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Development of a web application for consultation and online payments of technological services in higher education institutions

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Abstract. Currently services for online payments using gateways, have been displacing traditional payments. In this way, in addition to providing ease to the user, it also increases revenues from the use of these technologies. All electronic payment methods make life easier and make processing much cheaper, more efficient and more friendly for the end user, who with just a couple of clicks can process any request from your Smartphone, Tablet or Laptop. At present, the marketing processes of Tecnar's Technological Office services are carried out manually, as well as the offer to the external community in general. The process of paying for a service, vital to guarantee the income and sustainability of the business unit, does not have an online payment platform. For this reason, it is necessary to develop an information system that allows executing consultations and online payments.
A dynamic website will be delivered in a first phase using the PayU platform, to pay for computer maintenance services. Prior to this, there will be an investigation of other sites that use electronic commerce to promote their products. Finally, the development of the site will be carried out, implementing a database in MySQL, developing the site in HTML5 language through the BoilerPlate framework and the CSS3, JavaScript and PHP languages. In addition, implementing the Scrum methodology, which allows us to incorporate a set of good practices to work as a team and obtain better results. Preliminary effects include the creation of the database, the administration module and the PayU gateway registration.

1. Introduction

E-commerce can be defined, in a broad sense, as any form of transaction or exchange of commercial information based on the transmission of data over communication networks such as the Internet. In this sense, the concept of electronic commerce not only includes the electronic purchase and sale of goods, information or services, but also the use of the network for activities before or after the sale, such as: advertising, information search (about products, suppliers, etc.), negotiation between buyer and seller, customer service before and after the sale, etc. [1].

Undoubtedly, the rise of information and communication technologies and all their dissemination and development at an academic, social, cultural and business level means that every day people prepare and adopt the changes that are generated from the implementation of services and electronic commerce on the web (online payments). In this context, it is important to know how and when to develop strategies and digital marketing campaigns to publicize the services offered, such as WhatsApp marketing, Sendinblue and Acumbamail, accompanied by a business model on the Internet for its propagation as the B2B (Business to Business), B2C (Business to Consumer) or C2C (Consumer to Consumer) [2].

Today, companies are forced to innovate and implement changes in their organization to take full advantage of the opportunities offered by electronic commerce; otherwise, they will be destined for bankruptcy. Therefore, the effective application of the strategy of transforming traditional businesses to electronic businesses, turns out to be a very important factor to obtain a competitive advantage over others.

Based on the above, the development of a Web Application for consultation and on-line payments of Technological Services in Higher Education Institutions is projected, with a user-friendly interface that can be used to pay for computer maintenance services in a first stage through of the PayU payment gateway implementation [3].

The website that will be delivered will have a Responsive & Clean appearance and a high degree of usability. Features very typical of simple programming languages such as: Php, Html5, MySQL, Css3 and JavaScript

2. Methodology implemented
The development of this project is done with the Scrum collaborative framework, which is used for complex or simple implementations and belongs to the outstanding agile methodologies that handle iterations and incremental lines. This framework is usually used for software projects, although today, thanks to its adaptability, it can be used in different contexts. The Scrum life cycle is made up of three (3) very important roles, such as the Product Owner (owner of the product), the Scrum Master and the Development Team [4].
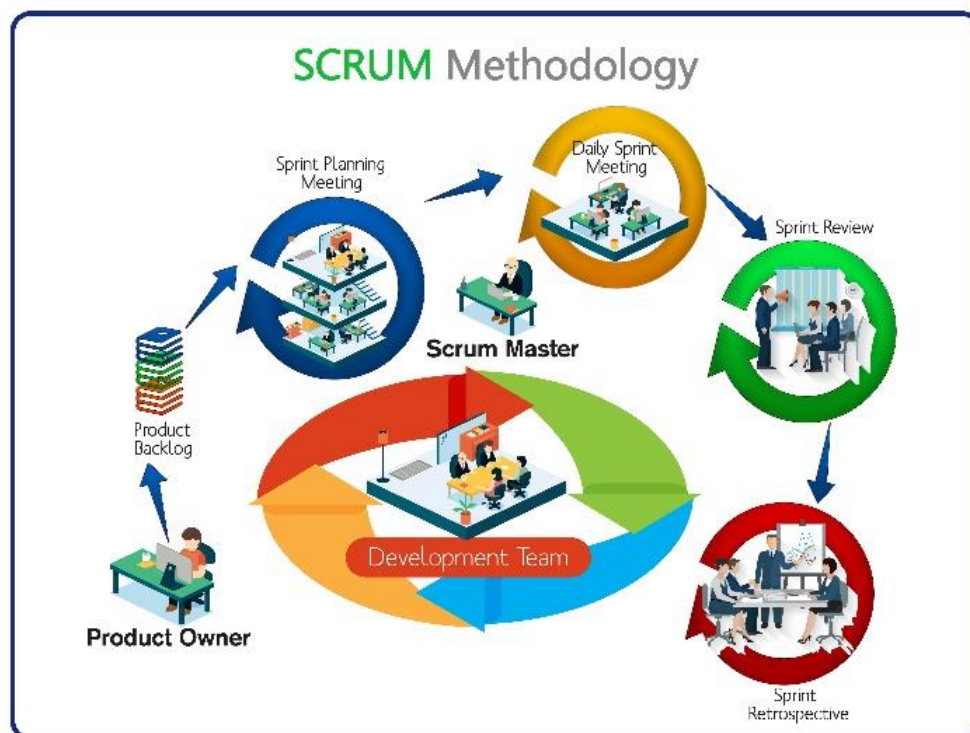
Figure 1. Scrum methodology

