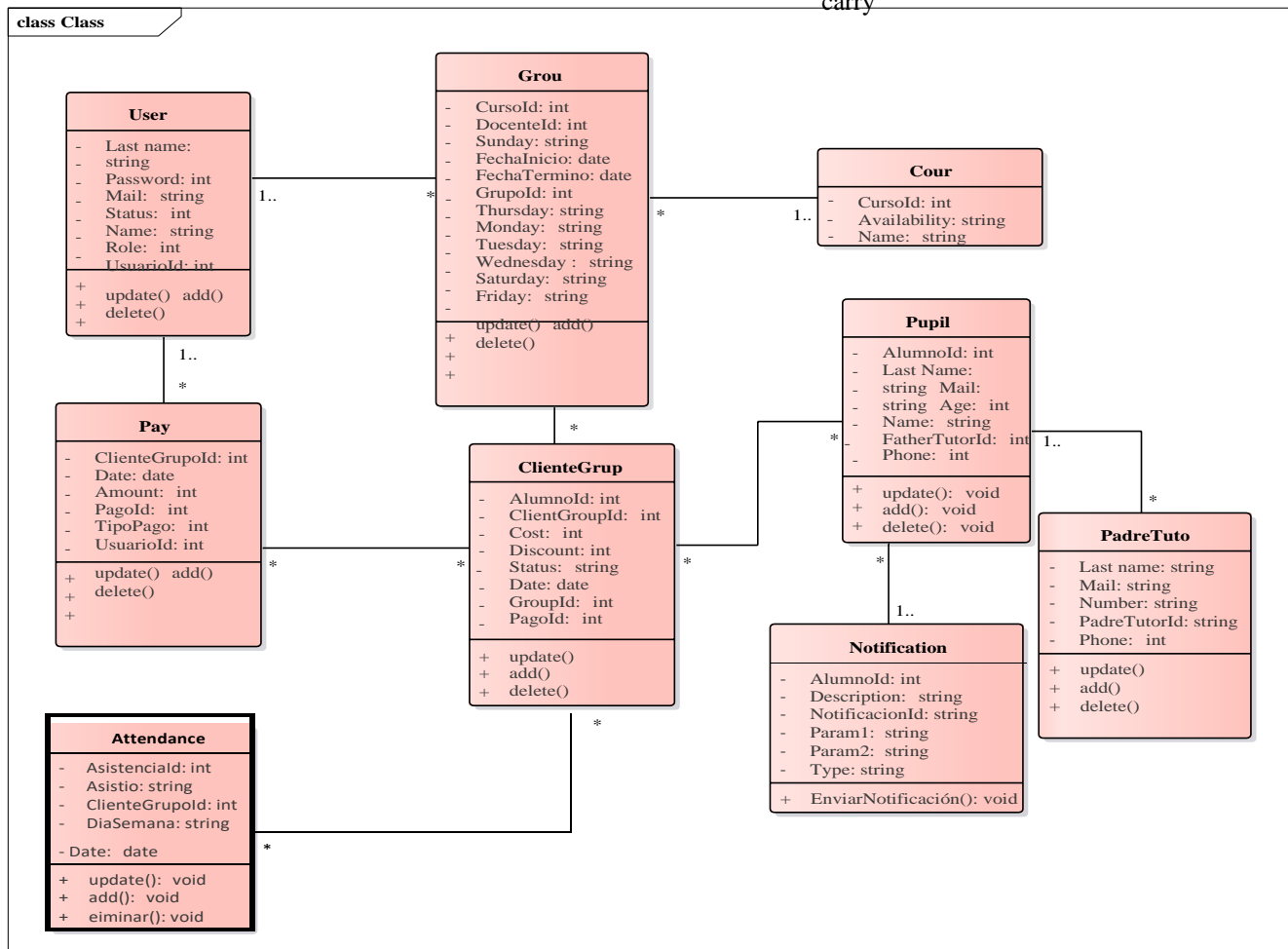


Fig. 4 shows the diagram that corresponds to the person responsible for the reception, where as the main function plays the registration of customers, as well as the payments of the company.