2.1. Product Owner
It is the person who represents the clients, something similar to the requirements engineer. This leader is in charge of raising all the information and knowing first hand all the needs of the client and thus be able to transmit them to the Development Team and the Scrum Master, so that they can build on that need.

2.2. Scrum Master
He is the leader of the work team, but he is not the person who gives orders or who says how things should be done, basically he is a moderator that helps the Development Team to understand the need of the client and the need that the Product Owner has raised.

2.3. Development Team
They are all people trained to solve the client's needs, building the project. These developers can be testers or analysts and must comply with the iterations (each sprint). This work team is represented by the author or owner of the project.

2.4. Product Backlog
Document defined by the Product Owner and contains all the needs, requirements and ideas of the client (these are called stories) that must be met. At this point, all the maintenance plans that will be offered on the website will be collected and created to be presented to the end user.

2.5. Sprint
Iteration whose duration is fixed beforehand and the equipment must comply with the provisions of the Product Backlog. Sprint is carried out every 20 days for this project.

2.6. Sprint Planning Meeting
Meeting to present by the Product Owner the stories captured in the Product Backlog, in order of priorities. In this initial stage, we present the design of the database to be implemented and the Sprint periodicity that will be 20 days from the first meeting. In addition, this meeting also reaches the conclusion that the programming language to be used is Php and JavaScript. The design and the interface will be made with Html5 and Css3 through the BoilerPlate Framework and the Sublime Text 3 editor, followed by an image that demonstrates this development.
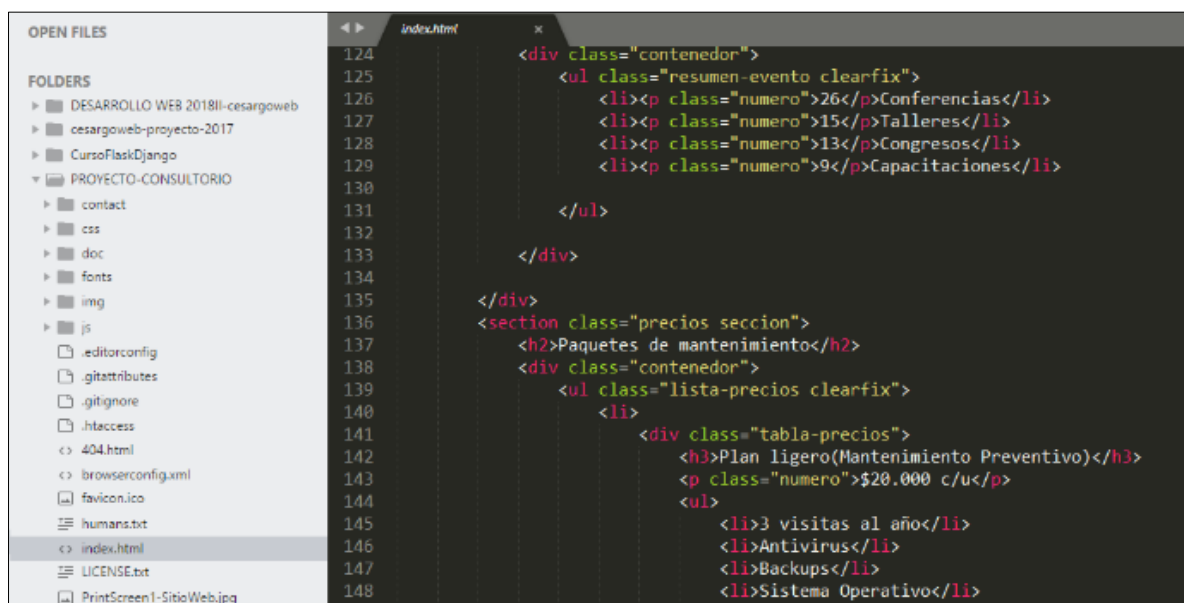
Figure 2. Sublime text 3 editor interface

2.7. Sprint Backlog
List of features that are obtained from the Sprint Planning Meeting. These are the requirements that must be built in each Sprint, which for this project is 20 days.