C. Class Diagram.

Fig. 5 shows the class diagram, where the information in the tables is represented in conjunction with the data and attributes, which are described below.

- **User:** This class contains the personal data for its capture, from this class the data of the collaborating users, such as teachers and receptionists, is recorded.
- **Group:** In this class the corresponding fields for the resgitro of a new Group / Course, as well as the teacher in charge of it.
- **Course:** This class will only show the name of the course, as well as its status, that is, whether the course is available or not.

- **Payment:** The main function of this class is to carry

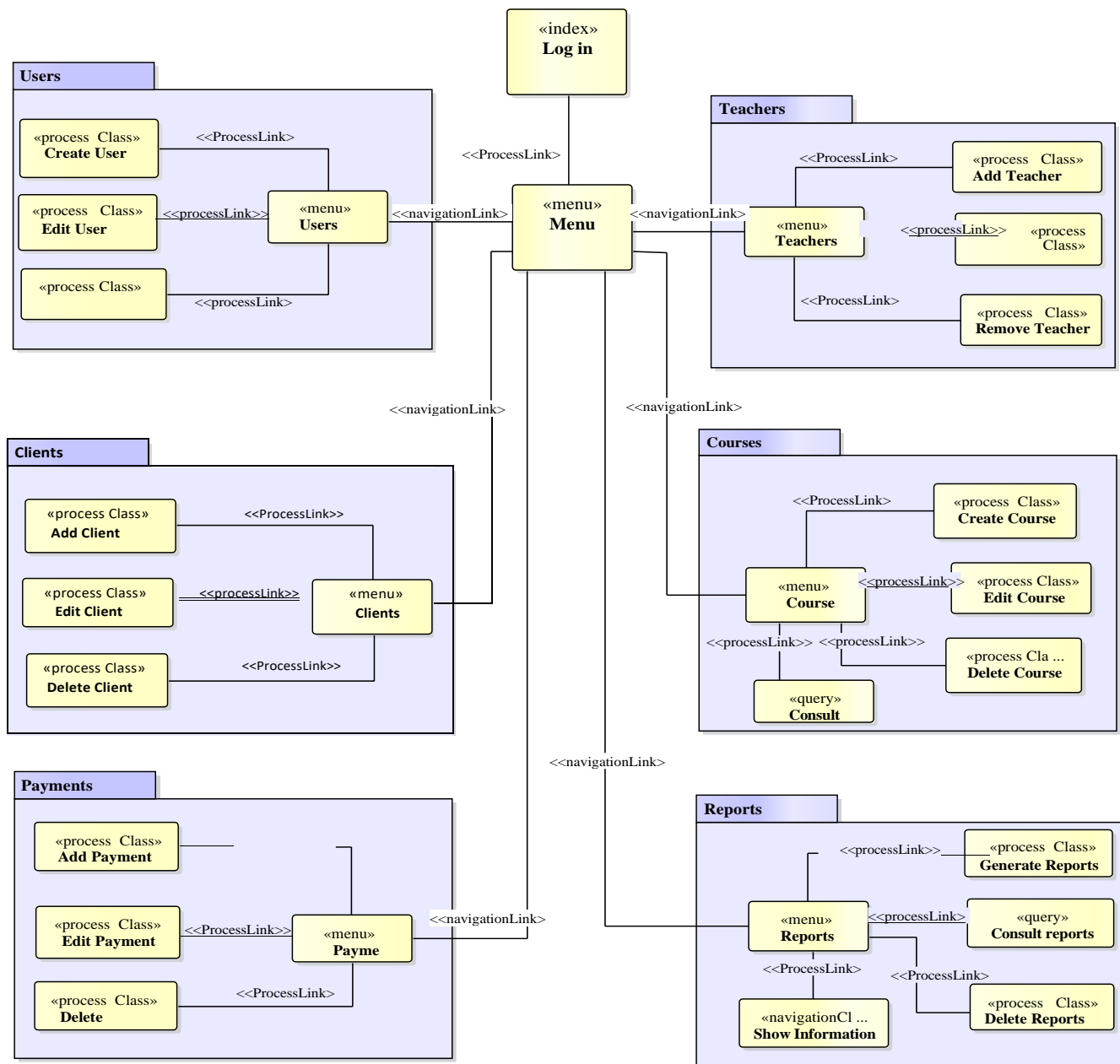
the data for the registration of the corresponding payments of each of the students.