2.8. Daily Sprint Meeting
Daily meeting between the Scrum Master and the Development Team, maximum 15 minutes to track what exists in the Sprint and ask some specific questions: what was done yesterday, what is being done today, what will be done tomorrow and what problems will be they found.

2.9. Sprint Review
Meeting that takes place at the end of the Sprint to verify the fulfilment of the goals and objectives of the Sprint that is being worked on to guarantee the delivery of the final product.

2.10. Sprint Retrospective
Meeting that takes place after delivering the product in which the results of the previous Sprint are analysed and to see if there is something to improve or some shortcomings.

3. Dynamic website
Before starting the development and implementation of this project, it was necessary to do a study and survey of information in the city of Cartagena, to measure the percentage of use of online payment gateways and tools that are being used by Higher Education Institutions.
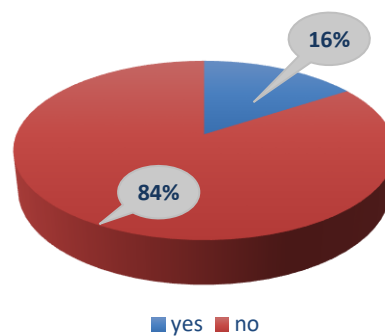
Figure 3. Online Payment System in Universities of Cartagena

Taking as a sample a number of nineteen (19) universities, it was evident that the data is not very encouraging in terms of the use of virtual payment systems. In figure 3 we can see that in the city of Cartagena, only 16% of the universities studied, have online payment and billing system, which shows that traditional collection systems such as payment in bank branches are still being implemented or windows of educational institutions and this registers 84% of the total intervened.
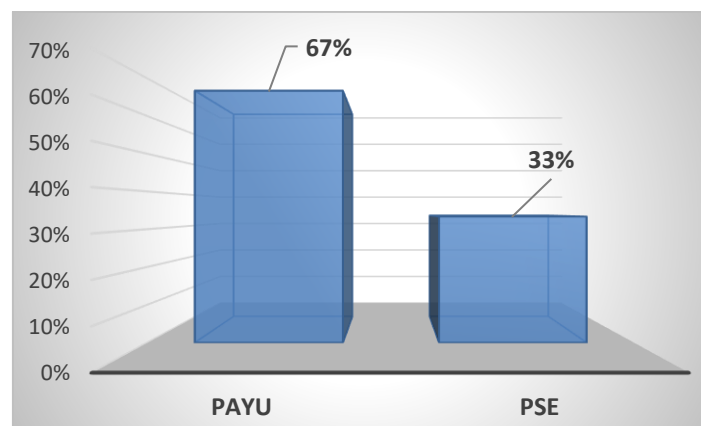
Figure 4. Payment Platforms in Universities of Cartagena

It can be observed in Figure 4, that the payment platform preferred by the Institutions that implement online payments is PayU, with a 67% share. This is explained by its technological versatility and by the easy way to be integrated into the information system of each entity.

In addition, this research shows that 100% of the institutions involved use their online payment method for tuition and continuing education such as specializations, extension courses, diploma courses and seminars, among others. Today in Cartagena there is no Higher Education Institution that promotes and sells technology services through its website. For this reason, the implementation of this online payment system through a dynamic website using the PayU payment gateway is relevant for the region.

This is the reason why we see the need to develop a site in which people, entrepreneurs, private and public educational institutions and strategic allies, can pay online for the technological services that are being promoted from the Tecnar technological office by middle of a PayU payment gateway. That is why we say that this project is relevant in our region, adaptable and scalable to other Institutions of Higher Education.

The website (consultoriotecnologico.tecnar.edu.co), which is anchored to the domain and server of the Institution, consists of a totally friendly interface, with a high degree of usability, with the application of standards and good programming practices. That W3C offers us and also with a Responsive & Clean design that provides the ease of navigation on any Android and iOS technology mobile device [5].

Figure 5. Homepage

The technological services that in this first stage of the project will be offered to be able to request and pay online are the different preventive maintenance plans to computers, at a regional level.

Figure 6. Option to pay

The design and structure of the site is supported in the Html5 language by means of the BoilerPlate Framework, which provides all the labels for the development of the interface, where any person could navigate without any inconvenience, a main banner with the name of the center is presented technological and navigation to social networks to achieve interaction with the user, a navigation bar with 4 (four) home links, who we are, services and contact us. The module to choose and pay for services online is in the central part of the main page or index. After creating the entire structure, the styles and the final appearance are defined with the CSS3 language, which gives us a unique aspect for visualization [6].

The dynamic part is worked with the Php programming language that connects with the MySQL database where all the tables that will contain the information of the visitors and people who make transactions are housed. This database is fully administrable with the PhpMyAdmin software, with which all the tables and fields that are worked on are created and modified [7].