- **ClientGroup:** This class corresponds to the core table where the relationship is made showing which student belongs to each of the courses.
- **Student:** In this class the personal data is obtained to carry out the registration of the clients (students).
- **PadreTutor:** The functionality of this class is to carry the registration of the clients, but in this case they will be some of the data corresponding to the Parent or Guardian of the student.

Fig. 5. Diagram of Classes of the System (Own elaboration).

D. Navigational Diagram.

In Fig. 6 the navigation structure is represented in the system, through a navigational model that



Organizes the design y Adapts the view of agreement with the needof the user of the application.

First the user will have to authenticate to access the menu and then to the different modules of the system, corresponding to the role of each user.

Below is an abstract view where the views of the application to which each of the users will have access are shown; the submenus are as follows: Users, Teachers, Clients, Courses, Payments and Reports.

Fig. 6. Navigational Diagram (Own elaboration).

- **Attendance:** In this class the data is obtained to keep track of the attendances and absences of the students for each of the groups.
- **Notification:** The functionality of this class is to make a reassortory of the pending payments to the parents of each of the students.

E. Deployment Diagram.

In Fig. 7 the distribution of the parts of the web system is represented, the components are separated by each node.

Each of them is described below:

- **PC:** Desktop computer on which the application will be accessed through a web browser such as; Chrome, Firefox, Opera, Edge, Brave, Safari.
- **Web Server:** This service contains the necessary resources for the proper functioning of the application, in this case Nginx is the web server, MySQL as the database manager and in turn is the database server, both are supported on Linux/ Ubuntu 20.
- **Devices Mobile:** Herself try of one team Portable, What Could be one telephone cell phone o tablet with the Which one a traverses of one browser web herself Canaccess.
- **Registration of courses and schedules:** The Administrator proceeds to carry out the registration of all the relevant data of the courses, as well as the corresponding schedules of each one.
- **Registration of users and teachers:** The administrator gives alto the collaborating users of the company, such as the receptionist and the teachers, the capture of the corresponding data is carried out.
- **Assignment of teachers to a course:** This process is carried out by filtering the data of the teachers to be able to assign them to a course, where the availability of this will be taken into account.

The second lane corresponds to the functionalities performed by the Receptionist.

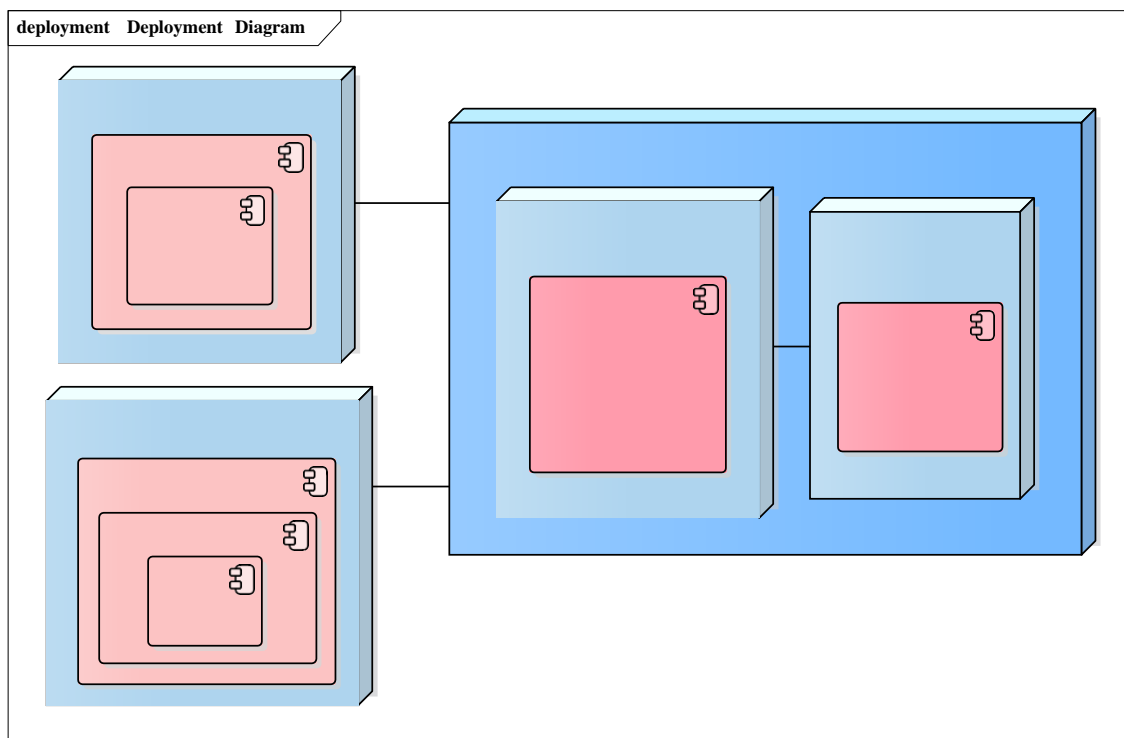


Fig. 7. Deployment Diagram (Own elaboration).

F. Business Modeling.

In Fig. 8 is represented the business process modeling, where it is allowed to have a better description of the processes that are executed in the company.

The processes are described below:

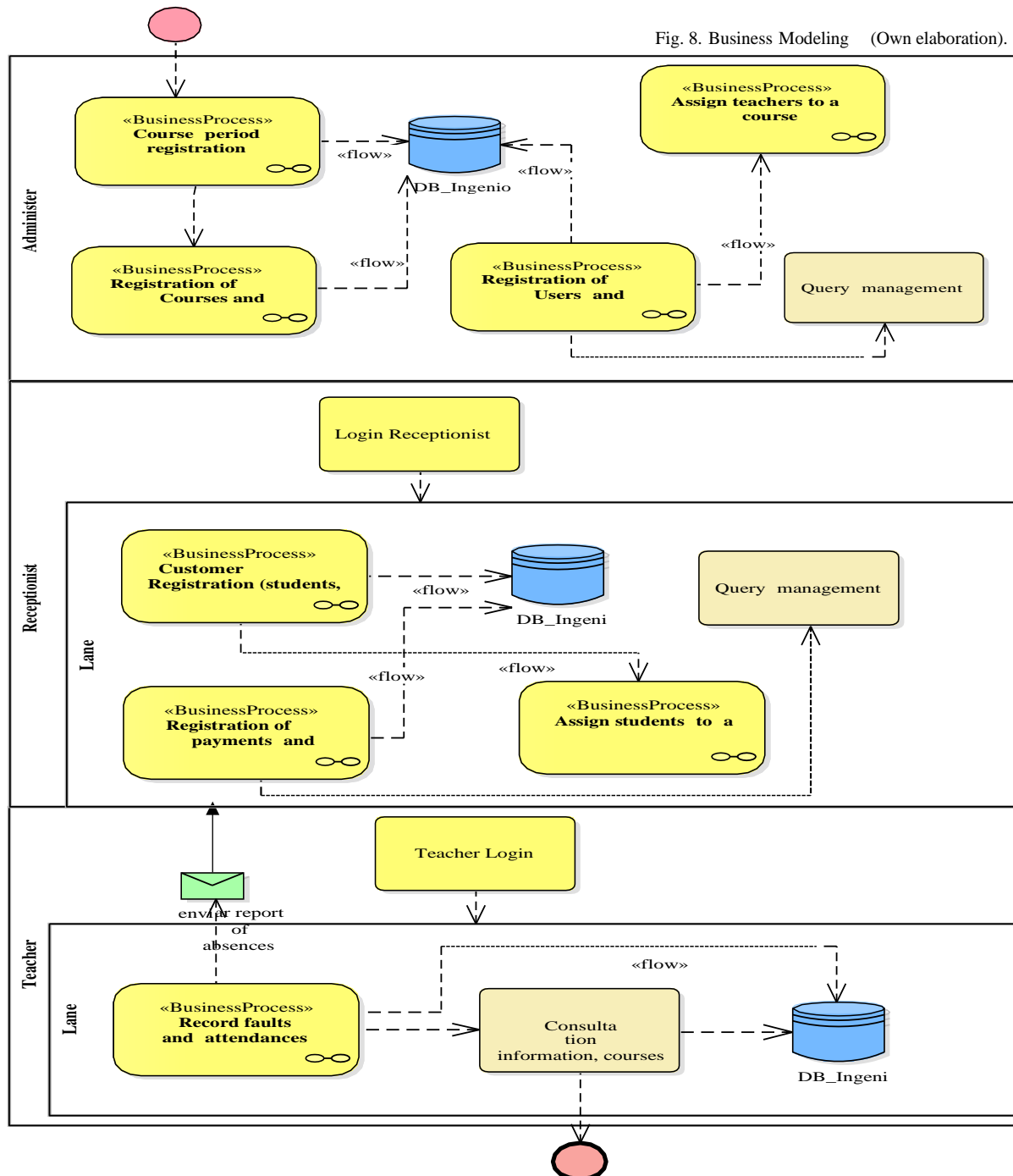
The first lane corresponds to the functions performed by the Administrator.