For this project a previous investigation was carried out on which platform would be the most appropriate to connect to the website for the ease of our clients. It was found that several payment gateways operate in Colombia such as: Enlineapagos, Pagoagil, PayU, Pagosinteligentes, Ev1enlinea, Paypal, 2CheckOut, Interpagos, among others. According to the analysis carried out, it was decided to implement the PayU platform due to its important scope and characteristics. This gateway receives national and international payments, customers receive notifications to their registered email or cell phone immediately after their transaction, registration to the PayU account is free, the client can integrate their banking agreements, very low processing fees, anti-fraud control, monitoring of ongoing transactions, technical and operational support 7 * 24, debit card payments, credit card payments, cash payments, bank payments and PayU's option (in which the customer can pay the purchase up to 14 days without interest), among others [8].

**Table 1.** Comparison between payment systems

Payment systems	Advantage	Limitations
PayU	Security Anti fraud module Ease of integration Variety of methods World presence	Network dependency Returns
PayPal	Email association Security Speed by mail Immediateness of money Free to the buyer	Money limit High Commissions
Pse	Real time confirmation Real time identification Cost savings Decongestion	Registration in banks Second banking code

In Table 1, we can observe some advantages and limitations on which we base ourselves to choose the PayU catwalk as the basis of this project, because its structure is quite robust and has a high degree of security. Its antifraud module does not allow thefts or false transactions that harm the end user and is

implemented almost everywhere as a payment system that provides a variety of methods for the ease of people [9].

For the action of making a consultation or online payment, the user must go to the central part of the site, where you will find 3 (three) maintenance packages and by choosing the desired plan by means of an input, you can use the pay button connect to PayU's database and online payment gateway to complete your transaction. Below is a detail of the website interface implemented [10].
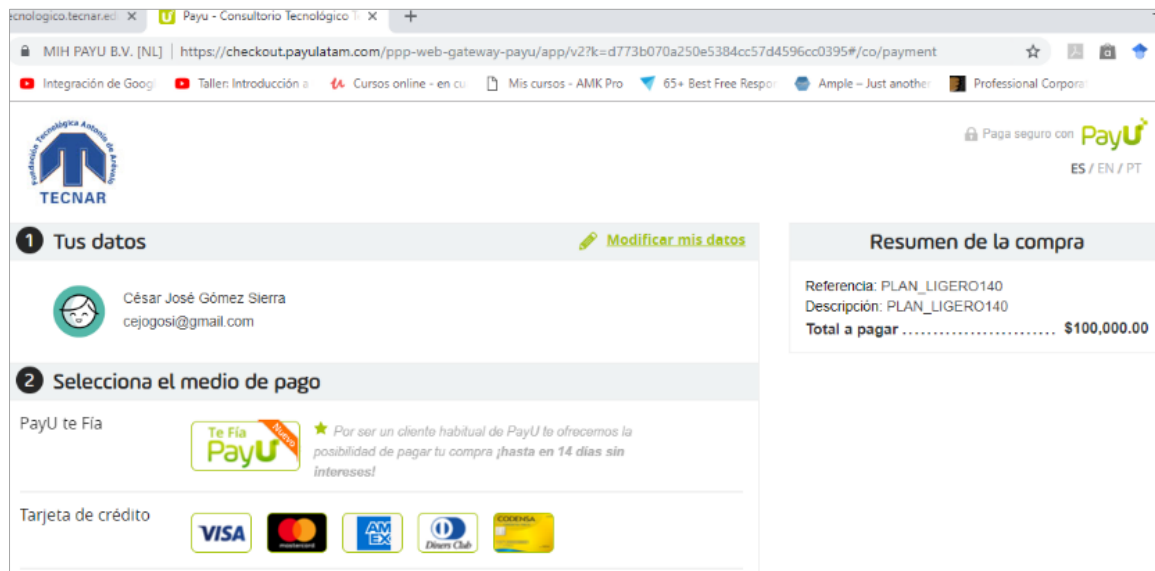
Figure 7. Payment finalization

4. Conclusions

With the development of this project, the implementation of an online payment system is achieved, which facilitates the achievement of the line of business of the Technological Office of the Antonio de Arevalo Technological Foundation and allows the possibility that many Higher Education Institutions, they also take ownership and can implement it as a model of additional generation of economic resources. This web page, whose interface is clean and totally friendly, allows through a system of entry of the number of computers that the user needs to be intervened, to have the total value calculated and make the payment with just a couple of clicks.

The project Development of a Web Application for consultation and online payments of Technological Services in Higher Education Institutions, is implemented in a scalable way, because it can be easily updated and also integrate new products to promote with their respective calculations and payments. The scalability of this software project also opens up the possibility of developing its mobile application for computers with Android and IoS operating systems.

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