- **Registration of course period:** It is the first process, which starts each new period, where the administrator registers all the courses that will be opened in that period.
- **Registration of Client Students, Parent / Tutor:** The receptionist is responsible for receiving customers interested in the courses, then proceeds to keep track of the personal data of both the student and the parent or guardian.
- **Registration of payments:** The receptionist is in charge of the management of the payments, from the registration of the client proceeds to the registration of his first payment, and so on with each monthly payment paid, by each of the clients.
- **Assignment of students to a course:** This process will be carried out at the time of registration of the

client where only you will have to select the course that corresponds to that student taking in account Certain Features of the same, as by example age.

The third lane corresponds to the functionalities of the Teachers.

- Register absences and attendances: The teacher who is in charge of the course must keep track of the faults of his students.
- Consult your information, courses and schedules: The teacher can make a query to your inf.
- Send report of absences: The teacher in front of the course you must send a report to the receptionist envelope the absences of the Students by course.



V. REXPECTED RESULTS.

With the development of this project it is expected to obtain a software tool, in order that the company can have the indicated technology, which improves the management of the information so that it is always centralized and updated, that automates the most important processes of the same, and minimizes the time of consultation, to be able to influence the correct functioning of the company's processes.

VI. CONCLUSIONES.

After the analysis carried out with respect to all the problems of the company Ingeniotics, it was possible to present and make the different diagrams, under the use of the OOHDM methodology, which will lead us to the development of each one of the modules that will constitute the application.

The use of a methodology oriented to the development of web applications has important benefits for software developers since it not only supports the quality of the product that is being developed, but also decreases execution errors to the extent, clarifies the panorama to the when defining the requirements because they are mostly exemplified within the web context; that is, the representations or modeled with any of these methodologies will be more specific in terms of relationships, navigations, classes, activities and situations that you want to represent in the environment.

The application provides the company's staff with a tool that streamlines all the processes that were previously carried out manually, in addition this tool keeps the information centralized, reduces consultation times and also the use of resources such as sheets of paper.

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